FINAL

ENVIRONMENTAL IMPACT STATEMENT
For the Rebuild by Design Meadowlands Flood Protection Project

October 2018 | Appendices H – Q

Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro and the Township of South Hackensack, Bergen County, New Jersey

REBUILD BY DESIGN
MEADOWLANDS

Prepared by AECOM for the State of New Jersey Department of Environmental Protection

Español 中文:繁體版 Việt-ngữ 한국어 Tagalog
Português العربية Kreyòl ગુજરાતી Italiano Polski
www.renewjerseystronger.org

Appendix H: Air Quality and Greenhouse Gas Emissions

This Page has been Intentionally Left Blank.

Projected Emissions for CY 2020
All Sources
Construction Year 1

Emission Source	Projected Emissions (tons per year)							CY 2020 (metric tons per year)
	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e	CO_2e
Construction Equipment Operation	15.90	16.63	2.71	1.73	1.73	1.14	1,665.18	1,510.63
Site Preparation - Fugitive Emissions	--	--	--	0.80	0.80	--	--	--
Rock/Soil Handling, Storage, and Export - Fugitive Emissions	--	--	--	0.16	0.02	--	--	--
Concrete Handling, Storage, and Export - Fugitive Emissions	--	--	--	0.71	0.09	--	--	--
Total	15.90	16.63	2.71	3.40	2.63	1.14	1,665.18	1,510.63

Projected Emissions for CY 2021
All Sources
Construction Year 2

Emission Source	Projected Emissions (tons per year)							CY 2021 (metric tons per year)
	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e	CO_2e
Construction Equipment Operation	22.86	20.22	2.92	1.90	1.90	1.39	1,996.32	1,811.03
Rock/Soil Handling, Storage, and Export - Fugitive Emissions	--	--	--	0.16	0.02	--	--	--
Concrete Handling, Storage, and Import - Fugitive Emissions	--	--	--	0.14	0.02	--	--	--
Total	22.86	20.22	2.92	2.20	1.94	1.39	1,996.32	1,811.03

Projected Emissions for CY 2022
All Sources
Construction Year 3

Emission Source	Projected Emissions (tons per year)							CY 2022 (metric tons per year)
	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e	CO_2e
Construction Equipment Operation	15.91	16.67	3.52	2.26	2.26	1.12	1,624.59	1,473.81
Rock/Soil Handling, Storage, and Import - Fugitive Emissions	--	--	--	0.30	0.03	--	--	--
Total	15.91	16.67	3.52	2.57	2.29	1.12	1,624.59	1,473.81

Projected Annual Operations Emissions
All Sources
Potential Annual Emissions from Stationary Sources During Operations

Emission Source	Projected Emissions (tons per year)							metric tons per year
	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	HAPs	CO_2e
Generators	0.63	4.36	0.17	0.05	0.05	0.002	0.002	211.68
Total	0.63	4.36	0.17	0.05	0.05	0.002	0.002	211.68

This Page has been Intentionally Left Blank.

Construction Equipment Projected Hours of Operation
RBDM Alternative 1

Equipment	Type	Average Rated HP	No. of Units	Days Per Year			Hours Per Year			
				CY 2020 Days	CY 2021 Days	CY 2022 Days	CY 2020 Hours	CY 2021 Hours	CY 2022 Hours	
Asphalt paver	Diesel Pavers	130	1			4			36	
Asphalt roller, 10 Ton	Diesel Rollers	130	3			13			117	
Backhoe loader	Diesel Tractors/Loaders/Backhoes	48	2	40	6	148	360	54	1,332	
Chain saws	2 Stroke Chain Saws >6 HP	7	6	36			324			
Generator, 10 kW	Diesel Generator Sets	13.41	4	118	470	23	1,062	4,230	207	
Concrete pump, 50 cy/hr.	Diesel Pumps	115	3	71	49		639	441		
Crane, Crawler, 100 Ton	Diesel Cranes	320	4	184	464	20	1,656	4,176	180	
Crane, RT, 25 Tons	Diesel Cranes	130	4	20	80	49	180	720	441	
Dewatering pump, 4-in.	Diesel Pumps	45	4	198	410		1,782	3,690		
Dozer	Diesel Crawler Tractor/Dozer	200	3	105		4	945		36	
Dozer	Diesel Crawler Tractor/Dozer	80	3		181	5		1,629	45	
Brush Chipper	Diesel Chippers/Stump Grinders	130	3	19			171			
Pile hammer, 41 k ft-lb	Diesel Crushing Equipment	60	2	74	74		666	666		
Pile hammer, vibratory	Diesel Crushing Equipment	300	4	47	203	8	423	1,827	72	
Welder, gas, 300 amp	4 Stroke Welders	50	4	23	54	10	207	486	90	
Grader, 30000 lb.	Diesel Graders	150	1			5			45	
Hammer, hydraulic, 1200 lb.	Diesel Crushing Equipment	60	2	61			549			
Excavator, hydraulic, 1.5 cy	Diesel Excavators	128	5	115	123	15	1,035	1,107	135	
Loader, skid steer	Diesel Skid Steer Loaders	30	3	25		5	225		45	
Loader, crawler, 3 cy	Diesel Tractors/Loaders/Backhoes	190	3	37		15	333		135	
Loader, wheel, 1.5 cy	Diesel Tractors/Loaders/Backhoes	75	1			32			288	
Loader, wheel, 4 cy	Diesel Tractors/Loaders/Backhoes	182	2	53			477			
Roller, compactor, 25 Ton	Diesel Rollers	205	1			5			45	
Roller, compactor, 5 Ton	Diesel Rollers	80	1		32			288		
Roller, compactor	Diesel Rollers	7.5	6		358	10		3,222	90	
Dump Truck, 12 cy	Diesel Dumpers/Tenders	400	9	393	917	1,565	3,538	8,252	14,086	
Dump Truck, 8 cy	Diesel Dumpers/Tenders	220	5	954			8,588			
Tanker Truck, 5000 gal.	Diesel Dumpers/Tenders	400	1		1	19		5	86	conservatively estimated to be operating 50% of the 9-hour day - assumed it is turning on and off to spray water for fugitive dust control
Pickup Truck, 3/4 Ton	Diesel Off-highway Trucks	400	unknown, assumed to be >10	1,178	1,178	977	5,301	5,301	4,397	conservatively estimated to be operating 50% of the 9-hour day - assuming trucks are turned off when not in use and are being used to carry small tools and equipment on site
Tugboat	Small Diesel Tugboat	600	1		23			207		
Barge, flat-deck, 2000 Ton	No engine - pulled by tugboat	-	1		23			207		

Assumptions:

Field construction is projected to start in early 2020 and be completed by summer 2022. It was conservatively assumed that construction would begin January 1, 2020 and end June 30, 2022.
Typical workday will include 9 hours of construction, 6 days per week.
Estimated hours of operation were provided by this Proposed Project's design team.
When it was not specified, it was assumed as a conservative estimate that the fuel would be diesel.
It is assumed that the workers potentially commuting to job sites under the Proposed Project would commute to other regional job sites that are unrelated to the Proposed Project under the No Action Alternative. Therefore, potential emissions generated from worker commutes were not quantified, since the commuter emissions are assumed to be the same, or of a negligible difference, between the Build Alternatives and No Action Alternative.

8 cy Dump Truck Hours for demolition and clearing estimated as follows:

Total trips =	8,588		
Average hours per round-trip =	1		
Total hours operated =	8,588	*Total days*	*954*

12 cy Dump Truck Hours for soil excavation estimated as follows:

Total trips =	7,075		
Average hours per round-trip =	1		
Total hours operated =	7,075	*Total days*	*786*

12 cy Dump Truck Hours for soil (wetland restoration) estimated as follows:

Total trips =	6,833		
Average hours per round-trip =	2		
Total hours operated =	13,666	*Total days*	*1,518*

12 cy Dump Truck Hours for concrete estimated as follows:

Total trips =	1,755		
Average hours per round-trip =	2		
Total hours operated =	3,510	*Total days*	*390*

12 cy Dump Truck Hours for steel estimated as follows:

Total trips =	397		
Average hours per round-trip =	2		
Total hours operated =	794	*Total days*	*88*

12 cy Dump Truck Hours for asphalt estimated as follows:

Total trips =	205		
Average hours per round-trip =	2		
Total hours operated =	410	*Total days*	*46*

PLUS an additional:	210	truckloads for other fabricated materials.
Average hours per round-trip =	2	
Total hours operated =	420	*Total days* *47*

Average run per trip = 2

Total hours operated = 34,463 hours

Truck Trip Table from Appendix F:

Anticipated Truck Trips and Material Quantity Transported

Materials	Quantity and Measurement		Average Quantity per Truckload		Truckloads (each)
EXPORTS					
Demolition and clearing debris	68,700	CY	8	CY	8,588
Soils	84,900	CY	12	CY	7,075
TOTAL EXPORT TRUCKLOADS					***15,663***
IMPORTS					
Soils and aggregates	82,000	CY	12	CY	6,833
Hot mix asphalt	4,100	Tons	20	Tons	205
Precast concrete	3,800	CY	6	CY	633
Ready-mix concrete and grout	10,100	CY	9	CY	1,122
Reinforcement steel	730	Tons	20	Tons	37
Structural steel and piling products	7,200	Tons	20	Tons	360
Other fabricated materials	210	Truckloads	1	Each	210
TOTAL IMPORT TRUCKLOADS					***9,400***

Assumptions:

Truck trips were separated by the type of export or import material (i.e., demolition debris, soil, steel, etc.). The Truck Trip table (**Table F-5**) from **Appendix F** provides the estimated number of truck trips for each type of material export or import and is provided here.

"Hours per round-trip" was determined based on the list of potential export and import facilities, and what materials that facility accepts or exports, as described in **Appendix F** and shown in **Table F-11** of **Appendix F**.

Estimated, average round-trip distances (in minutes or hours) was determined based on the location of each materials' potential associated export or import facility(ies) in relation to the Project Area and what routes the trucks would be taking, as provided in **Attachment F-4** to **Appendix F**.

Construction Equipment Projected Hours of Operation
Separated By RBDM Alternative 1 Work Areas

			Northeastern				Central				Southeastern				Berry's Creek			
Equipment	Type	Average Rated HP	No. of Units	CY 2020 Hours	CY 2021 Hours	CY 2022 Hours	No. of Units	CY 2020 Hours	CY 2021 Hours	CY 2022 Hours	No. of Units	CY 2020 Hours	CY 2021 Hours	CY 2022 Hours	No. of Units	CY 2020 Hours	CY 2021 Hours	CY 2022 Hours
Asphalt paver	Diesel Pavers	130	0				1			36	0				0			
Asphalt roller, 10 Ton	Diesel Rollers	130	0				3			117	0				0			
Backhoe loader	Diesel Tractors/Loaders/Backhoes	48	1	40	54		1	320		1,332	0				0			
Chain saws	2 Stroke Chain Saws >6 HP	7	2	26			2	253			2	36			2	10		
Generator, 10 kW	Diesel Generator Sets	13.41	1	11	677		1	21	2,369	207	1		804		1	1,030	381	
Concrete pump, 50 cy/hr.	Diesel Pumps	115	0		9		1		207		1		35		1	639	190	
Crane, Crawler, 100 Ton	Diesel Cranes	320	1	116	251		1	464	2,213	9	1	33	418		1	1,043	1,295	171
Crane, RT, 25 Tons	Diesel Cranes	130	1	9	274		1	171	274	423	1		173		1			18
Dewatering pump, 4-in.	Diesel Pumps	45	1	107			1		2,915		1	303			1	1,372	775	
Dozer	Diesel Crawler Tractor/Dozer	200	1	28			1	671		36	1	236			0	9		
Dozer	Diesel Crawler Tractor/Dozer	80	0		4		1		1,315	45	1		195		1		114	
Brush Chipper	Diesel Chippers/Stump Grinders	130	1	19			1	127			1	19			0	7		
Pile hammer, 41 k ft-lb	Diesel Crushing Equipment	60	0				1	73	73		0				1	260	260	
Pile hammer, vibratory	Diesel Crushing Equipment	300	1	186			1	106	1,334		1	34	438		1	97	55	72
Welder, gas, 300 amp	4 Stroke Welders	50	1		63		1	25	63		1		63		1	182	296	90
Grader, 30000 lb.	Diesel Graders	150	0				1			45	0				0			
Hammer, hydraulic, 1200 lb.	Diesel Crushing Equipment	60	1	55			1	494			0				0			
Excavator, hydraulic, 1.5 cy	Diesel Excavators	128	1	93			2	766	675	96	1	72	122		1	104	310	39
Loader, skid steer	Diesel Skid Steer Loaders	30	1	27			1	176		45	1	18			0	5		
Loader, crawler, 3 cy	Diesel Tractors/Loaders/Backhoes	190	1	20			1	286		135	1	20			0	7		
Loader, wheel, 1.5 cy	Diesel Tractors/Loaders/Backhoes	75	0				1			288	0				0			
Loader, wheel, 4 cy	Diesel Tractors/Loaders/Backhoes	182	1	52			1	425			0				0			
Roller, compactor, 25 Ton	Diesel Rollers	205	0				1			45	0				0			
Roller, compactor, 5 Ton	Diesel Rollers	80	0				1		279		0		9		0			
Roller, compactor	Diesel Rollers	7.5	0		3		2		2,900	90	2		226		2		93	
Dump Truck, 12 cy	Diesel Dumpers/Tenders	400	2	354	825	141	3	2,264	5,281	13,663	2	142	330	141	2	778	1,815	141
Dump Truck, 8 cy	Diesel Dumpers/Tenders	220	1	129			2	8,244			1	129			1	86		
Tanker Truck, 5000 gal.	Diesel Dumpers/Tenders	400	0				1			86	0		5		0			
Pickup Truck, 3/4 Ton	Diesel Off-highway Trucks	400	-	1,325	1,325	1,099	-	1,325	1,325	1,099	-	1,325	1,325	1,099	-	1,325	1,325	1,099
Tugboat	Small Diesel Tugboat	600	1	108			0	99			0				0			
Barge, flat-deck, 2000 Ton	No engine - pulled by tugboat	-	1	108			0	99			0				0			

Assumptions:

Field construction is projected to start in early 2020 and be completed by summer 2022. It was conservatively assumed that construction would begin January 1, 2020 and end June 30, 2022.

Typical workday will include 9 hours of construction, 6 days per week.

Estimated hours of operation were provided by this Proposed Project's design team.

When it was not specified, it was assumed as a conservative estimate that the fuel would be diesel.

It is assumed that the workers potentially commuting to job sites under the Proposed Project would commute to other regional job sites that are unrelated to the Proposed Project under the No Action Alternative. Therefore, potential emissions generated from worker commutes were not quantified, since the commuter emissions are assumed to be the same, or of a negligible difference, between the Build Alternatives and No Action Alternative.

Construction Equipment Air Quality Emission Factors
RBDM Alternative 1

Equipment	Type	Average Rated HP[1]	Loading Factors[2]	Emission Factors (lb/1000 HP-hr)[2]							Emission Factors (lb/hr)[3]						
				CO	NOx	VOC	PM_{10}	$PM_{2.5}$	SOx	CO_2e	CO	NOx	VOC	PM_{10}	$PM_{2.5}$	SOx	CO_2e
Asphalt paver	Diesel Pavers	130	59%	4.76	10.72	0.9	0.88	0.84	0.84	1224	3.65E-01	8.22E-01	6.90E-02	6.75E-02	6.44E-02	6.44E-02	93.85
Asphalt roller, 10 Ton	Diesel Rollers	130	59%	5.78	11.09	1.01	0.99	0.97	0.86	1244	4.43E-01	8.51E-01	7.75E-02	7.59E-02	7.44E-02	6.60E-02	95.39
Backhoe loader	Diesel Tractors/Loaders/Backhoes	48	21%	14.64	15.61	3.42	2.36	2.27	1.01	1473	1.48E-01	1.57E-01	3.45E-02	2.38E-02	2.29E-02	1.02E-02	14.85
Chain saws	2 Stroke Chain Saws >6 HP	7	70%	779.31	2.12	165.53	21.52	19.80	0.31	1541	3.82E+00	1.04E-02	8.11E-01	1.05E-01	9.70E-02	1.52E-03	7.55
Generator, 10 kW	Diesel Generator Sets	13.41	43%	6.95	13.98	1.85	1.35	1.30	0.88	1261	4.01E-02	8.06E-02	1.07E-02	7.78E-03	7.50E-03	5.07E-03	7.27
Concrete pump, 50 cy/hr.	Diesel Pumps	115	43%	6.92	14.09	1.76	1.37	1.32	0.88	1261	3.42E-01	6.97E-01	8.70E-02	6.77E-02	6.53E-02	4.35E-02	62.37
Crane, Crawler, 100 Ton	Diesel Cranes	320	43%	3.02	12.06	0.84	0.64	0.62	0.82	1186	4.16E-01	1.66E+00	1.16E-01	8.81E-02	8.53E-02	1.13E-01	163.16
Crane, RT, 25 Tons	Diesel Cranes	130	43%	3.02	12.06	0.84	0.64	0.62	0.82	1186	1.69E-01	6.74E-01	4.70E-02	3.58E-02	3.47E-02	4.58E-02	66.28
Dewatering pump, 4-in.	Diesel Pumps	45	43%	6.92	14.09	1.76	1.37	1.32	0.88	1261	1.34E-01	2.73E-01	3.41E-02	2.65E-02	2.55E-02	1.70E-02	24.41
Dozer	Diesel Crawler Tractor/Dozer	200	59%	4.50	11.09	0.77	0.73	0.71	0.84	1199	5.31E-01	1.31E+00	9.09E-02	8.61E-02	8.38E-02	9.91E-02	141.48
Dozer	Diesel Crawler Tractor/Dozer	80	59%	4.50	11.09	0.77	0.73	0.71	0.84	1199	2.12E-01	5.23E-01	3.63E-02	3.45E-02	3.35E-02	3.96E-02	56.59
Brush Chipper	Diesel Chippers/Stump Grinders	130	43%	5.67	13.69	1.39	1.08	1.06	0.84	1226	3.17E-01	7.65E-01	7.77E-02	6.04E-02	5.93E-02	4.70E-02	68.52
Pile hammer, 41 k ft-lb	Diesel Crushing Equipment	60	43%	4.21	12.72	0.99	0.79	0.77	0.84	1213	1.09E-01	3.28E-01	2.55E-02	2.04E-02	1.99E-02	2.17E-02	31.28
Pile hammer, vibratory	Diesel Crushing Equipment	300	43%	4.21	12.72	0.99	0.79	0.77	0.84	1213	5.43E-01	1.64E+00	1.28E-01	1.02E-01	9.93E-02	1.08E-01	156.42
Welder, gas, 300 amp	4 Stroke Welders	50	68%	1422.95	7.47	25.20	0.24	0.22	0.46	2225	4.84E+01	2.54E-01	8.57E-01	8.16E-03	7.48E-03	1.56E-02	75.65
Grader, 30000 lb.	Diesel Graders	150	59%	3.33	10.05	0.75	0.68	0.66	0.82	1195	2.95E-01	8.89E-01	6.64E-02	6.02E-02	5.84E-02	7.26E-02	105.72
Hammer, hydraulic, 1200 lb.	Diesel Crushing Equipment	60	43%	4.21	12.72	0.99	0.79	0.77	0.84	1213	1.09E-01	3.28E-01	2.55E-02	2.04E-02	1.99E-02	2.17E-02	31.28
Excavator, hydraulic, 1.5 cy	Diesel Excavators	128	59%	3.75	10.03	0.75	0.71	0.68	0.84	1204	2.83E-01	7.57E-01	5.66E-02	5.36E-02	5.14E-02	6.34E-02	90.90
Loader, skid steer	Diesel Skid Steer Loaders	30	21%	19.58	16.01	4.85	3.11	3.02	1.06	1533	1.23E-01	1.01E-01	3.06E-02	1.96E-02	1.90E-02	6.68E-03	9.66
Loader, crawler, 3 cy	Diesel Tractors/Loaders/Backhoes	190	21%	14.64	15.61	3.42	2.36	2.27	1.01	1473	5.84E-01	6.23E-01	1.36E-01	9.42E-02	9.06E-02	4.03E-02	58.76
Loader, wheel, 1.5 cy	Diesel Tractors/Loaders/Backhoes	75	21%	14.64	15.61	3.42	2.36	2.27	1.01	1473	2.31E-01	2.46E-01	5.39E-02	3.72E-02	3.58E-02	1.59E-02	23.20
Loader, wheel, 4 cy	Diesel Tractors/Loaders/Backhoes	182	21%	14.64	15.61	3.42	2.36	2.27	1.01	1473	5.60E-01	5.97E-01	1.31E-01	9.02E-02	8.68E-02	3.86E-02	56.29
Roller, compactor, 25 Ton	Diesel Rollers	205	59%	5.78	11.09	1.01	0.99	0.97	0.86	1244	6.99E-01	1.34E+00	1.22E-01	1.20E-01	1.17E-01	1.04E-01	150.42
Roller, compactor, 5 Ton	Diesel Rollers	80	59%	5.78	11.09	1.01	0.99	0.97	0.86	1245	2.73E-01	5.23E-01	4.77E-02	4.67E-02	4.58E-02	4.06E-02	58.75
Roller, compactor	Diesel Rollers	7.5	59%	5.78	11.09	1.01	0.99	0.97	0.86	1246	2.56E-02	4.91E-02	4.47E-03	4.38E-03	4.29E-03	3.81E-03	5.51
Dump Truck, 12 cy	Diesel Dumpers/Tenders	400	21%	18.74	16.43	5.01	3.11	3.00	1.04	1513	1.57E+00	1.38E+00	4.21E-01	2.61E-01	2.52E-01	8.74E-02	127.07
Dump Truck, 8 cy	Diesel Dumpers/Tenders	220	21%	18.74	16.43	5.01	3.11	3.00	1.04	1513	8.66E-01	7.59E-01	2.31E-01	1.44E-01	1.39E-01	4.80E-02	69.89
Tanker Truck, 5000 gal.	Diesel Dumpers/Tenders	400	121%	18.74	16.43	5.01	3.11	3.00	1.04	1513	9.07E+00	7.95E+00	2.42E+00	1.51E+00	1.45E+00	5.03E-01	732.17
Pickup Truck, 3/4 Ton	Diesel Off-highway Trucks	400	59%	3.66	11.27	0.64	0.57	0.55	0.82	1192	8.64E-01	2.66E+00	1.51E-01	1.35E-01	1.30E-01	1.94E-01	281.40
Tugboat	Small Diesel Tugboat	600	31%	1.10	13.20	0.50	0.72	0.72	1.30	ND	2.05E-01	2.46E+00	9.30E-02	1.34E-01	1.34E-01	2.42E-01	ND
Barge, flat-deck, 2000 Ton	No engine - pulled by tugboat	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

1. Average horsepower ratings were obtained from a review of various manufacturers' specifications
2. Loading factors and emission factors from USAFCEE *Air Emissions Guide For Air Force Mobile Sources*, July 2016, Section 4; except for the Tugboat, which was provided by USEPA *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories*, April 2009, Section 3.
3. Emission Factors (lbs./hr.) = (Average Rated HP X Loading Factors X Emission Factors (lbs./1000 HP-hr.)) / 1000
4. ND = No Data available

Projected Emissions for CY 2020
Construction Equipment
RBDM Alternative 1

Construction Equipment	Usage (hr)	Emissions (lb)						
		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
Asphalt paver	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt roller, 10 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe loader	360	53.13	56.65	12.41	8.56	8.24	3.67	5,344.39
Chain saws	324	1,237.23	3.37	262.80	34.17	31.43	0.49	2,446.49
Generator, 10 kW	1062	42.56	85.61	11.33	8.27	7.96	5.39	7,724.02
Concrete pump, 50 cy/hr.	639	218.66	445.22	55.61	43.29	41.71	27.81	39,855.57
Crane, Crawler, 100 Ton	1656	688.15	2,748.06	191.41	145.83	141.28	186.85	270,196.19
Crane, RT, 25 Tons	180	30.39	121.35	8.45	6.44	6.24	8.25	11,931.22
Dewatering pump, 4-in.	1782	238.61	485.85	60.69	47.24	45.52	30.34	43,492.11
Dozer	945	501.80	1,236.65	85.86	81.40	79.17	93.67	133,700.49
Dozer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brush Chipper	171	54.20	130.86	13.29	10.32	10.13	8.03	11,716.82
Pile hammer, 41 k ft-lb	666	72.34	218.57	17.01	13.57	13.23	14.43	20,834.49
Pile hammer, vibratory	423	229.73	694.09	54.02	43.11	42.02	45.84	66,163.58
Welder, gas, 300 amp	207	10,014.72	52.57	177.36	1.69	1.55	3.24	15,658.64
Grader, 30000 lb.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hammer, hydraulic, 1200 lb.	549	59.63	180.17	14.02	11.19	10.91	11.90	17,174.38
Excavator, hydraulic, 1.5 cy	1035	293.11	783.98	58.62	55.50	53.15	65.66	94,085.04
Loader, skid steer	225	27.75	22.69	6.87	4.41	4.28	1.50	2,172.86
Loader, crawler, 3 cy	333	194.52	207.41	45.44	31.36	30.16	13.42	19,568.25
Loader, wheel, 1.5 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loader, wheel, 4 cy	477	266.90	284.58	62.35	43.03	41.38	18.41	26,849.98
Roller, compactor, 25 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor, 5 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck, 12 cy	3538	5,568.59	4,882.17	1,488.72	924.14	891.45	309.04	449,513.66
Dump Truck, 8 cy	8588	7,435.39	6,518.86	1,987.80	1,233.94	1,190.30	412.64	600,207.16
Tanker Truck, 5000 gal.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Truck, 3/4 Ton	5301	4,578.79	14,099.18	800.66	713.09	688.07	1,025.85	1,491,722.82
Tugboat	0	0.00	0.00	0.00	0.00	0.00	0.00	ND
Barge, flat-deck, 2000 Ton	0	-	-	-	-	-	-	-
Total Emissions	**(lb./yr.):**	**31,806.2**	**33,257.9**	**5,414.7**	**3,460.5**	**3,338.2**	**2,286.4**	**3,330,358.2**
Total Emissions	**(tpy)**	**15.90**	**16.63**	**2.71**	**1.73**	**1.67**	**1.14**	**1,665.18**
Total Emissions	**(Metric Tons/yr.)**							**1,510.63**

Projected Emissions for CY 2021
Construction Equipment
RBDM Alternative 1

Construction Equipment	Usage (hr)	Emissions (lb)						
		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
Asphalt paver	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt roller, 10 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe loader	54	7.97	8.50	1.86	1.28	1.24	0.55	801.66
Chain saws	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generator, 10 kW	4230	169.52	340.99	45.12	32.93	31.71	21.46	30,765.18
Concrete pump, 50 cy/hr.	441	150.91	307.27	38.38	29.88	28.79	19.19	27,505.95
Crane, Crawler, 100 Ton	4176	1,735.35	6,929.89	482.68	367.76	356.26	471.19	681,364.31
Crane, RT, 25 Tons	720	121.55	485.39	33.81	25.76	24.95	33.00	47,724.87
Dewatering pump, 4-in.	3690	494.10	1,006.05	125.67	97.82	94.25	62.83	90,059.43
Dozer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	1629	346.00	852.70	59.20	56.13	54.59	64.59	92,189.67
Brush Chipper	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pile hammer, 41 k ft-lb	666	72.34	218.57	17.01	13.57	13.23	14.43	20,834.49
Pile hammer, vibratory	1827	992.23	2,997.89	233.33	186.19	181.48	197.97	285,770.35
Welder, gas, 300 amp	486	23,512.83	123.43	416.40	3.97	3.64	7.60	36,763.75
Grader, 30000 lb.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hammer, hydraulic, 1200 lb.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator, hydraulic, 1.5 cy	1107	313.50	838.51	62.70	59.36	56.85	70.22	100,630.09
Loader, skid steer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loader, crawler, 3 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loader, wheel, 1.5 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loader, wheel, 4 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor, 25 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor, 5 Ton	288	78.57	150.75	13.73	13.46	13.19	11.69	16,919.55
Roller, compactor	3222	82.41	158.11	14.40	14.11	13.83	12.26	17,759.95
Dump Truck, 12 cy	8252	12,989.18	11,388.06	3,472.56	2,155.62	2,079.38	720.85	1,048,526.36
Dump Truck, 8 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tanker Truck, 5000 gal.	5	40.82	35.78	10.91	6.77	6.53	2.27	3,294.77
Pickup Truck, 3/4 Ton	5301	4,578.79	14,099.18	800.66	713.09	688.07	1,025.85	1,491,722.82
Tugboat	207	42.35	508.23	19.25	27.72	27.72	50.05	ND
Barge, flat-deck, 2000 Ton	207	-	-	-	-	-	-	-
Total Emissions	**(lb./yr.):**	**45,728.4**	**40,449.3**	**5,847.7**	**3,805.4**	**3,675.7**	**2,786.0**	**3,992,633.2**
Total Emissions	**(tpy)**	**22.86**	**20.22**	**2.92**	**1.90**	**1.84**	**1.39**	**1,996.32**
Total Emissions	**(Metric Tons/yr.)**							**1,811.03**

Projected Emissions for CY 2022
Construction Equipment
RBDM Alternative 1

Construction Equipment	Usage (hr)	Emissions (lb)						
		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
Asphalt paver	36	13.14	29.60	2.49	2.43	2.32	2.32	3,378.44
Asphalt roller, 10 Ton	117	51.87	99.52	9.06	8.88	8.70	7.72	11,160.57
Backhoe loader	1332	196.56	209.59	45.92	31.69	30.48	13.56	19,774.23
Chain saws	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generator, 10 kW	207	8.30	16.69	2.21	1.61	1.55	1.05	1,505.53
Concrete pump, 50 cy/hr.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane, Crawler, 100 Ton	180	74.80	298.70	20.81	15.85	15.36	20.31	29,369.15
Crane, RT, 25 Tons	441	74.45	297.30	20.71	15.78	15.28	20.21	29,231.48
Dewatering pump, 4-in.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	36	19.12	47.11	3.27	3.10	3.02	3.57	5,093.35
Dozer	45	9.56	23.56	1.64	1.55	1.51	1.78	2,546.68
Brush Chipper	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pile hammer, 41 k ft-lb	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pile hammer, vibratory	72	39.10	118.14	9.20	7.34	7.15	7.80	11,261.89
Welder, gas, 300 amp	90	4,354.23	22.86	77.11	0.73	0.67	1.41	6,808.10
Grader, 30000 lb.	45	13.26	40.02	2.99	2.71	2.63	3.27	4,757.45
Hammer, hydraulic, 1200 lb.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator, hydraulic, 1.5 cy	135	38.23	102.26	7.65	7.24	6.93	8.56	12,271.96
Loader, skid steer	45	5.55	4.54	1.37	0.88	0.86	0.30	434.57
Loader, crawler, 3 cy	135	78.86	84.08	18.42	12.71	12.23	5.44	7,933.08
Loader, wheel, 1.5 cy	288	66.41	70.81	15.51	10.70	10.30	4.58	6,680.48
Loader, wheel, 4 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor, 25 Ton	45	31.46	60.36	5.50	5.39	5.28	4.68	6,768.98
Roller, compactor, 5 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor	90	2.30	4.42	0.40	0.39	0.39	0.34	496.09
Dump Truck, 12 cy	14086	22,173.62	19,440.37	5,927.95	3,679.83	3,549.67	1,230.55	1,789,922.11
Dump Truck, 8 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tanker Truck, 5000 gal.	86	775.50	679.91	207.32	128.70	124.15	43.04	62,600.62
Pickup Truck, 3/4 Ton	4397	3,797.52	11,693.46	664.05	591.42	570.67	850.81	1,237,192.86
Tugboat	0	0.00	0.00	0.00	0.00	0.00	0.00	ND
Barge, flat-deck, 2000 Ton	0	-	-	-	-	-	-	-
Total Emissions	**(lb./yr.):**	**31,823.8**	**33,343.3**	**7,043.6**	**4,528.9**	**4,369.1**	**2,231.3**	**3,249,187.6**
Total Emissions	**(tpy)**	**15.91**	**16.67**	**3.52**	**2.26**	**2.18**	**1.12**	**1,624.59**
Total Emissions	**(Metric Tons/yr.)**							**1,473.81**

Source: Emission factors and methodology from USAFCEE *Air Emissions Guide For Air Force Mobile Sources*, except for the Tugboat, which was provided by USEPA *Current Methodologies in Preparing Mobile Source Port-Related Emissions Inventories.*

This Page has been Intentionally Left Blank.

Projected Emissions for CY 2020
Construction Equipment
Separated By RBDM Alternative 1 Work Areas

Construction Equipment	Northeast Usage (hr)	Northeast CO	Northeast NO_x	Northeast VOC	Northeast PM_{10}	Northeast $PM_{2.5}$	Northeast SO_2	Northeast CO_2e	Central Usage (hr)	Central CO	Central NO_x	Central VOC	Central PM_{10}	Central $PM_{2.5}$	Central SO_2	Central CO_2e	Southeast Usage (hr)	Southeast CO	Southeast NO_x	Southeast VOC	Southeast PM_{10}	Southeast $PM_{2.5}$	Southeast SO_2	Southeast CO_2e	Berry's Creek Usage (hr)	Berry's Creek CO	Berry's Creek NO_x	Berry's Creek VOC	Berry's Creek PM_{10}	Berry's Creek $PM_{2.5}$	Berry's Creek SO_2	Berry's Creek CO_2e
		Emissions (lb)								Emissions (lb)								Emissions (lb)								Emissions (lb)						
Asphalt paver	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt roller, 10 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe loader	40	5.84	6.23	1.37	0.94	0.91	0.40	587.88	320	47.28	50.41	11.05	7.62	7.33	3.26	4,756.51	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain saws	26	98.98	0.27	21.02	2.73	2.51	0.04	195.72	253	965.04	2.63	204.98	26.65	24.52	0.38	1,908.26	36	136.10	0.37	28.91	3.76	3.46	0.05	269.11	10	37.12	0.10	7.88	1.02	1.02	0.01	73.39
Generator, 10 kW	11	0.43	0.86	0.11	0.08	0.08	0.05	77.24	21	0.85	1.71	0.23	0.17	0.16	0.11	154.48	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1030	41.28	83.04	10.99	8.02	8.02	5.23	7,492.30
Concrete pump, 50 cy/hr.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	639	218.66	445.22	55.61	43.29	43.29	27.81	39,855.57
Crane, Crawler, 100 Ton	116	48.17	192.36	13.40	10.21	9.89	13.08	18,913.73	464	192.68	769.46	53.59	40.83	39.56	52.32	75,654.93	33	13.76	54.96	3.83	2.92	2.83	3.74	5,403.92	1043	433.54	1,731.28	120.59	91.88	91.88	117.72	170,223.60
Crane, RT, 25 Tons	9	1.52	6.07	0.42	0.32	0.31	0.41	596.56	171	28.87	115.28	8.03	6.12	5.93	7.84	11,334.66	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dewatering pump, 4-in.	107	14.32	29.15	3.84	2.83	2.73	1.82	2,609.53	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	303	40.56	82.59	10.32	8.03	7.74	5.16	7,393.66	1372	183.73	374.10	46.73	36.37	36.37	23.36	33,488.93
Dozer	28	15.05	37.10	2.58	2.44	2.38	2.81	4,011.01	671	356.27	878.02	60.96	57.80	56.21	66.50	94,927.35	236	125.45	309.16	21.47	20.35	19.79	23.42	33,425.12	9	5.02	12.37	0.86	0.81	0.81	0.94	1,337.00
Dozer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brush Chipper	19	5.96	14.39	1.46	1.14	1.11	0.88	1,288.85	127	40.11	96.84	9.83	7.64	7.50	5.94	8,670.45	19	5.96	14.39	1.46	1.14	1.11	0.88	1,288.85	7	2.17	5.23	0.53	0.41	0.41	0.32	468.67
Pile hammer, 41 k ft-lb	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	73	7.96	24.04	1.87	1.49	1.46	1.59	2,291.79	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	260	28.21	85.24	6.63	5.29	5.29	5.63	8,125.45
Pile hammer, vibratory	186	101.08	305.40	23.77	18.97	18.49	20.17	29,111.97	106	57.43	173.52	13.51	10.78	10.59	11.46	16,540.89	34	18.38	55.53	4.32	3.45	3.36	3.67	5,293.09	97	52.84	159.64	12.42	9.91	9.91	10.54	15,217.62
Welder, gas, 300 amp	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25	1,201.77	6.31	21.28	0.20	0.19	0.39	1,879.04	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	182	8,812.96	46.26	156.07	1.49	1.49	2.85	13,779.60
Grader, 30000 lb.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hammer, hydraulic, 1200 lb.	55	5.96	18.02	1.40	1.12	1.09	1.19	1,717.44	494	53.67	162.15	12.62	10.07	9.82	10.71	15,456.94	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator, hydraulic, 1.5 cy	93	26.38	70.56	5.28	4.99	4.78	5.91	8,467.65	766	216.90	580.14	43.38	41.07	39.93	48.59	69,622.93	72	20.52	54.88	4.10	3.88	3.72	4.60	6,585.95	104	29.31	78.40	5.86	5.55	5.55	6.57	9,408.50
Loader, skid steer	27	3.33	2.72	0.82	0.53	0.51	0.18	260.74	176	21.65	17.70	5.36	3.44	3.34	1.17	1,694.83	18	2.22	1.82	0.55	0.35	0.34	0.12	173.83	5	0.56	0.45	0.14	0.09	0.09	0.03	43.46
Loader, crawler, 3 cy	20	11.67	12.44	2.73	1.88	1.81	0.81	1,174.10	286	167.28	178.37	39.08	26.97	25.94	11.54	16,828.70	20	11.67	12.44	2.73	1.88	1.81	0.81	1,174.10	7	3.89	4.15	0.91	0.63	0.63	0.27	391.37
Loader, wheel, 1.5 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loader, wheel, 4 cy	52	29.36	31.30	6.86	4.73	4.55	2.03	2,953.50	425	237.54	253.28	55.49	38.29	36.83	16.39	23,896.48	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor, 25 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor, 5 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck, 12 cy	1325	1,144.70	3,524.79	200.17	178.27	172.02	256.46	372,930.70	2264	3,563.90	3,124.59	952.78	591.45	570.53	197.78	287,688.74	142	222.74	195.29	59.55	36.97	35.66	12.36	17,980.55	778	1,225.09	1,074.08	327.52	203.31	203.31	67.99	98,893.01
Dump Truck, 8 cy	129	111.53	97.78	29.82	18.51	17.85	6.19	9,003.11	8244	7,137.97	6,258.10	1,908.28	1,184.58	1,142.68	396.13	576,198.87	129	111.53	97.78	29.82	18.51	17.85	6.19	9,003.11	86	74.35	65.19	19.88	12.34	12.34	4.13	6,002.07
Tanker Truck, 5000 gal.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Truck, 3/4 Ton	1325	1,144.70	3,524.79	200.17	178.27	172.02	256.46	372,930.70	1325	1,144.70	3,524.79	200.17	178.27	172.02	256.46	372,930.70	1325	1,144.70	3,524.79	200.17	178.27	172.02	256.46	372,930.70	1325	1,144.70	3,524.79	200.17	178.27	178.27	256.46	372,930.70
Tugboat	108	22.02	264.28	10.01	14.42	14.42	26.03	ND	99	20.33	243.95	9.24	13.31	13.31	24.03	ND	0	0.00	0.00	0.00	0.00	0.00	0.00	ND	0	0.00	0.00	0.00	0.00	0.00	0.00	ND
Barge, flat-deck, 2000 Ton	108	-	-	-	-	-	-	-	99	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
Total Emissions	**(lb./yr.):**	**2,203.2**	**5,102.0**	**473.7**	**356.5**	**344.6**	**369.4**	**498,851.1**	**(lb./yr.):**	**15,462.2**	**16,461.3**	**3,611.7**	**2,246.7**	**2,167.1**	**1,112.6**	**1,582,436.6**	**(lb./yr.):**	**1,853.6**	**4,404.0**	**367.2**	**279.5**	**269.7**	**317.5**	**460,922.0**	**(lb./yr.):**	**12,293.4**	**7,689.6**	**972.8**	**598.7**	**598.7**	**529.8**	**777,731.3**
Total Emissions	**(tpy)**	**1.10**	**2.55**	**0.24**	**0.18**	**0.17**	**0.18**	**249.43**	**(tpy)**	**7.73**	**8.23**	**1.81**	**1.12**	**1.08**	**0.56**	**791.22**	**(tpy)**	**0.93**	**2.20**	**0.18**	**0.14**	**0.13**	**0.16**	**230.46**	**(tpy)**	**6.15**	**3.84**	**0.49**	**0.30**	**0.30**	**0.26**	**388.87**
Total Emissions	**(Metric Tons/yr.)**							**226.28**	**(Metric Tons/yr.)**							**717.78**	**(Metric Tons/yr.)**							**209.07**	**(Metric Tons/yr.)**							**352.77**

Projected Emissions for CY 2021
Construction Equipment
Separated By RBDM Alternative 1 Work Areas

Construction Equipment	Northeast Usage (hr)	Northeast CO	Northeast NO_x	Northeast VOC	Northeast PM_{10}	Northeast $PM_{2.5}$	Northeast SO_2	Northeast CO_2e	Central Usage (hr)	Central CO	Central NO_x	Central VOC	Central PM_{10}	Central $PM_{2.5}$	Central SO_2	Central CO_2e	Southeast Usage (hr)	Southeast CO	Southeast NO_x	Southeast VOC	Southeast PM_{10}	Southeast $PM_{2.5}$	Southeast SO_2	Southeast CO_2e	Berry's Creek Usage (hr)	Berry's Creek CO	Berry's Creek NO_x	Berry's Creek VOC	Berry's Creek PM_{10}	Berry's Creek $PM_{2.5}$	Berry's Creek SO_2	Berry's Creek CO_2e
		Emissions (lb)								Emissions (lb)								Emissions (lb)								Emissions (lb)						
Asphalt paver	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt roller, 10 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe loader	54	7.97	8.50	1.86	1.28	1.24	0.55	801.66	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain saws	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Generator, 10 kW	677	27.12	54.56	7.22	5.27	5.07	3.43	4,922.43	2369	94.93	190.96	190.96	18.44	17.76	12.02	17,228.50	804	32.21	64.79	8.57	6.26	6.02	4.08	5,845.38	381	15.26	30.69	4.06	2.96	2.85	1.93	2,768.87
Concrete pump, 50 cy/hr.	9	3.02	6.15	0.77	0.60	0.58	0.38	550.12	207	70.93	144.42	144.42	14.04	13.53	9.02	12,927.80	35	12.07	24.58	3.07	2.39	2.30	1.54	2,200.48	190	64.89	132.12	16.50	12.85	12.38	8.25	11,827.56
Crane, Crawler, 100 Ton	251	104.12	415.79	28.96	22.07	21.38	28.27	40,881.86	2213	919.73	3,672.84	3,672.84	194.91	188.82	249.73	361,123.09	418	173.53	692.99	48.27	36.78	35.63	47.12	68,136.43	1295	537.96	2,148.27	149.63	114.00	110.44	146.07	211,222.94
Crane, RT, 25 Tons	274	46.19	184.45	12.85	9.79	9.48	12.54	18,135.45	274	46.19	184.45	184.45	9.79	9.48	12.54	18,135.45	173	29.17	116.49	8.11	6.18	5.99	7.92	11,453.97	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dewatering pump, 4-in.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2915	390.34	794.78	794.78	77.28	74.46	49.64	71,146.95	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	775	103.76	211.27	26.39	20.54	19.79	13.19	18,912.48
Dozer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	4	0.86	2.13	0.15	0.14	0.14	0.16	230.47	1315	279.39	688.55	688.55	45.32	44.08	52.15	74,443.16	195	41.52	102.32	7.10	6.74	6.55	7.75	11,062.76	114	24.22	59.69	4.14	3.93	3.82	4.52	6,453.28
Brush Chipper	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pile hammer, 41 k ft-lb	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	73	7.96	24.04	24.04	1.49	1.46	1.59	2,291.79	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	260	28.21	85.24	6.63	5.29	5.16	5.63	8,125.45
Pile hammer, vibratory	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1334	724.32	2,188.46	2,188.46	135.92	132.48	144.52	208,612.36	438	238.13	719.49	56.00	44.69	43.55	47.51	68,584.88	55	29.77	89.94	7.00	5.59	5.44	5.94	8,573.11
Welder, gas, 300 amp	63	3,056.67	16.05	54.13	0.52	0.47	0.99	4,779.29	63	3,056.67	16.05	16.05	0.52	0.47	0.99	4,779.29	63	3,056.67	16.05	54.13	0.52	0.47	0.99	4,779.29	296	14,342.82	75.29	254.01	2.42	2.22	4.64	22,425.89
Grader, 30000 lb.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hammer, hydraulic, 1200 lb.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator, hydraulic, 1.5 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	675	191.24	511.49	511.49	36.21	34.68	42.84	61,384.36	122	34.49	92.24	6.90	6.53	6.25	7.72	11,069.31	310	87.78	234.78	17.56	16.62	15.92	19.66	28,176.43
Loader, skid steer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loader, crawler, 3 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loader, wheel, 1.5 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loader, wheel, 4 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor, 25 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor, 5 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90	2.30	4.42	0.40	0.39	0.39	0.34	496.09	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dump Truck, 12 cy	141	221.74	194.40	59.28	36.80	35.50	12.31	17,899.22	13663	21,508.41	18,857.16	5,750.11	3,569.43	3,443.18	1,193.64	1,736,224.44	141	0.00	0.00	0.00	0.00	0.00	0.00	0.00	141	221.74	194.40	59.28	36.80	35.50	12.31	17,899.22
Dump Truck, 8 cy	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tanker Truck, 5000 gal.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	86	775.50	679.91	207.32	128.70	124.15	43.04	62,600.62	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Truck, 3/4 Ton	1099	949.38	2,923.36	166.01	147.85	142.67	212.70	309,298.22	1099	949.38	2,923.36	166.01	147.85	142.67	212.70	309,298.22	1099	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1099	949.38	2,923.36	166.01	147.85	142.67	212.70	309,298.22
Tugboat	0	0.00	0.00	0.00	0.00	0.00	0.00	ND	0	0.00	0.00	0.00	0.00	0.00	0.00	ND	0	0.00	0.00	0.00	0.00	0.00	0.00	ND	0	0.00	0.00	0.00	0.00	0.00	0.00	ND
Barge, flat-deck, 2000 Ton	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-	0	-	-	-	-	-	-	-
Total Emissions	**(lb./yr.):**	**1,171.1**	**3,117.8**	**225.3**	**184.7**	**178.2**	**225.0**	**327,197.4**	**(lb./yr.):**	**23,832.0**	**23,523.7**	**6,258.6**	**3,949.1**	**3,809.6**	**1,524.5**	**2,216,896.5**	**(lb./yr.):**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**(lb./yr.):**	**5,649.6**	**3,584.1**	**334.4**	**210.5**	**203.2**	**256.8**	**377,896.2**
Total Emissions	**(tpy)**	**0.59**	**1.56**	**0.11**	**0.09**	**0.09**	**0.11**	**163.60**	**(tpy)**	**11.92**	**11.76**	**3.13**	**1.97**	**1.90**	**0.76**	**1,108.45**	**(tpy)**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**(tpy)**	**2.82**	**1.79**	**0.17**	**0.11**	**0.10**	**0.13**	**188.95**
Total Emissions	**(Metric Tons/yr.)**							**148.41**	**(Metric Tons/yr.)**							**1,005.57**	**(Metric Tons/yr.)**							**0.00**	**(Metric Tons/yr.)**							**171.41**

Projected Emissions for CY 2022
Construction Equipment
Separated By RBDM Alternative 1 Work Areas

Construction Equipment	Northeast Usage (hr)	Northeast CO	Northeast NO_x	Northeast VOC	Northeast PM_{10}	Northeast $PM_{2.5}$	Northeast SO_2	Northeast CO_2e	Central Usage (hr)	Central CO	Central NO_x	Central VOC	Central PM_{10}	Central $PM_{2.5}$	Central SO_2	Central CO_2e	Southeast Usage (hr)	Southeast CO	Southeast NO_x	Southeast VOC	Southeast PM_{10}	Southeast $PM_{2.5}$	Southeast SO_2	Southeast CO_2e	Berry's Creek Usage (hr)	Berry's Creek CO	Berry's Creek NO_x	Berry's Creek VOC	Berry's Creek PM_{10}	Berry's Creek $PM_{2.5}$	Berry's Creek SO_2	Berry's Creek CO_2e
		Emissions (lb)								Emissions (lb)								Emissions (lb)								Emissions (lb)						
Asphalt paver	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	36	13.14	29.60	2.49	2.43	2.32	2.32	3,378.44	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt roller, 10 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	117	51.87	99.52	9.06	8.88	8.70	7.72	11,160.57	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe loader	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1332	196.56	209.59	45.92	31.69	30.48	13.56	19,774.23	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chain saws	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.

This Page has been Intentionally Left Blank.

Fugitive Dust Emissions (Site Preparation)
RBDM Alternative 1

CY 2020	
Description:[1]	
Square feet:	1,732,939
Total acres of land disturbed:	20
Assumed number of 9-hr days:	10
Assumed equivalent acres/day:	1.989

Equation for Fugitive Dust Emissions (PM_{10})
E_{TSP} (lb./yr.) = 80 * No. of 9-hr days * Acres/day

Calculation

E_{TSP} (lb./yr.) = 80 * 10 days * 0.221 acres/day

E_{TSP} = 1591.31 lb./yr.
7.96E-01 tpy

Assumptions:

[1] The area of disturbance during site preparation is conservatively assumed to be 50 percent of the entire LOP footprint.
[2] It is assumed that construction activity related to site preparation would be completed within two months in CY 2020.

Source of Equation:

Emission factors and methodology from USAFCEE *Air Emissions Guide For Air Force Mobile Sources* (Section 5, August 2013).
Note: Assume PM= PM_{10}=$PM_{2.5}$

Fugitive Dust Emissions - Rock/Soil Export in CY 2020
RBDM Alternative 1

Input Parameters:

Soil moved during exporting =	42,450	cy	
Soil moved during exporting =	68,769	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	14	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

3.34E-04	**lbs./ton**	**PM**
1.58E-04	**lbs./ton**	**PM_{10}**
2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

22.93	lbs./yr.	**0.011**	**tons/yr.**	**PM**	**E1**
10.85	lbs./yr.	**0.005**	**tons/yr.**	**PM_{10}**	**E1**
1.64	lbs./yr.	**0.0008**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

1.15E-03	**tons/yr.**	**PM**	**E2**
5.42E-04	**tons/yr.**	**PM10**	**E2**
8.21E-05	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/36$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (42,450 cy/year of excavated soil)/(truck load)*(average distance traveled each way)

VMT = ((42,450 cy/yr.) / (12 cy/truck))*(50 miles/round trip*1% miles/unpaved roads)

VMT = 1,769 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

11,530	lbs./yr.	**5.76**	**tons/yr.**	**PM**
3,113	lbs./yr.	**1.56**	**tons/yr.**	**PM_{10}**
311	lbs./yr.	**0.16**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export in CY 2020 (Continued)
RBDM Alternative 1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

0.58	**tons/yr.**	**PM**	**E2**
0.16	**tons/yr.**	**PM10**	**E2**
0.016	**tons/yr.**	**PM2.5**	**E2**

Total annual fugitive emissions from soil removal (tons/yr.) =

=E1+E2

0.578	**tons/yr.**	**PM**
0.156	**tons/yr.**	**PM_{10}**
0.016	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export in CY 2021
RBDM Alternative 1

Input Parameters:

Soil moved during exporting =	42,450	cy	
Soil moved during exporting =	68,769	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4		(Mean, Table 13.2.2-1, Page 13.2.2-3)
Material moisture content =	14		(Mean, Table 13.2.4, Page 13.2.4-2)

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

3.34E-04	**lbs./ton**	**PM**
1.58E-04	**lbs./ton**	**PM_{10}**
2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

22.93	lbs./yr.	**0.011**	**tons/yr.**	**PM**	**E1**
10.85	lbs./yr.	**0.005**	**tons/yr.**	**PM_{10}**	**E1**
1.64	lbs./yr.	**0.0008**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

1.15E-03	**tons/yr.**	**PM**	**E2**
5.42E-04	**tons/yr.**	**PM10**	**E2**
8.21E-05	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (42,450 cy/year of excavated soil)/(truck load)*(average distance traveled each way)

VMT = ((42,450 cy/yr.) / (12 cy/truck))*(50 miles/round trip*1% miles/unpaved roads)

VMT = 1,769 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

11,530	lbs./yr.	**5.76**	**tons/yr.**	**PM**
3,113	lbs./yr.	**1.56**	**tons/yr.**	**PM_{10}**
311	lbs./yr.	**0.16**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export in CY 2021 (Continued)
RBDM Alternative 1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

0.58	**tons/yr.**	**PM**	**E2**
0.16	**tons/yr.**	**PM10**	**E2**
0.016	**tons/yr.**	**PM2.5**	**E2**

Total annual fugitive emissions from soil removal (tons/yr.) =

=E1+E2

0.578	**tons/yr.**	**PM**
0.156	**tons/yr.**	**PM_{10}**
0.016	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Import in CY 2022
RBDM Alternative 1

Input Parameters:

Soil moved during importing =	82,000	cy	
Soil moved during importing =	132,840	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4		(Mean, Table 13.2.2-1, Page 13.2.2-3)
Material moisture content =	14		(Mean, Table 13.2.4, Page 13.2.4-2)

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

3.34E-04	**lbs./ton**	**PM**
1.58E-04	**lbs./ton**	**PM_{10}**
2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

44.30	lbs./yr.	**0.022**	**tons/yr.**	**PM**	**E1**
20.95	lbs./yr.	**0.010**	**tons/yr.**	**PM_{10}**	**E1**
3.17	lbs./yr.	**0.0016**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

2.22E-03	**tons/yr.**	**PM**	**E2**
1.05E-03	**tons/yr.**	**PM10**	**E2**
1.59E-04	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (82,000 cy/year of excavated soil)/(truck load)*(average distance traveled each way)

VMT = ((82,000 cy/yr.) / (12 cy/truck))*(60 miles/round trip*0.83% miles/unpaved roads)

VMT =3417 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

22,271	lbs./yr.	**11.14**	**tons/yr.**	**PM**
6,012	lbs./yr.	**3.01**	**tons/yr.**	**PM_{10}**
601	lbs./yr.	**0.30**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Import in CY 2022 (Continued)
RBDM Alternative 1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

1.11	**tons/yr.**	**PM**	**E2**
0.30	**tons/yr.**	**PM10**	**E2**
0.030	**tons/yr.**	**PM2.5**	**E2**

Total annual fugitive emissions from soil import (tons/yr.) =

=E1+E2

1.116	**tons/yr.**	**PM**
0.302	**tons/yr.**	**PM_{10}**
0.030	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export CY 2020
RBDM Alternative 1

Input Parameters:

Concrete moved during export =	68,700	cy	
Concrete moved during export =	111,294	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4		(Mean, Table 13.2.2-1, Page 13.2.2-3)
Material moisture content =	0.2		(Mean, Table 13.2.4, Page 13.2.4-2)

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

EF = k (0.0032) $[U/5)^{1.3}$ / $(M/2)^{1.4}$]

1.28E-01	**lbs./ton**	**PM**
6.04E-02	**lbs./ton**	**PM_{10}**
9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

14,213.72	lbs./yr.	**7.107**	**tons/yr.**	**PM**	**E1**
6,722.70	lbs./yr.	**3.361**	**tons/yr.**	**PM_{10}**	**E1**
1,018.01	lbs./yr.	**0.509**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

7.11E-01	**tons/yr.**	**PM**	**E2**
3.36E-01	**tons/yr.**	**PM10**	**E2**
5.09E-02	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

EF = $[k(s/12)^a (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (68,700 cy/yr. of concrete/(truck load)*(average distance traveled each way)

VMT = ((68,700 cy/yr.) / (8 cy/truck))*(24 miles/round trip*2.1% miles/unpaved roads)

VMT = 4,294 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

27,987	lbs./yr.	**13.99**	**tons/yr.**	**PM**
7,555	lbs./yr.	**3.78**	**tons/yr.**	**PM_{10}**
756	lbs./yr.	**0.38**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export CY 2020 (Continued)
RBDM Alternative 1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

1.40	**tons/yr.**	**PM**	**E2**
0.38	**tons/yr.**	**PM10**	**E2**
0.038	**tons/yr.**	**PM2.5**	**E2**

Total annual fugitive emissions from concrete demolition (tons/yr.) =

=E1+E2

2.110	**tons/yr.**	**PM**
0.714	**tons/yr.**	**PM_{10}**
0.089	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Import CY 2021
RBDM Alternative 1

Input Parameters:

Concrete moved during import =	13,900	cy	
Concrete moved during import =	22,518	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	0.2	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

1.28E-01	**lbs./ton**	**PM**
6.04E-02	**lbs./ton**	**PM_{10}**
9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

2,875.85	lbs./yr.	**1.438**	**tons/yr.**	**PM**	**E1**
1,360.20	lbs./yr.	**0.680**	**tons/yr.**	**PM_{10}**	**E1**
205.97	lbs./yr.	**0.1030**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

1.44E-01	**tons/yr.**	**PM**	**E2**
6.80E-02	**tons/yr.**	**PM10**	**E2**
1.03E-02	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (13,900 cy/yr. of concrete/(truck load)*(average distance traveled each way)

VMT = ((13,900 cy/yr.) / (8 cy/truck))*(60 miles/round trip*0.83% miles/unpaved roads)

VMT = 869 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

5,664	lbs./yr.	**2.83**	**tons/yr.**	**PM**
1,529	lbs./yr.	**0.76**	**tons/yr.**	**PM_{10}**
153	lbs./yr.	**0.08**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Import CY 2021 (Continued)
RBDM Alternative 1

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

0.28	**tons/yr.**	**PM**	**E2**
0.08	**tons/yr.**	**PM10**	**E2**
0.008	**tons/yr.**	**PM2.5**	**E2**

Total annual fugitive emissions from concrete import (tons/yr.) =

=E1+E2

0.427	**tons/yr.**	**PM**
0.144	**tons/yr.**	**PM_{10}**
0.018	**tons/yr.**	**$PM_{2.5}$**

Emergency Generators - Potential Emissions

Equipment Information

Make:	ND
Model Number:	ND
Serial Number:	ND
Number of Identical Generators:	2
Generator Demand (hp):	2011.5
Generator Rating (kW)[1]:	1500
Permitted Source:	Title V
Fuel Burned:	Diesel
Projected Hours of Operation:	100
Fuel Sulfur Content (wt%):	0.0015
Fuel Heat Content (Btu/gal):	137,000

Potential Emissions - Criteria Pollutants

Criteria Pollutant	Emission Factor[2] (lb/hp-hr) >600 hp	Emissions (lb/yr)	Total (tpy)
$PM/PM_{10}/PM_{2.5}$	2.69E-04	1.08E+02	5.41E-02
SO_x	1.21E-05	4.88E+00	2.44E-03
NO_x	2.17E-02	8.73E+03	4.36E+00
VOC	8.38E-04	3.37E+02	1.69E-01
CO	3.15E-03	1.27E+03	6.34E-01

Potential Emissions - HAPs

HAP	Emission Factor[2] (lb/hp-hr) >600 hp	Emissions (lb/yr)	Total (tpy)
Acetaldehyde	1.76E-07	7.10E-02	3.55E-05
Acrolein	5.52E-08	2.22E-02	1.11E-05
Benzene	5.43E-06	2.19E+00	1.09E-03
Formaldehyde	5.52E-07	2.22E-01	1.11E-04
Naphthalene	9.10E-07	3.66E-01	1.83E-04
Polycyclic Aromatic Hydrocarbons (PAHs)[3]	5.74E-07	2.31E-01	1.15E-04
Toluene	1.97E-06	7.91E-01	3.96E-04
Xylenes	1.35E-06	5.44E-01	2.72E-04
	Total HAP	**4.43E+00**	**2.22E-03**

Potential Emissions - GHGs

GHG	Emission Factor[4] (lbs./hp-hr.)	Total (lb/yr)	Total (tpy)	Total (metric tpy)
CO_2e	1.16	466,668.00	233.33	211.68

ND = No Data

1. It is anticipated that there will be two identical generators. Generators conservatively estimated to be 1,500 kW each.
2. Criteria pollutant emission factors from manufacture's specifications for a Caterpillar 3512B and converted from g/hp-hr to lb/hp-hr using 453.6 g to lb conversion factor. HAP emission factors from AP-42, Tables 3.4-3 and 3.4-4, October 1996 and converted from lb/MMBtu to lb/hp-hr using average brake-specific fuel consumption (BSFC) = 7 MMBtu/1000 hp-hr.
3. For inventory purposes, assume PAH is the same as Polycyclic Organic Matter (POM).
4. Emission factor from USAFCEE Air Emissions Guide For Air Force Stationary Sources, July 2016.

Projected Emissions for CY 2020
All Sources
Construction Year 2

Emission Source	Projected Emissions (tons per year)							CY 2020 (metric tons per year)
	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e	CO_2e
Construction Equipment Operation	6.51	10.75	1.51	1.05	1.01	0.75	1,089.83	988.68
Site Preparation - Fugitive Emissions	--	--	--	1.09E-01	1.09E-01	--	--	--
Rock/Soil Export and Import - Fugitive Emissions	--	--	--	1.14E-01	1.14E-02	--	--	--
Concrete Export and Import - Fugitive Emissions	--	--	--	3.55E-02	4.82E-03	--	--	--
Total	6.51	10.75	1.51	1.30	1.13	0.75	1,089.83	988.68

Projected Emissions for CY 2021
All Sources
Construction Year 3

Emission Source	Projected Emissions (tons per year)							CY 2021 (metric tons per year)
	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e	CO_2e
Construction Equipment Operation	3.00	5.14	0.70	0.49	0.47	0.36	524.91	476.19
Site Preparation - Fugitive Emissions	--	--	--	1.82E-02	1.82E-02	--	--	--
Rock/Soil Export and Import - Fugitive Emissions	--	--	--	4.65E-02	4.66E-03	--	--	--
Concrete Export and Import - Fugitive Emissions	--	--	--	3.06E-02	4.15E-03	--	--	--
Total	3.00	5.14	0.70	0.58	0.50	0.36	524.91	476.19

Projected Emissions for CY 2022
All Sources
Construction Year 4

Emission Source	Projected Emissions (tons per year)							CY 2022 (metric tons per year)
	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e	CO_2e
Construction Equipment Operation	4.06	7.42	0.92	0.66	0.64	0.53	765.43	694.39
Site Preparation - Fugitive Emissions	--	--	--	1.22E-01	1.22E-01	--	--	--
Rock/Soil Export and Import - Fugitive Emissions	--	--	--	4.07E-02	4.08E-03	--	--	--
Concrete Export and Import - Fugitive Emissions	--	--	--	3.34E-02	4.53E-03	--	--	--
Total	4.06	7.42	0.92	0.86	0.77	0.53	765.43	694.39

Projected Annual Operations Emissions
All Sources
Potential Annual Emissions from Stationary Sources During Operations

Emission Source	Projected Emissions (tons per year)							metric tons per year
	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	HAPs	CO_2e
Generators at East Riser Ditch Pump Station	9.76E-02	9.05E-01	2.44E-02	6.65E-03	6.65E-03	1.22E-03	1.11E-03	105.84
Generators at Losen Slote Pump Station A	7.24E-02	2.33E-01	0.00E+00	5.17E-03	5.17E-03	2.85E-04	6.44E-04	24.70
Generators at Losen Slote Pump Station C	9.76E-02	9.05E-01	2.44E-02	6.65E-03	6.65E-03	1.22E-03	1.11E-03	105.84
Total	0.27	2.04	0.05	0.02	0.02	2.73E-03	2.86E-03	236.37

This Page has been Intentionally Left Blank.

Construction Equipment Projected Hours of Operation
RBDM Alternative 2

Equipment	Type	Average Rated HP	No. of Units	Days Per Year				Hours Per Year				
				CY 2019 Days	CY 2020 Days	CY 2021 Days	CY 2022 Days	CY 2019 Hours	CY 2020 Hours	CY 2021 Hours	CY 2022 Hours	
Asphalt paver	Diesel Pavers	130	1	0	7	3	0	0	63	27	0	
Asphalt paver, CAT AP1055F	Diesel Pavers	225	1	0	2	1	2	0	18	9	18	
Asphalt roller, 10 Ton	Diesel Rollers	130	1	0	7	3	0	0	63	27	0	
Asphalt roller, CAT CB68B	Diesel Rollers	142	1	0	2	1	2	0	18	9	18	
Backhoe loader	Diesel Tractors/Loaders/Backhoes	48	2	0	145	31	70	0	1,305	279	630	
Chain saws	2 Stroke Chain Saws >6 HP	7	6	0	12	4	4	0	108	36	36	
Generator, 10 kW	Diesel Generator Sets	13.41	4	0	166	83	64	0	1,494	747	576	
Planter equipment	Diesel Tillers >6 HP	100	1	0	3	0	0	0	27	0	0	
Crane	Diesel Cranes	320	1	4	23	4	8	34	203	34	72	
Track Mounted Loco Crane	Diesel Cranes	200	1	3	15	3	0	23	135	23	0	
Dewatering pump, 4-in.	Diesel Pumps	45	1	0	45	0	0	0	405	0	0	
Dewatering pump, MWI-RWP006	Diesel Pumps	45	1	0	0	27	0	0	0	243	0	
Dozer	Diesel Crawler Tractor/Dozer	200	3	0	36	7	23	0	324	63	207	
Dozer	Diesel Crawler Tractor/Dozer	80	3	0	160	37	81	0	1,440	333	729	
Dozer, CAT D5G	Diesel Crawler Tractor/Dozer	90	1	13	78	40	33	117	702	360	297	
Brush Chipper	Diesel Chippers/Stump Grinders	130	3	0	5	0	6	0	45	0	54	
Pile hammer, J&M 115	Diesel Crushing Equipment	175	1	4	23	13	20	34	203	115	180	
Pile hammer, vibratory	Diesel Crushing Equipment	300	2	0	11	17	20	0	99	153	180	3 days in 2020 for gray infra.
Pipelayer, CAT PL87	Diesel Other Material Handling	320	1	0	0	27	29	0	0	243	261	
Crawler Rig, 6-8 ton hammer	Diesel Crushing Equipment	127	1	0	13	0	0	0	117	0	0	
Excavator, hydraulic, 1.5 cy	Diesel Excavators	128	1	0	49	2	9	0	441	18	81	
Excavator, hydraulic, CAT 330F L	Diesel Excavators	235	1	18	106	72	118	159	952	645	1,062	
Loader, skid steer	Diesel Skid Steer Loaders	30	3	0	443	106	252	0	3,987	954	2,268	
Front Loader, CAT 980H	Diesel Tractors/Loaders/Backhoes	318	1	9	53	9	4	80	479	80	36	
18-Wheeler (with trailer)	Diesel Off-highway Trucks	510	1	0	11	3	9	0	99	27	81	
Roller, compactor, CAT Compact CMV	Diesel Rollers	133	1	0	3	0	0	0	27	0	0	
Roller, compactor	Diesel Rollers	7.5	3	0	228	15	29	0	2,052	135	261	
Off-Road Dump Truck, 23 cy, CAT 770G	Diesel Off-highway Trucks	477	3	15	91	111	122	136	817	1,000	1,098	
Dump Truck, 16 cy, International 2574	Diesel Dumpers/Tenders	370	9	57	351	188	174	515	3,156	1,696	1,570	
Dump Truck, 12 cy	Diesel Dumpers/Tenders	220	5	26	167	68	62	232	1,501	611	557	
Tanker Truck, 5000 gal.	Diesel Dumpers/Tenders	400	1	0	76	0	124	0	342	0	558	conservatively estimated to be operating 50% of the 9-hour day - assumed it is turning on and off to spray water for fugitive dust control
Pickup Truck, 3/4 Ton	Diesel Off-highway Trucks	400	unknown, assumed to be >10	0	562	150	340	0	2,529	675	1,530	conservatively estimated to be operating 50% of the 9-hour day - assuming trucks are turned off when not in use and are being used to carry small tools and equipment on site
Concrete truck	Diesel Off-highway Trucks	350	1	2	12	2	0	18	54	9	0	
Cold Planner, CAT PM620	Diesel Scrapers	630	1	0	2	1	2	0	9	9	9	
Train	Tier II Locomotive	4000	1	0	1	0	0	0	9	0	0	

Assumptions:
Field construction is projected to start in late 2019 and be completed by late summer 2022.
Typical workday will include 9 hours of construction, 6 days per week.
Estimated hours of operation were provided by this Proposed Project's design team.
When it was not specified, it was assumed as a conservative estimate that the fuel would be diesel.
It is assumed that the workers potentially commuting to job sites under the Proposed Project would commute to other regional job sites that are unrelated to the Proposed Project under the No Action Alternative.
Therefore, potential emissions generated from worker commutes were not quantified, since the commuter emissions are assumed to be the same, or of a negligible difference, between the Build Alternatives and No Action Alternative.

This Page has been Intentionally Left Blank.

Dump Truck Hours for demolition and clearing estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =	62	369	347	110		73	481	73	21
Average run (hrs) per trip to Impact Reuse and Recovery=	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5
Total hours operated =	31	185	174	55		37	240	37	11
Total days operated =	*3*	*21*	*19*	*6*		*4*	*27*	*4*	*1*

Dump Truck Hours for soil excavation estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =	31	189	63	8		264	1,582	666	693
Average hours per round-trip to Clean Earth =	1	1	1	1		1	1	1	1
Total hours operated =	31	189	63	8		264	1,582	666	693
Total days operated =	*3*	*21*	*7*	*1*		*29*	*176*	*74*	*77*

Dump Truck Hours for soil imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =	66	397	128	48		4	26	503	525
Average hours per round-trip =	1	1	1	1		1	1	1	1
Total hours operated =	66	397	128	48		4	26	503	525
Total days operated =	*7*	*44*	*14*	*5*		*0*	*3*	*56*	*58*

Dump Truck Hours for concrete imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =	19	136.25	25	51		16	101	16	34
Average hours per round-trip =	1	1	1	1		1	1	1	1
Total hours operated =	19	136	25	51		16	101	16	34
Total days operated =	*2*	*15*	*3*	*6*		*2*	*11*	*2*	*4*

Dump Truck Hours for piping and pump imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =		11	1	1			8	17	20
Average hours per round-trip =	2	2	2	2		2	2	2	2
Total hours operated =	0	22	2	2		0	16	34	40
Total days operated =	*0*	*2*	*0*	*0*		*0*	*2*	*4*	*4*

Dump Truck Hours for steel imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =		3	0	9		4	37	8	13
Average hours per round-trip =	1	1	1	1		1	1	1	1
Total hours operated =	0	3	0	9		4	37	8	13
Total days operated =	*0*	*0*	*0*	*1*		*0*	*4*	*1*	*1*

Dump Truck Hours for asphalt imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =	9	52	45	0				121	127
Average hours per round-trip =	2	2	2	2		2	2	2	2
Total hours operated =	17	104	89	0		0	0	242	254
Total days operated =	*2*	*12*	*10*	*0*		*0*	*0*	*27*	*28*

Dump Truck for other fabriacted material imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =	33.4	200.25	62.38	168			5		
Average hours per round-trip =	2	2	2	2		2	2	2	2
Total hours operated =	67	401	125	336		0	10	0	0
Total days operated =	*7*	*45*	*14*	*37*		*0*	*1*	*0*	*0*

Dump Truck for vegetation imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =		33	2	24		95	572	95	
Average hours per round-trip =	2	2	2	2		2	2	2	2
Total hours operated =	0	66	4	48		190	1,144	190	0
Total days operated =	*0*	*7*	*0*	*5*		*21*	*127*	*21*	*0*

Average run per trip =	1	1	1	1	1	1	1	1
Total hours operated =	**232**	**1,501**	**611**	**557**	**515**	**3,156**	**1,696**	**1,570**
Total days operated =	**26**	**167**	**68**	**62**	**57**	**351**	**188**	**174**

Phase 1: November 2019 – February 2021
Phase 2: March 2021 – December 2021
Phase 3: January 2022 – August 2022

Phase 1: 12.5% in 2019, 75% in 2020, 12.5% in 2021
Phase 2: 100% in 2021
Phase 3: 100% in 2022

Assumptions:

Truck trips were separated by the type of export or import material (i.e., demolition debris, soil, steel, etc.). The Truck Trip table (**Table F-12**) from **Appendix F** has been expanded to include an estimated number of truck trips for *each type* of material export or import and is provided here.

"Hours per round-trip" was determined based on the list of potential export and import facilities, and what materials that facility accepts or exports, as described in **Appendix F** and shown in **Table F-19** of **Appendix F**.

Estimated, average round-trip distances (in minutes or hours) was determined based on the location of each materials' potential associated export or import facility(ies) in relation to the Project Area and what routes the trucks would be taking, as provided in **Attachment F-4** to **Appendix F**.

Truck Trip Tables from Appendix F:

Anticipated Truck Trips and Material Quantity Transported - GI (all during Phase 1)

Materials	Quantity and Measurement		Average Quantity per Truckload		Truckloads (each)	
EXPORTS						
Demolition and clearing debris excavated soils	4373	Tons	10	Ton	437	assumed 50% demo debris & 50% soils
TOTAL EXPORT TRUCKLOADS					***437***	
IMPORTS						
Soils and aggregates	3184	Tons	20	Tons	159	
Pipe	2265	LF	312	LF	8	
Precast concrete inlets	63	Units	4	Units	16	
Trees	57	Units	6	Units	10	
TOTAL IMPORT TRUCKLOADS					***193***	

Anticipated Truck Trips and Material Quantity Transported - Parks

Materials	Average Quantity per Truckload		Anticipated Truck Trips			
			Phase 1	Phase 2	Phase 3	Total
EXPORTS						
Demolition and clearing debris	8	CY	274	46	110	430
Soils	12	CY	33	32	8	73
TOTAL EXPORT TRUCKLOADS			***307***	***78***	***118***	***503***
IMPORTS						
Soils and aggregates	12	CY	370	62	48	480
Hot mix asphalt	20	Tons	69	36	0	105
Pipe	312	LF	3	1	1	5
Precast concrete inlets	4	Units	4	1	1	6
Ready-mix concrete and grout	9	CY	155	5	50	210
Structural steel and piling products	20	Tons	3	0	9	12
Trees	20	Units	23	2	24	49
Other fabricated and nursery materials	1	Each	267	29	168	464
TOTAL IMPORT TRUCKLOADS			***894***	***136***	***301***	***1331***

Materials	Average Quantity per Truckload		Anticipated Truck Trips			
			Phase 1	Phase 2	Phase 3	Total
EXPORTS						
Dredging - ERD						
Dredged Sediment	10	CY	2020			2020
Structures - ERD						
Soil & Water	16	CY	89			89
Concrete Debris	16	CY	11			11
Asphalt Debris	16	CY	13			13
Steel sheet pile	40	ton	6			6
Ballast	100	ton	(jumbo ope			1 railroad trip (jumbo open top hopper)
Steel Beams						
Railroad track and Timber Ties						
Timber Piles						
Catwalk						
Existing Metal Structure	16	CY	10			10
Pump Station - ERD						
Clear, Grub, Strip	16	CY	585			585
Sheet Piling	40	Ton	2			2
Losen Slote Features						
Soil & Asphalt	10	CY		402	423	825
Soil (PS A&C)	10	CY			270	270
Clear and Grub	16	CY			21	21
TOTAL EXPORT TRUCKLOADS			***2,736***	***402***	***714***	***3,852***
TOTAL EXPORT RAIL TRIPS			***1***			***1***
IMPORTS						
Dredging						
Riparian Revegetation	16	CY	524			524
Non-Riparian Revegetation	16	CY	236			236
Trees	1440	CF	2			2
Container Material	1440	CF	3			3
Structures						
Backfill	16	CY	35			35
RCBs	8	Ft	27			27
Steel Sheet Piles	40	ton	6			6
Ballast	16	CY	2			2
Steel Beams	40	ton	1			1
Rail road track	40	ton	1			1
Timber Ties	40	Ton	1			1
Concrete for abutments	16	CY	3			3
Steel H Piles	40	tons	2			2
Catwalk	40	tons	1			1
Pump Station						
Concrete	16	CY	101			101
Steel Sheet Piles	40	ton	2			2
Steel Bars	40	ton	1			1
PS and forebay Piles (8 piles per load	36.6	tons	32			32
Pumps	1	Ea.	8			8
Losen Slote Features						
Bedding	10	CY		189	199	388
Backfill	10	CY		310	326	636
Asphalt	10	CY		121	127	248
Dewatering pumps and sediment/treatment tank				1	1	2
11.875 Micropiles	40	tons		4	4	8
HP 16x141	40	tons			9	9
36-inch dia. Pipe (DIP)	200	LF		16	17	33
Concrete Panels	484	CF			34	34
Pumps	3	Ea.			1	1
Pumps	3	Ea.			1	1
TOTAL IMPORT TRUCKLOADS			***988***	***641***	***719***	***2,348***

This Page has been Intentionally Left Blank.

Construction Equipment Air Quality Emission Factors

RBDM Alternative 2

Equipment	Type	Average Rated HP[1]	Loading Factors[2]	Emission Factors (lb/1000 HP-hr)[2]							Emission Factors (lb/hr)[3]						
				CO	NOx	VOC	PM_{10}	$PM_{2.5}$	SOx	CO_2e	CO	NOx	VOC	PM_{10}	$PM_{2.5}$	SOx	CO_2e
Asphalt paver	Diesel Pavers	130	59%	4.76	10.72	0.9	0.88	0.84	0.84	1224	3.65E-01	8.22E-01	6.90E-02	6.75E-02	6.44E-02	6.44E-02	93.85
Asphalt paver, CAT AP1055F	Diesel Pavers	225	59%	4.76	10.72	0.9	0.88	0.84	0.84	1224	6.32E-01	1.42E+00	1.19E-01	1.17E-01	1.12E-01	1.12E-01	162.42
Asphalt roller, 10 Ton	Diesel Rollers	130	59%	5.78	11.09	1.01	0.99	0.97	0.86	1244	4.43E-01	8.51E-01	7.75E-02	7.59E-02	7.44E-02	6.60E-02	95.39
Asphalt roller, CAT CB68B	Diesel Rollers	142	59%	5.78	11.09	1.01	0.99	0.97	0.86	1244	4.84E-01	9.29E-01	8.46E-02	8.29E-02	8.13E-02	7.21E-02	104.19
Backhoe loader	Diesel Tractors/Loaders/Backhoes	48	21%	14.64	15.61	3.42	2.36	2.27	1.01	1473	1.48E-01	1.57E-01	3.45E-02	2.38E-02	2.29E-02	1.02E-02	14.85
Chain saws	2 Stroke Chain Saws >6 HP	7	70%	779.31	2.12	165.53	21.52	19.80	0.31	1541	3.82E+00	1.04E-02	8.11E-01	1.05E-01	9.70E-02	1.52E-03	7.55
Generator, 10 kW	Diesel Generator Sets	13.41	43%	6.95	13.98	1.85	1.35	1.30	0.88	1261	4.01E-02	8.06E-02	1.07E-02	7.78E-03	7.50E-03	5.07E-03	7.27
Planter equipment	Diesel Tillers >6 HP	100	59%	8.33	13.56	1.37	1.19	1.15	0.84	1195	4.91E-01	8.00E-01	8.08E-02	7.02E-02	6.79E-02	4.96E-02	70.48
Crane	Diesel Cranes	320	43%	3.02	12.06	0.84	0.64	0.62	0.82	1186	4.16E-01	1.66E+00	1.16E-01	8.81E-02	8.53E-02	1.13E-01	163.16
Track Mounted Loco Crane	Diesel Cranes	200	43%	3.02	12.06	0.84	0.64	0.62	0.82	1186	2.60E-01	1.04E+00	7.22E-02	5.50E-02	5.33E-02	7.05E-02	101.98
Dewatering pump, 4-in.	Diesel Pumps	45	43%	6.92	14.09	1.76	1.37	1.32	0.88	1261	1.34E-01	2.73E-01	3.41E-02	2.65E-02	2.55E-02	1.70E-02	24.41
Dewatering pump, MWI-RWP006	Diesel Pumps	45	43%	6.92	14.09	1.76	1.37	1.32	0.88	1261	1.34E-01	2.73E-01	3.41E-02	2.65E-02	2.55E-02	1.70E-02	24.41
Dozer	Diesel Crawler Tractor/Dozer	200	59%	4.50	11.09	0.77	0.73	0.71	0.84	1199	5.31E-01	1.31E+00	9.09E-02	8.61E-02	8.38E-02	9.91E-02	141.48
Dozer	Diesel Crawler Tractor/Dozer	80	59%	4.50	11.09	0.77	0.73	0.71	0.84	1199	2.12E-01	5.23E-01	3.63E-02	3.45E-02	3.35E-02	3.96E-02	56.59
Dozer, CAT D5G	Diesel Crawler Tractor/Dozer	90	59%	4.50	11.09	0.77	0.73	0.71	0.84	1199	2.39E-01	5.89E-01	4.09E-02	3.88E-02	3.77E-02	4.46E-02	63.67
Brush Chipper	Diesel Chippers/Stump Grinders	130	43%	5.67	13.69	1.39	1.08	1.06	0.84	1226	3.17E-01	7.65E-01	7.77E-02	6.04E-02	5.93E-02	4.70E-02	68.52
Pile hammer, J&M 115	Diesel Crushing Equipment	175	43%	4.21	12.72	0.99	0.79	0.77	0.84	1213	3.17E-01	9.57E-01	7.45E-02	5.94E-02	5.79E-02	6.32E-02	91.24
Pile hammer, vibratory	Diesel Crushing Equipment	300	43%	4.21	12.72	0.99	0.79	0.77	0.84	1213	5.43E-01	1.64E+00	1.28E-01	1.02E-01	9.93E-02	1.08E-01	156.42
Pipelayer, CAT PL87	Diesel Other Material Handling	320	21%	12.08	18.32	3.37	2.18	2.12	0.99	1419	8.12E-01	1.23E+00	2.26E-01	1.46E-01	1.42E-01	6.65E-02	95.38
Crawler Rig, 6-8 ton hammer	Diesel Crushing Equipment	127	43%	4.21	12.72	0.99	0.79	0.77	0.84	1213	2.30E-01	6.95E-01	5.41E-02	4.31E-02	4.20E-02	4.59E-02	66.22
Excavator, hydraulic, 1.5 cy	Diesel Excavators	128	59%	3.75	10.03	0.75	0.71	0.68	0.84	1204	2.83E-01	7.57E-01	5.66E-02	5.36E-02	5.14E-02	6.34E-02	90.90
Excavator, hydraulic, CAT 330F L	Diesel Excavators	235	59%	3.75	10.03	0.75	0.71	0.68	0.84	1204	5.20E-01	1.39E+00	1.04E-01	9.84E-02	9.43E-02	1.16E-01	166.89
Loader, skid steer	Diesel Skid Steer Loaders	30	21%	19.58	16.01	4.85	3.11	3.02	1.06	1533	1.23E-01	1.01E-01	3.06E-02	1.96E-02	1.90E-02	6.68E-03	9.66
Front Loader, CAT 980H	Diesel Tractors/Loaders/Backhoes	318	21%	14.64	15.61	3.42	2.36	2.27	1.01	1473	9.78E-01	1.04E+00	2.28E-01	1.58E-01	1.52E-01	6.74E-02	98.35
18-Wheeler (with trailer)	Diesel Off-highway Trucks	510	59%	3.66	11.27	0.64	0.57	0.55	0.82	1193	1.10E+00	3.39E+00	1.93E-01	1.72E-01	1.65E-01	2.47E-01	359.09
Roller, compactor, CAT Compact CMV	Diesel Rollers	133	59%	5.78	11.09	1.01	0.99	0.97	0.86	1244	4.54E-01	8.70E-01	7.93E-02	7.77E-02	7.61E-02	6.75E-02	97.59
Roller, compactor	Diesel Rollers	7.5	59%	5.78	11.09	1.01	0.99	0.97	0.86	1244	2.56E-02	4.91E-02	4.47E-03	4.38E-03	4.29E-03	3.81E-03	5.50
Off-Road Dump Truck, 23 cy, CAT 770(	Diesel Off-highway Trucks	477	59%	3.66	11.27	0.64	0.57	0.55	0.82	1192	1.03E+00	3.17E+00	1.80E-01	1.60E-01	1.55E-01	2.31E-01	335.57
Dump Truck, 16 cy, International 2574	Diesel Dumpers/Tenders	370	21%	18.74	16.43	5.01	3.11	3.00	1.04	1513	1.46E+00	1.28E+00	3.89E-01	2.42E-01	2.33E-01	8.08E-02	117.54
Dump Truck, 12 cy	Diesel Dumpers/Tenders	220	21%	18.74	16.43	5.01	3.11	3.00	1.04	1513	8.66E-01	7.59E-01	2.31E-01	1.44E-01	1.39E-01	4.80E-02	69.89
Tanker Truck, 5000 gal.	Diesel Dumpers/Tenders	400	21%	18.74	16.43	5.01	3.11	3.00	1.04	1513	1.57E+00	1.38E+00	4.21E-01	2.61E-01	2.52E-01	8.74E-02	127.07
Pickup Truck, 3/4 Ton	Diesel Off-highway Trucks	400	59%	3.66	11.27	0.64	0.57	0.55	0.82	1192	8.64E-01	2.66E+00	1.51E-01	1.35E-01	1.30E-01	1.94E-01	281.40
Concrete truck	Diesel Off-highway Trucks	350	59%	3.66	11.27	0.64	0.57	0.55	0.82	1193	7.56E-01	2.33E+00	1.32E-01	1.18E-01	1.14E-01	1.69E-01	246.44
Cold Planner, CAT PM620	Diesel Scrapers	630	59%	4.70	10.98	0.66	0.68	0.66	0.82	1192	1.75E+00	4.08E+00	2.45E-01	2.53E-01	2.45E-01	3.05E-01	443.21
Train	Tier II Locomotive	4000	21%	2.82	28.60	1.11	0.70	0.68	ND	ND	2.37E+00	2.40E+01	9.34E-01	5.91E-01	5.74E-01	ND	ND

1. Average horsepower ratings were obtained from a review of various manufacturers' specifications
2. Loading factors and emission factors from USAFCEE *Air Emissions Guide For Air Force Mobile Sources*, July 2016, Section 4 and 5; except for the Train, which was provided by EPA *Emission Factors for Locomotives*, April 2009.
3. Emission Factors (lbs./hr.) = (Average Rated HP X Loading Factors X Emission Factors (lbs./1000 HP-hr.)) / 1000
4. ND = No Data available

This Page has been Intentionally Left Blank.

Projected Emissions for CY 2020
Construction Equipment
RBDM Alternative 2

Construction Equipment	Usage (hr)	Emissions (lb)						
		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
Asphalt paver	63	23.00	51.80	4.35	4.25	4.06	4.06	5,912.27
Asphalt paver, CAT AP1055F	18	11.37	25.62	2.15	2.10	2.01	2.01	2,923.65
Asphalt roller, 10 Ton	63	27.93	53.59	4.88	4.78	4.69	4.16	6,009.54
Asphalt roller, CAT CB68B	18	8.72	16.72	1.52	1.49	1.46	1.30	1,875.50
Backhoe loader	1305	192.58	205.34	44.99	31.04	29.86	13.29	19,373.41
Chain saws	108	412.41	1.12	87.60	11.39	10.48	0.16	815.50
Generator, 10 kW	1494	59.87	120.44	15.94	11.63	11.20	7.58	10,866.00
Planter equipment	27	13.27	21.60	2.18	1.90	1.83	1.34	1,902.98
Crane	203	84.15	336.04	23.41	17.83	17.28	22.85	33,040.30
Track Mounted Loco Crane	135	35.06	140.02	9.75	7.43	7.20	9.52	13,766.79
Dewatering pump, 4-in.	405	54.23	110.42	13.79	10.74	10.34	6.90	9,884.57
Dewatering pump, MWI-RWP006	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	324	172.04	423.99	29.44	27.91	27.14	32.11	45,840.17
Dozer	1440	305.86	753.77	52.34	49.62	48.26	57.09	81,493.63
Dozer, CAT D5G	702	167.74	413.39	28.70	27.21	26.47	31.31	44,694.16
Brush Chipper	45	14.26	34.44	3.50	2.72	2.67	2.11	3,083.37
Pile hammer, J&M 115	203	64.15	193.83	15.09	12.04	11.73	12.80	18,476.53
Pile hammer, vibratory	99	53.77	162.45	12.64	10.09	9.83	10.73	15,485.09
Pipelayer, CAT PL87	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crawler Rig, 6-8 ton hammer	117	26.90	81.27	6.33	5.05	4.92	5.37	7,747.24
Excavator, hydraulic, 1.5 cy	441	124.89	334.04	24.98	23.65	22.65	27.98	40,088.41
Excavator, hydraulic, CAT 330F L	952	494.85	1,323.56	98.97	93.69	89.73	110.85	158,840.42
Loader, skid steer	3987	491.81	402.14	121.82	78.12	75.86	26.63	38,503.03
Front Loader, CAT 980H	479	468.54	499.59	109.45	75.53	72.65	32.32	47,135.00
18-Wheeler (with trailer)	99	109.03	335.72	19.07	16.98	16.38	24.43	35,550.01
Roller, compactor, CAT Compact CMV	27	12.25	23.50	2.14	2.10	2.06	1.82	2,634.95
Roller, compactor	2052	52.48	100.70	9.17	8.99	8.81	7.81	11,292.65
Off-Road Dump Truck, 23 cy, CAT 7700	817	841.28	2,590.50	147.11	131.02	126.42	188.48	274,080.32
Dump Truck, 16 cy, International 2574	3156	4,595.99	4,029.46	1,228.70	762.73	735.75	255.06	371,002.45
Dump Truck, 12 cy	1501	1,299.82	1,139.60	347.50	215.71	208.08	72.14	104,925.30
Tanker Truck, 5000 gal.	342	538.36	472.00	143.93	89.34	86.18	29.88	43,458.28
Pickup Truck, 3/4 Ton	2529	2,184.45	6,726.43	381.98	340.20	328.26	489.41	711,670.82
Concrete truck	54	40.81	125.67	7.14	6.36	6.13	9.14	13,307.49
Cold Planner, CAT PM620	9	15.72	36.73	2.21	2.27	2.21	2.74	3,988.90
Train	9	21.29	216.22	8.41	5.32	5.16	-	-
Total Emissions	**(lb./yr.):**	**13,018.9**	**21,501.7**	**3,011.2**	**2,091.2**	**2,017.8**	**1,503.4**	**2,179,668.7**
Total Emissions	**(tpy)**	**6.51**	**10.75**	**1.51**	**1.05**	**1.01**	**0.75**	**1,089.83**
Total Emissions	**(Metric Tons/yr.)**							**988.68**

Projected Emissions for CY 2021
Construction Equipment
RBDM Alternative 2

Construction Equipment	Usage (hr)	Emissions (lb)						
		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
Asphalt paver	27	9.86	22.20	1.86	1.82	1.74	1.74	2,533.83
Asphalt paver, CAT AP1055F	9	5.69	12.81	1.08	1.05	1.00	1.00	1,461.82
Asphalt roller, 10 Ton	27	11.97	22.97	2.09	2.05	2.01	1.78	2,575.52
Asphalt roller, CAT CB68B	9	4.36	8.36	0.76	0.75	0.73	0.65	937.75
Backhoe loader	279	41.17	43.90	9.62	6.64	6.38	2.84	4,141.90
Chain saws	36	137.47	0.37	29.20	3.80	3.49	0.05	271.83
Generator, 10 kW	747	29.94	60.22	7.97	5.82	5.60	3.79	5,433.00
Planter equipment	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane	34	14.02	56.01	3.90	2.97	2.88	3.81	5,506.72
Track Mounted Loco Crane	23	5.84	23.34	1.63	1.24	1.20	1.59	2,294.46
Dewatering pump, 4-in.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dewatering pump, MWI-RWP006	243	32.54	66.25	8.28	6.44	6.21	4.14	5,930.74
Dozer	63	33.45	82.44	5.72	5.43	5.28	6.24	8,913.37
Dozer	333	70.73	174.31	12.10	11.47	11.16	13.20	18,845.40
Dozer, CAT D5G	360	86.02	212.00	14.72	13.95	13.57	16.06	22,920.08
Brush Chipper	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pile hammer, J&M 115	115	36.35	109.84	8.55	6.82	6.65	7.25	10,470.03
Pile hammer, vibratory	153	83.09	251.05	19.54	15.59	15.20	16.58	23,931.51
Pipelayer, CAT PL87	243	197.26	299.16	55.03	35.60	34.62	16.17	23,176.44
Crawler Rig, 6-8 ton hammer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator, hydraulic, 1.5 cy	18	5.10	13.63	1.02	0.97	0.92	1.14	1,636.26
Excavator, hydraulic, CAT 330F L	645	335.16	896.45	67.03	63.46	60.78	75.08	107,583.40
Loader, skid steer	954	117.68	96.22	29.15	18.69	18.15	6.37	9,212.92
Front Loader, CAT 980H	80	78.09	83.26	18.24	12.59	12.11	5.39	7,855.83
18-Wheeler (with trailer)	27	29.73	91.56	5.20	4.63	4.47	6.66	9,695.46
Roller, compactor, CAT Compact CMV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor	135	3.45	6.62	0.60	0.59	0.58	0.51	742.94
Off-Road Dump Truck, 23 cy, CAT 7700	1000	1,030.16	3,172.11	180.14	160.44	154.81	230.80	335,616.26
Dump Truck, 16 cy, International 2574	1696	2,468.91	2,164.57	660.04	409.73	395.24	137.02	199,297.56
Dump Truck, 12 cy	611	528.70	463.53	141.34	87.74	84.64	29.34	42,678.19
Tanker Truck, 5000 gal.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Truck, 3/4 Ton	675	583.04	1,795.31	101.95	90.80	87.62	130.63	189,947.73
Concrete truck	9	6.80	20.95	1.19	1.06	1.02	1.52	2,217.92
Cold Planner, CAT PM620	9	15.72	36.73	2.21	2.27	2.21	2.74	3,988.90
Train	0	0.00	0.00	0.00	0.00	0.00	-	-
Total Emissions	**(lb./yr.):**	**6,002.3**	**10,286.2**	**1,390.2**	**974.4**	**940.3**	**724.1**	**1,049,817.8**
Total Emissions	**(tpy)**	**3.00**	**5.14**	**0.70**	**0.49**	**0.47**	**0.36**	**524.91**
Total Emissions	**(Metric Tons/yr.)**							**476.19**

Projected Emissions for CY 2022
Construction Equipment
RBDM Alternative 2

Construction Equipment	Usage (hr)	Emissions (lb)						
		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
Asphalt paver	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt paver, CAT AP1055F	18	11.37	25.62	2.15	2.10	2.01	2.01	2,923.65
Asphalt roller, 10 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt roller, CAT CB68B	18	8.72	16.72	1.52	1.49	1.46	1.30	1,875.50
Backhoe loader	630	92.97	99.13	21.72	14.99	14.42	6.41	9,352.68
Chain saws	36	137.47	0.37	29.20	3.80	3.49	0.05	271.83
Generator, 10 kW	576	23.08	46.43	6.14	4.48	4.32	2.92	4,189.30
Planter equipment	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane	72	29.92	119.48	8.32	6.34	6.14	8.12	11,747.66
Track Mounted Loco Crane	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dewatering pump, 4-in.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dewatering pump, MWI-RWP006	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	207	109.92	270.88	18.81	17.83	17.34	20.52	29,286.77
Dozer	729	154.84	381.59	26.49	25.12	24.43	28.90	41,256.15
Dozer, CAT D5G	297	70.97	174.90	12.14	11.51	11.20	13.25	18,909.07
Brush Chipper	54	17.12	41.32	4.20	3.26	3.20	2.54	3,700.05
Pile hammer, J&M 115	180	57.02	172.29	13.41	10.70	10.43	11.38	16,423.58
Pile hammer, vibratory	180	97.76	295.36	22.99	18.34	17.88	19.50	28,154.71
Pipelayer, CAT PL87	261	211.87	321.32	59.11	38.24	37.18	17.36	24,893.21
Crawler Rig, 6-8 ton hammer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator, hydraulic, 1.5 cy	81	22.94	61.35	4.59	4.34	4.16	5.14	7,363.18
Excavator, hydraulic, CAT 330F L	1062	552.17	1,476.88	110.43	104.54	100.13	123.69	177,240.37
Loader, skid steer	2268	279.77	228.76	69.30	44.44	43.15	15.15	21,902.40
Front Loader, CAT 980H	36	35.20	37.53	8.22	5.67	5.46	2.43	3,540.66
18-Wheeler (with trailer)	81	89.20	274.68	15.60	13.89	13.41	19.99	29,086.38
Roller, compactor, CAT Compact CMV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor	261	6.68	12.81	1.17	1.14	1.12	0.99	1,436.35
Off-Road Dump Truck, 23 cy, CAT 7700	1098	1,130.98	3,482.54	197.77	176.14	169.96	253.39	368,460.60
Dump Truck, 16 cy, International 2574	1570	2,285.35	2,003.64	610.97	379.26	365.85	126.83	184,480.09
Dump Truck, 12 cy	557	482.24	422.80	128.92	80.03	77.20	26.76	38,928.20
Tanker Truck, 5000 gal.	558	878.38	770.11	234.83	145.77	140.62	48.75	70,905.62
Pickup Truck, 3/4 Ton	1530	1,321.55	4,069.37	231.09	205.82	198.59	296.09	430,548.18
Concrete truck	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cold Planner, CAT PM620	9	15.72	36.73	2.21	2.27	2.21	2.74	3,988.90
Train	0	0.00	0.00	0.00	0.00	0.00	-	-
Total Emissions	**(lb./yr.):**	**8,123.2**	**14,842.6**	**1,841.3**	**1,321.5**	**1,275.3**	**1,056.2**	**1,530,865.1**
Total Emissions	**(tpy)**	**4.06**	**7.42**	**0.92**	**0.66**	**0.64**	**0.53**	**765.43**
Total Emissions	**(Metric Tons/yr.)**							**694.39**

Source: Emission factors from USAFCEE Air Emissions Guide For Air Force Mobile Sources, July 2016, Section 4 and 5; except for the Train, which was provided by EPA Emission Factors for Locomotives, April 2009.

This Page has been Intentionally Left Blank.

Fugitive Dust Emissions (Site Preparation)
RBDM Alternative 2

CY 2019

Description:[1]	
Square feet:	357,806
Total acres of land disturbed:	4
Assumed number of 9-hr days:	10
Assumed equivalent acres/day:	0.411

Equation for Fugitive Dust Emissions (PM_{10})[2]
E_{TSP} (lb./yr.) = 80 * No. of 9-hr days * Acres/day

Calculation
E_{TSP} (lb./yr.) = 80 * 10 days * 0.411 acres/day
E_{TSP} = 328.56 lb./yr.
1.64E-01 tpy

CY 2020

Description:[1]	
Square feet:	236,379
Total acres of land disturbed:	3
Assumed number of 9-hr days:	8
Assumed equivalent acres/day:	0.339

Equation for Fugitive Dust Emissions (PM_{10})[2]
E_{TSP} (lb./yr.) = 80 * No. of 9-hr days * Acres/day

Calculation
E_{TSP} (lb./yr.) = 80 * 8 days * 0.339 acres/day
E_{TSP} = 217.06 lb./yr.
1.09E-01 tpy

CY 2021

Description:[1]	
Square feet:	39,615
Total acres of land disturbed:	0
Assumed number of 9-hr days:	1
Assumed equivalent acres/day:	0.455

Equation for Fugitive Dust Emissions (PM_{10})[2]
E_{TSP} (lb./yr.) = 80 * No. of 9-hr days * Acres/day

Calculation
E_{TSP} (lb./yr.) = 80 * 1 days * 0.455 acres/day
E_{TSP} = 36.38 lb./yr.
1.82E-02 tpy

CY 2022

Description:[1]	
Square feet:	265,360
Total acres of land disturbed:	3
Assumed number of 9-hr days:	7
Assumed equivalent acres/day:	0.435

Equation for Fugitive Dust Emissions (PM_{10})[2]
E_{TSP} (lb./yr.) = 80 * No. of 9-hr days * Acres/day

Calculation
E_{TSP} (lb./yr.) = 80 * 7 days * 0.435 acres/day
E_{TSP} = 243.67 lb./yr.
1.22E-01 tpy

Assumptions:

[1] The area of disturbance during site preparation is conservatively assumed to be 50 percent of the footprint.

[2]Emission factors and methodology from USAFCEE *Air Emissions Guide For Air Force Mobile Sources* (Section 5, August 2013).

Note: Assume PM= PM_{10}=$PM_{2.5}$

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2019
RBDM Alternative 2

Input Parameters:

Soil moved during exporting =	4,543	cy	
Soil moved during exporting =	7,360	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4		(Mean, Table 13.2.2-1, Page 13.2.2-3)
Material moisture content =	14		(Mean, Table 13.2.4, Page 13.2.4-2)

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

3.34E-04	**lbs./ton**	**PM**
1.58E-04	**lbs./ton**	**PM_{10}**
2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

2.45	lbs./yr.	**0.001**	**tons/yr.**	**PM**	**E1**
1.16	lbs./yr.	**0.001**	**tons/yr.**	**PM_{10}**	**E1**
0.18	lbs./yr.	**0.0001**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

1.23E-04	**tons/yr.**	**PM**	**E2**
5.80E-05	**tons/yr.**	**PM10**	**E2**
8.79E-06	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/36$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (4,543 cy/year of excavated soil)/(truck load)*(average distance traveled each way)

VMT = ((4,543 cy/yr.) / (12 cy/truck))*(50 miles/round trip*1% miles/unpaved roads)

VMT = 189 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

1,232	lbs./yr.	**0.62**	**tons/yr.**	**PM**
333	lbs./yr.	**0.17**	**tons/yr.**	**PM_{10}**
33	lbs./yr.	**0.02**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2019 (Continued)
RBDM Alternative 2

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

0.06	**tons/yr.**	**PM**	**E2**
0.02	**tons/yr.**	**PM10**	**E2**
0.002	**tons/yr.**	**PM2.5**	**E2**

Total annual fugitive emissions from soil removal (tons/yr.) =

=E1+E2

0.062	**tons/yr.**	**PM**
0.017	**tons/yr.**	**PM_{10}**
0.002	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2020
RBDM Alternative 2

Input Parameters:

Soil moved during exporting =	31,023	cy	
Soil moved during exporting =	50,257	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	14	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

3.34E-04	**lbs./ton**	**PM**
1.58E-04	**lbs./ton**	**PM_{10}**
2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

16.76	lbs./yr.	**0.008**	**tons/yr.**	**PM**	**E1**
7.93	lbs./yr.	**0.004**	**tons/yr.**	**PM_{10}**	**E1**
1.20	lbs./yr.	**0.0006**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

8.38E-04	**tons/yr.**	**PM**	**E2**
3.96E-04	**tons/yr.**	**PM10**	**E2**
6.00E-05	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (31,023 cy/year of excavated soil)/(truck load)*(average distance traveled each way)

VMT = ((31,023 cy/yr.) / (12 cy/truck))*(50 miles/round trip*1% miles/unpaved roads)

VMT = 1,293 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

8,427	lbs./yr.	**4.21**	**tons/yr.**	**PM**
2,275	lbs./yr.	**1.14**	**tons/yr.**	**PM_{10}**
228	lbs./yr.	**0.11**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2020 (Continued)
RBDM Alternative 2

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

0.42	**tons/yr.**	**PM**	**E2**
0.11	**tons/yr.**	**PM10**	**E2**
0.011	**tons/yr.**	**PM2.5**	**E2**

Total annual fugitive emissions from soil removal (tons/yr.) =

=E1+E2

0.422	**tons/yr.**	**PM**
0.114	**tons/yr.**	**PM_{10}**
0.011	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2021
RBDM Alternative 2

Input Parameters:

Soil moved during importing =	12,659	cy	
Soil moved during importing =	20,508	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4		(Mean, Table 13.2.2-1, Page 13.2.2-3)
Material moisture content =	14		(Mean, Table 13.2.4, Page 13.2.4-2)

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

3.34E-04	**lbs./ton**	**PM**
1.58E-04	**lbs./ton**	**PM_{10}**
2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

6.84	lbs./yr.	**0.003**	**tons/yr.**	**PM**	**E1**
3.23	lbs./yr.	**0.002**	**tons/yr.**	**PM_{10}**	**E1**
0.49	lbs./yr.	**0.0002**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

3.42E-04	**tons/yr.**	**PM**	**E2**
1.62E-04	**tons/yr.**	**PM10**	**E2**
2.45E-05	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (12,659 cy/year of excavated soil)/(truck load)*(average distance traveled each way)

VMT = ((12,659 cy/yr.) / (12 cy/truck))*(50 miles/round trip*1% miles/unpaved roads)

VMT = 527 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

3,435	lbs./yr.	**1.72**	**tons/yr.**	**PM**
927	lbs./yr.	**0.46**	**tons/yr.**	**PM_{10}**
93	lbs./yr.	**0.05**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2021 (Continued)
RBDM Alternative 2

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

0.17	**tons/yr.**	**PM**	**E2**
0.05	**tons/yr.**	**PM10**	**E2**
0.005	**tons/yr.**	**PM2.5**	**E2**

Total annual fugitive emissions from soil import (tons/yr.) =

=E1+E2

0.172	**tons/yr.**	**PM**
0.047	**tons/yr.**	**PM_{10}**
0.005	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2022
RBDM Alternative 2

Input Parameters:

Soil moved during importing =	11,053	cy	
Soil moved during importing =	17,906	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	14	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

3.34E-04	**lbs./ton**	**PM**
1.58E-04	**lbs./ton**	**PM_{10}**
2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

5.97	lbs./yr.	**0.003**	**tons/yr.**	**PM**	**E1**
2.82	lbs./yr.	**0.001**	**tons/yr.**	**PM_{10}**	**E1**
0.43	lbs./yr.	**0.0002**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

2.99E-04	**tons/yr.**	**PM**	**E2**
1.41E-04	**tons/yr.**	**PM10**	**E2**
2.14E-05	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (11,053 cy/year of excavated soil)/(truck load)*(average distance traveled each way)

VMT = ((11,053 cy/yr.) / (12 cy/truck))*(50 miles/round trip*1% miles/unpaved roads)

VMT = 461 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

3,005	lbs./yr.	**1.50**	**tons/yr.**	**PM**
811	lbs./yr.	**0.41**	**tons/yr.**	**PM_{10}**
81	lbs./yr.	**0.04**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2022 (Continued)
RBDM Alternative 2

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

0.15	**tons/yr.**	**PM**	**E2**
0.04	**tons/yr.**	**PM10**	**E2**
0.004	**tons/yr.**	**PM2.5**	**E2**

Total annual fugitive emissions from soil import (tons/yr.) =

=E1+E2

0.151	**tons/yr.**	**PM**
0.041	**tons/yr.**	**PM_{10}**
0.004	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2019
RBDM Alternative 2

Input Parameters:

Concrete moved during export =	696	cy	
Concrete moved during export =	1,127	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	0.2	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

1.28E-01	**lbs./ton**	**PM**
6.04E-02	**lbs./ton**	**PM_{10}**
9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

143.97	lbs./yr.	**0.072**	**tons/yr.**	**PM**	**E1**
68.10	lbs./yr.	**0.034**	**tons/yr.**	**PM_{10}**	**E1**
10.31	lbs./yr.	**0.005**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from concrete handling and storage =

uncontrolled emissions * 0.1

7.20E-03	**tons/yr.**	**PM**	**E2**
3.40E-03	**tons/yr.**	**PM10**	**E2**
5.16E-04	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (696 cy/yr. of concrete/(truck load)*(average distance traveled each way)

VMT = ((696 cy/yr.) / (8 cy/truck))*(20 miles/round trip*1% miles/unpaved roads)

VMT = 17 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

111	lbs./yr.	**0.06**	**tons/yr.**	**PM**
30	lbs./yr.	**0.01**	**tons/yr.**	**PM_{10}**
3	lbs./yr.	**0.00**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2019 (Continued)
RBDM Alternative 2

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

0.01	**tons/yr.**	**PM**	**E2**
0.00	**tons/yr.**	**PM10**	**E2**
0.000	**tons/yr.**	**PM2.5**	**E2**

Total annual fugitive emissions from concrete demolition (tons/yr.) =

=E1+E2

0.013	**tons/yr.**	**PM**
0.005	**tons/yr.**	**PM_{10}**
0.001	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2020
RBDM Alternative 2

Input Parameters:

Concrete moved during export =	5,015	cy	
Concrete moved during export =	8,124	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	0.2	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

1.28E-01	**lbs./ton**	**PM**
6.04E-02	**lbs./ton**	**PM_{10}**
9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

1,037.57	lbs./yr.	**0.519**	**tons/yr.**	**PM**	**E1**
490.74	lbs./yr.	**0.245**	**tons/yr.**	**PM_{10}**	**E1**
74.31	lbs./yr.	**0.037**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from concrete handling and storage =

uncontrolled emissions * 0.1

5.19E-02	**tons/yr.**	**PM**	**E2**
2.45E-02	**tons/yr.**	**PM10**	**E2**
3.72E-03	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (5,015 cy/yr. of concrete/(truck load)*(average distance traveled each way)

VMT = ((5,015 cy/yr.) / (8 cy/truck))*(20 miles/round trip*1% miles/unpaved roads)

VMT = 125 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

815	lbs./yr.	**0.41**	**tons/yr.**	**PM**
220	lbs./yr.	**0.11**	**tons/yr.**	**PM_{10}**
22	lbs./yr.	**0.01**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2020 (Continued)
RBDM Alternative 2

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

0.04	**tons/yr.**	**PM**	**E2**
0.01	**tons/yr.**	**PM10**	**E2**
0.001	**tons/yr.**	**PM2.5**	**E2**

Total annual fugitive emissions from concrete demolition (tons/yr.) =

=E1+E2

0.093	**tons/yr.**	**PM**
0.036	**tons/yr.**	**PM_{10}**
0.005	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2021
RBDM Alternative 2

Input Parameters:

Concrete moved during import =	4,318	cy	
Concrete moved during import =	6,995	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	0.2	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

1.28E-01	**lbs./ton**	**PM**
6.04E-02	**lbs./ton**	**PM_{10}**
9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

893.35	lbs./yr.	**0.447**	**tons/yr.**	**PM**	**E1**
422.53	lbs./yr.	**0.211**	**tons/yr.**	**PM_{10}**	**E1**
63.98	lbs./yr.	**0.0320**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from concrete handling and storage =

uncontrolled emissions * 0.1

4.47E-02	**tons/yr.**	**PM**	**E2**
2.11E-02	**tons/yr.**	**PM10**	**E2**
3.20E-03	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (4,318 cy/yr. of concrete/(truck load)*(average distance traveled each way)

VMT = ((4,318 cy/yr.) / (8 cy/truck))*(20 miles/round trip*1% miles/unpaved roads)

VMT = 108 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

704	lbs./yr.	**0.35**	**tons/yr.**	**PM**
190	lbs./yr.	**0.10**	**tons/yr.**	**PM_{10}**
19	lbs./yr.	**0.01**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2021 (Continued)
RBDM Alternative 2

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

0.04	**tons/yr.**	**PM**	**E2**
0.01	**tons/yr.**	**PM10**	**E2**
0.001	**tons/yr.**	**PM2.5**	**E2**

Total annual fugitive emissions from concrete import (tons/yr.) =

=E1+E2

0.080	**tons/yr.**	**PM**
0.031	**tons/yr.**	**PM_{10}**
0.004	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2022
RBDM Alternative 2

Input Parameters:

Concrete moved during import =	4,709	cy	
Concrete moved during import =	7,629	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	0.2	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

1.28E-01	**lbs./ton**	**PM**
6.04E-02	**lbs./ton**	**PM_{10}**
9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

974.27	lbs./yr.	**0.487**	**tons/yr.**	**PM**	**E1**
460.80	lbs./yr.	**0.230**	**tons/yr.**	**PM_{10}**	**E1**
69.78	lbs./yr.	**0.0349**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from concrete handling and storage =

uncontrolled emissions * 0.1

4.87E-02	**tons/yr.**	**PM**	**E2**
2.30E-02	**tons/yr.**	**PM10**	**E2**
3.49E-03	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (4,709 cy/yr. of concrete/(truck load)*(average distance traveled each way)

VMT = ((4,709 cy/yr.) / (8 cy/truck))*(20 miles/round trip*1% miles/unpaved roads)

VMT = 118 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

769	lbs./yr.	**0.38**	**tons/yr.**	**PM**
208	lbs./yr.	**0.10**	**tons/yr.**	**PM_{10}**
21	lbs./yr.	**0.01**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2022 (Continued)
RBDM Alternative 2

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

0.04	**tons/yr.**	**PM**	**E2**
0.01	**tons/yr.**	**PM10**	**E2**
0.001	**tons/yr.**	**PM2.5**	**E2**

Total annual fugitive emissions from concrete import (tons/yr.) =

=E1+E2

0.087	**tons/yr.**	**PM**
0.033	**tons/yr.**	**PM_{10}**
0.005	**tons/yr.**	**$PM_{2.5}$**

his Page has been ntentionally eft Blan .

Emergency Generators - Potential Emissions

Equipment Information

Location:	East Riser Ditch Pump Station
Make:	ND
Model Number:	ND
Serial Number:	ND
Number of Identical Generators:	1
Generator Demand (hp):	2011.5
Generator Rating (kW)[1]:	1500
Permitted Source:	Title V
Fuel Burned:	Diesel
Projected Hours of Operation:	100
Fuel Sulfur Content (wt%):	0.0015
Fuel Heat Content (Btu/gal):	137,000

Potential Emissions - Criteria Pollutants

Criteria Pollutant	Emission Factor[2] (lb/hp-hr) >600 hp	Emissions (lb/yr)	Total (tpy)
$PM/PM_{10}/PM_{2.5}$	6.61E-05	1.33E+01	6.65E-03
SO_x	1.21E-05	2.44E+00	1.22E-03
NO_x	8.99E-03	1.81E+03	9.05E-01
VOC	2.43E-04	4.88E+01	2.44E-02
CO	9.70E-04	1.95E+02	9.76E-02

Potential Emissions - HAPs

HAP	Emission Factor[2] (lb/hp-hr) >600 hp	Emissions (lb/yr)	Total (tpy)
Acetaldehyde	1.76E-07	3.55E-02	1.77E-05
Acrolein	5.52E-08	1.11E-02	5.55E-06
Benzene	5.43E-06	1.09E+00	5.46E-04
Formaldehyde	5.52E-07	1.11E-01	5.55E-05
Naphthalene	9.10E-07	1.83E-01	9.15E-05
Polycyclic Aromatic Hydrocarbons (PAHs)[3]	5.74E-07	1.15E-01	5.77E-05
Toluene	1.97E-06	3.96E-01	1.98E-04
Xylenes	1.35E-06	2.72E-01	1.36E-04
	Total HAP	**2.22E+00**	**1.11E-03**

Potential Emissions - GHGs

GHG	Emission Factor[4] (lbs./hp-hr.)	Total (lb/yr)	Total (tpy)	Total (metric tpy)
CO_2e	1.16	233,334.00	116.67	105.84

Equipment Information

Location:	Losen Slote Pump Station A
Make:	ND
Model Number:	ND
Serial Number:	ND
Number of Identical Generators:	1
Generator Demand (hp):	469.35
Generator Rating (kW)[1]:	350
Permitted Source:	Title V
Fuel Burned:	Diesel
Projected Hours of Operation:	100
Fuel Sulfur Content (wt%):	0.0015
Fuel Heat Content (Btu/gal):	137,000

Potential Emissions - Criteria Pollutants

Criteria Pollutant	Emission Factor[2] (lb/hp-hr) <600 hp	Emissions (lb/yr)	Total (tpy)
$PM/PM_{10}/PM_{2.5}$	2.20E-04	1.03E+01	5.17E-03
SO_x	1.21E-05	5.70E-01	2.85E-04
NO_x	9.92E-03	4.66E+02	2.33E-01
VOC	0.00E+00	0.00E+00	0.00E+00
CO	3.09E-03	1.45E+02	7.24E-02

Potential Emissions - HAPs

HAP	Emission Factor[2] (lb/hp-hr) <600 hp	Emissions (lb/yr)	Total (tpy)
Acetaldehyde	5.37E-06	2.52E-01	1.26E-04
Acrolein	6.48E-07	3.04E-02	1.52E-05
Benzene	6.53E-06	3.06E-01	1.53E-04
Formaldehyde	8.26E-06	3.88E-01	1.94E-04
Naphthalene	5.94E-07	2.79E-02	1.39E-05
Polycyclic Aromatic Hydrocarbons (PAHs)[3]	1.18E-06	5.54E-02	2.77E-05
Toluene	2.86E-06	1.34E-01	6.71E-05
Xylenes	2.00E-06	9.39E-02	4.69E-05
	Total HAP	**1.29E+00**	**6.44E-04**

Potential Emissions - GHGs

GHG	Emission Factor[4] (lbs./hp-hr.)	Total (lb/yr)	Total (tpy)	Total (metric tpy)
CO_2e	1.16	54,444.60	27.22	24.70

Equipment Information

Location:	Losen Slote Pump Station C
Make:	ND
Model Number:	ND
Serial Number:	ND
Number of Identical Generators:	1
Generator Demand (hp):	2011.5
Generator Rating (kW)[1]:	1500
Permitted Source:	Title V
Fuel Burned:	Diesel
Projected Hours of Operation:	100
Fuel Sulfur Content (wt%):	0.0015
Fuel Heat Content (Btu/gal):	137,000

Potential Emissions - Criteria Pollutants

Criteria Pollutant	Emission Factor[2] (lb/hp-hr) >600 hp	Emissions (lb/yr)	Total (tpy)
$PM/PM_{10}/PM_{2.5}$	6.61E-05	1.33E+01	6.65E-03
SO_x	1.21E-05	2.44E+00	1.22E-03
NO_x	8.99E-03	1.81E+03	9.05E-01
VOC	2.43E-04	4.88E+01	2.44E-02
CO	9.70E-04	1.95E+02	9.76E-02

Potential Emissions - HAPs

HAP	Emission Factor[2] (lb/hp-hr) >600 hp	Emissions (lb/yr)	Total (tpy)
Acetaldehyde	1.76E-07	3.55E-02	1.77E-05
Acrolein	5.52E-08	1.11E-02	5.55E-06
Benzene	5.43E-06	1.09E+00	5.46E-04
Formaldehyde	5.52E-07	1.11E-01	5.55E-05
Naphthalene	9.10E-07	1.83E-01	9.15E-05
Polycyclic Aromatic Hydrocarbons (PAHs)[3]	5.74E-07	1.15E-01	5.77E-05
Toluene	1.97E-06	3.96E-01	1.98E-04
Xylenes	1.35E-06	2.72E-01	1.36E-04
	Total HAP	**2.22E+00**	**1.11E-03**

Potential Emissions - GHGs

GHG	Emission Factor[4] (lbs./hp-hr.)	Total (lb/yr)	Total (tpy)	Total (metric tpy)
CO_2e	1.16	233,334.00	116.67	105.84

ND = No Data

1. It is anticipated that there will be three generators, one at each of the proposed pump stations. Generator sizes conservatively estimated based on the cfs capacity of each pump station.
2. Criteria pollutant emission factors from manufacture's specification for a Caterpillar 3512C (for the 1500 kW generators) and Caterpillar C13 (for the 350 kW generator) converted from g/hp-hr to lb/hp-hr using 453.6 g to lb conversion factor.
HAP emission factors from AP-42, Tables 3.3-2 (<600 hp) and 3.4-3 and 3.4-4 (>600 hp), October 1996 and converted from lb/MMBtu to lb/hp-hr using average brake-specific fuel consumption (BSFC) = 7 MMBtu/1000 hp-hr.
3. For inventory purposes, assume PAH is the same as Polycyclic Organic Matter (POM).
4. Emission factor from USAFCEE Air Emissions Guide For Air Force Stationary Sources, July 2016.
5. ND = No Data

This Page has been Intentionally Left Blank.

Projected Emissions for CY 2020
All Sources
Construction Year 2

Emission Source	Projected Emissions (tons per year)							CY 2020 (metric tons per year)
	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e	CO_2e
Construction Equipment Operation	6.25	10.13	1.46	1.01	0.97	0.71	1,024.39	929.31
Site Preparation - Fugitive Emissions	--	--	--	8.53E-03	8.53E-03	--	--	--
Rock/Soil Export and Import - Fugitive Emissions	--	--	--	1.17E-01	1.17E-02	--	--	--
Concrete Export and Import - Fugitive Emissions	--	--	--	3.54E-02	4.80E-03	--	--	--
Total	6.25	10.13	1.46	1.17	1.00	0.71	1,024.39	929.31

Projected Emissions for CY 2021
All Sources
Construction Year 3

Emission Source	Projected Emissions (tons per year)							CY 2021 (metric tons per year)
	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e	CO_2e
Construction Equipment Operation	1.38	2.31	0.32	0.22	0.21	0.16	235.41	213.56
Site Preparation - Fugitive Emissions	--	--	--	1.82E-02	1.82E-02	--	--	--
Rock/Soil Export and Import - Fugitive Emissions	--	--	--	2.14E-02	2.14E-03	--	--	--
Concrete Export and Import - Fugitive Emissions	--	--	--	7.85E-03	1.06E-03	--	--	--
Total	1.38	2.31	0.32	0.27	0.23	0.16	235.41	213.56

Projected Emissions for CY 2022
All Sources
Construction Year 4

Emission Source	Projected Emissions (tons per year)							CY 2022 (metric tons per year)
	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e	CO_2e
Construction Equipment Operation	2.90	5.03	0.67	0.48	0.46	0.36	514.67	466.90
Site Preparation - Fugitive Emissions	--	--	--	4.00E-02	4.00E-02	--	--	--
Rock/Soil Export and Import - Fugitive Emissions	--	--	--	3.34E-02	3.34E-03	--	--	--
Concrete Export and Import - Fugitive Emissions	--	--	--	2.80E-02	3.80E-03	--	--	--
Total	2.90	5.03	0.67	0.58	0.51	0.36	514.67	466.90

Projected Annual Operations Emissions
All Sources
Potential Annual Emissions from Stationary Sources During Operations

Emission Source	Projected Emissions (tons per year)							metric tons per year
	CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	HAPs	CO_2e
Generators at East Riser Ditch Pump Station	0.10	0.90	0.02	0.01	0.01	1.22E-03	1.11E-03	105.84
Generators at Losen Slote Pump Station A	0.07	0.23	0.00	0.01	0.01	2.85E-04	6.44E-04	24.70
Total	0.17	1.14	0.02	0.01	0.01	1.51E-03	1.75E-03	130.53

This Page has been Intentionally Left Blank.

Construction Equipment Projected Hours of Operation
RBDM Alternative 3

Equipment	Type	Average Rated HP	No. of Units	Days Per Year				Hours Per Year				
				CY 2019 Days	CY 2020 Days	CY 2021 Days	CY 2022 Days	CY 2019 Hours	CY 2020 Hours	CY 2021 Hours	CY 2022 Hours	
Asphalt paver	Diesel Pavers	130	1	0	9	3	0	0	81	27	0	
Asphalt paver, CAT AP1055F	Diesel Pavers	225	1	0	2	0	2	0	18	0	18	
Asphalt roller, 10 Ton	Diesel Rollers	130	1	0	9	3	0	0	81	27	0	
Asphalt roller, CAT CB68B	Diesel Rollers	142	1	0	2	0	2	0	18	0	18	
Backhoe loader	Diesel Tractors/Loaders/Backhoes	48	2	0	124	31	39	0	1,116	279	351	
Chain saws	2 Stroke Chain Saws >6 HP	7	6	0	10	4	2	0	90	36	18	
Generator, 10 kW	Diesel Generator Sets	13.41	4	0	77	83	64	0	693	747	576	
Planter equipment	Diesel Tillers >6 HP	100	1	0	3	0	0	0	27	0	0	
Crane	Diesel Cranes	320	1	4	23	4	4	34	203	34	36	
Track Mounted Loco Crane	Diesel Cranes	200	1	3	15	3	0	23	135	23	0	
Dewatering pump, 4-in.	Diesel Pumps	45	1	0	45	0	0	0	405	0	0	
Dewatering pump, MWI-RWP006	Diesel Pumps	45	1	0	0	0	0	0	0	0	0	
Dozer	Diesel Crawler Tractor/Dozer	200	3	0	27	7	6	0	243	63	54	
Dozer	Diesel Crawler Tractor/Dozer	80	3	0	138	37	35	0	1,242	333	315	
Dozer, CAT D5G	Diesel Crawler Tractor/Dozer	90	1	13	78	13	33	117	702	117	297	
Brush Chipper	Diesel Chippers/Stump Grinders	130	3	0	3	0	2	0	27	0	18	
Pile hammer, J&M 115	Diesel Crushing Equipment	175	1	4	23	4	10	34	203	34	90	
Pile hammer, vibratory	Diesel Crushing Equipment	300	2	0	6	17	20	0	54	153	180	3 days in 2020 for gray infra.
Pipelayer, CAT PL87	Diesel Other Material Handling	320	1	0	0	0	29	0	0	0	261	
Crawler Rig, 6-8 ton hammer	Diesel Crushing Equipment	127	1	0	13	0	0	0	117	0	0	
Excavator, hydraulic, 1.5 cy	Diesel Excavators	128	1	0	44	2	5	0	396	18	45	
Excavator, hydraulic, CAT 330F L	Diesel Excavators	235	1	18	106	18	90	159	952	159	810	
Loader, skid steer	Diesel Skid Steer Loaders	30	3	0	321	106	84	0	2,889	954	756	
Front Loader, CAT 980H	Diesel Tractors/Loaders/Backhoes	318	1	9	53	9	4	80	479	80	36	
18-Wheeler (with trailer)	Diesel Off-highway Trucks	510	1	0	11	0	8	0	99	0	72	
Roller, compactor, CAT Compact CMV	Diesel Rollers	133	1	0	3	0	0	0	27	0	0	
Roller, compactor	Diesel Rollers	7.5	3	0	156	15	9	0	1,404	135	81	
Off-Road Dump Truck, 23 cy, CAT 770G	Diesel Off-highway Trucks	477	3	15	91	15	105	136	817	136	945	
Dump Truck, 16 cy, International 2574	Diesel Dumpers/Tenders	370	9	57	351	57	157	515	3,156	515	1,412	
Dump Truck, 12 cy	Diesel Dumpers/Tenders	220	5	26	167	66	24	234	1,506	595	219	
Tanker Truck, 5000 gal.	Diesel Dumpers/Tenders	400	1	0	97	0	103	0	437	0	464	conservatively estimated to be operating 50% of the 9-hour day - assumed it is turning on and off to spray water for fugitive dust control
Pickup Truck, 3/4 Ton	Diesel Off-highway Trucks	400	unknown, assumed to be >10	0	492	150	130	0	2,214	675	585	conservatively estimated to be operating 50% of the 9-hour day - assuming trucks are turned off when not in use and are being used to carry small tools and equipment on site
Concrete truck	Diesel Off-highway Trucks	350	1	2	12	2	0	18	54	9	0	
Cold Planner, CAT PM620	Diesel Scrapers	630	1	0	2	0	2	0	9	0	9	
Train	Tier II Locomotive	4000	1	0	1	0	0	0	9	0	0	

Assumptions:
Field construction is projected to start in late 2019 and be completed by late summer 2022.
Typical workday will include 9 hours of construction, 6 days per week.
Estimated hours of operation were provided by this Proposed Project's design team.
When it was not specified, it was assumed as a conservative estimate that the fuel would be diesel.
It is assumed that the workers potentially commuting to job sites under the Proposed Project would commute to other regional job sites that are unrelated to the Proposed Project under the No Action Alternative.
Therefore, potential emissions generated from worker commutes were not quantified, since the commuter emissions are assumed to be the same, or of a negligible difference, between the Build Alternatives and No Action Alternative.

This Page has been Intentionally Left Blank.

Dump Truck Hours for demolition and clearing estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =	57	339	307	30		73	481	73	21
Average run (hrs) per trip to Impact Reuse and Recovery=	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5
Total hours operated =	28	170	154	15		37	240	37	11
Total days operated =	*3*	*19*	*17*	*2*		*4*	*27*	*4*	*1*

Dump Truck Hours for soil excavation estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =	29	173	61	1		264	1,582	264	558
Average hours per round-trip to Clean Earth =	1	1	1	1		1	1	1	1
Total hours operated =	29	173	61	1		264	1,582	264	558
Total days operated =	*3*	*19*	*7*	*0*		*29*	*176*	*29*	*62*

Dump Truck Hours for soil imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =	81	484	143	4		4	26	4	525
Average hours per round-trip =	1	1	1	1		1	1	1	1
Total hours operated =	81	484	143	4		4	26	4	525
Total days operated =	*9*	*54*	*16*	*0*		*0*	*3*	*0*	*58*

Dump Truck Hours for concrete imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =	23	160.25	29	38		16	101	16	17
Average hours per round-trip =	1	1	1	1		1	1	1	1
Total hours operated =	23	160	29	38		16	101	16	17
Total days operated =	*3*	*18*	*3*	*4*		*2*	*11*	*2*	*2*

Dump Truck Hours for piping and pump imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =		10	1	1			8	0	19
Average hours per round-trip =	2	2	2	2		2	2	2	2
Total hours operated =	0	20	2	2		0	16	0	38
Total days operated =	*0*	*2*	*0*	*0*		*0*	*2*	*0*	*4*

Dump Truck Hours for steel imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =		0	0	9		4	37	4	9
Average hours per round-trip =	1	1	1	1		1	1	1	1
Total hours operated =	0	0	0	9		4	37	4	9
Total days operated =	*0*	*0*	*0*	*1*		*0*	*4*	*0*	*1*

Dump Truck Hours for asphalt imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =	12	71	48	0				0	127
Average hours per round-trip =	2	2	2	2		2	2	2	2
Total hours operated =	24	141	96	0		0	0	0	254
Total days operated =	*3*	*16*	*11*	*0*		*0*	*0*	*0*	*28*

Dump Truck for other fabriacted material imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =	24.5	147	53.5	73			5		
Average hours per round-trip =	2	2	2	2		2	2	2	2
Total hours operated =	49	294	107	146		0	10	0	0
Total days operated =	*5*	*33*	*12*	*16*		*0*	*1*	*0*	*0*

Dump Truck for vegetation imports estimated as follows:

Green:	2019	2020	2021	2022	Gray:	2019	2020	2021	2022
Total trips =		32	2	2		95	572	95	
Average hours per round-trip =	2	2	2	2		2	2	2	2
Total hours operated =	0	64	4	4		190	1,144	190	0
Total days operated =	*0*	*7*	*0*	*0*		*21*	*127*	*21*	*0*
Average run per trip =	1	1	1	1		1	1	1	1
Total hours operated =	**234**	**1,506**	**595**	**219**		**515**	**3,156**	**515**	**1,412**
Total days operated =	**26**	**167**	**66**	**24**		**57**	**351**	**57**	**157**

Phase 1: November 2019 – February 2021
Phase 2: March 2021 – December 2021
Phase 3: January 2022 – August 2022

Phase 1: 12.5% in 2019, 75% in 2020, 12.5% in 2021
Phase 2: 100% in 2021
Phase 3: 100% in 2022

Assumptions:

Truck trips were separated by the type of export or import material (i.e., demolition debris, soil, steel, etc.). The Truck Trip table (**Table F-20**) from **Appendix F** has been expanded to include an estimated number of truck trips for *each type* of material export or import and is provided here.

"Hours per round-trip" was determined based on the list of potential export and import facilities, and what materials that facility accepts or exports, as described in **Appendix F** and shown in **Table F-27** of **Appendix F**.

Estimated, average round-trip distances (in minutes or hours) was determined based on the location of each materials' potential associated export or import facility(ies) in relation to the Project Area and what routes the trucks would be taking, as provided in **Attachment F-4** to **Appendix F**.

Truck Trip Tables from Appendix F:

Anticipated Truck Trips and Material Quantity Transported - GI (all during Phase 1)

Materials	Quantity and Measurement		Average Quantity per Truckload		Truckloads (each)	
EXPORTS						
Demolition and clearing debris excavated soils	4373	Tons	10	Ton	437	assumed 50% demo debris & 50% soils
TOTAL EXPORT TRUCKLOADS					***437***	
IMPORTS						
Soils and aggregates	3184	Tons	20	Tons	159	
Pipe	2265	LF	312	LF	8	
Precast concrete inlets	63	Units	4	Units	16	
Trees	57	Units	6	Units	10	
TOTAL IMPORT TRUCKLOADS					***193***	

Anticipated Truck Trips and Material Quantity Transported - Parks

Materials	Average Quantity per Truckload		Anticipated Truck Trips			
			Phase 1	Phase 2	Phase 3	Total
EXPORTS						
Demolition and clearing debris	8	CY	234	46	30	310
Soils	12	CY	12	32	1	45
TOTAL EXPORT TRUCKLOADS			***246***	***78***	***31***	***355***
IMPORTS						
Soils and aggregates	12	CY	486	62	4	552
Hot mix asphalt	20	Tons	94	36	0	130
Pipe	312	LF	2	1	1	4
Precast concrete inlets	4	Units	4	1	1	6
Ready-mix concrete and grout	9	CY	187	5	37	229
Structural steel and piling products	20	Tons	0	0	9	9
Trees	20	Units	22	2	2	26
Other fabricated and nursery materials	1	Each	196	29	73	298
TOTAL IMPORT TRUCKLOADS			***991***	***136***	***127***	***1254***

Materials	Average Quantity per Truckload		Anticipated Truck Trips			
			Phase 1	Phase 2	Phase 3	Total
EXPORTS						
Dredging - ERD						
Dredged Sediment	10	CY	2020			2020
Structures - ERD						
Soil & Water	16	CY	89			89
Concrete Debris	16	CY	11			11
Asphalt Debris	16	CY	13			13
Steel sheet pile	40	ton	6			6
Ballast	100	ton	1 railroad trip (jumbo open top hopper)			1 railroad trip (jumbo open top hopper)
Steel Beams						
Railroad track and Timber Ties						
Timber Piles						
Catwalk						
Existing Metal Structure	16	CY	10			10
Pump Station - ERD						
Clear, Grub, Strip	16	CY	585			585
Sheet Piling	40	Ton	2			2
Losen Slote Features						
Soil & Asphalt	10	CY		0	423	423
Soil (PS A&C)	10	CY			135	135
Clear and Grub	16	CY			21	21
TOTAL EXPORT TRUCKLOADS			***2,736***	***0***	***579***	***3,315***
TOTAL EXPORT RAIL TRIPS			***1***			***1***
IMPORTS						
Dredging						
Riparian Revegetation	16	CY	524			524
Non-Riparian Revegetation	16	CY	236			236
Trees	1440	CF	2			2
Container Material	1440	CF	3			3
Structures						
Backfill	16	CY	35			35
RCBs	8	Ft	27			27
Steel Sheet Piles	40	ton	6			6
Ballast	16	CY	2			2
Steel Beams	40	ton	1			1
Rail road track	40	ton	1			1
Timber Ties	40	Ton	1			1
Concrete for abutments	16	CY	3			3
Steel H Piles	40	tons	2			2
Catwalk	40	tons	1			1
Pump Station						
Concrete	16	CY	101			101
Steel Sheet Piles	40	ton	2			2
Steel Bars	40	ton	1			1
PS and forebay Piles (8 piles per load	36.6	tons	32			32
Pumps	1	Ea.	8			8
Losen Slote Features						
Bedding	10	CY		0	199	199
Backfill	10	CY		0	326	326
Asphalt	10	CY		0	127	127
Dewatering pumps and sediment/treatment tank				0	1	1
11.875 Micropiles	40	tons		0	4	4
HP 16x141	40	tons			5	5
36-inch dia. Pipe (DIP)	200	LF		0	17	17
Concrete Panels	484	CF			17	17
Pumps	3	Ea.			1	1
Pumps	3	Ea.			0	0
TOTAL IMPORT TRUCKLOADS			***988***	***0***	***697***	***1,685***

This Page has been Intentionally Left Blank.

Construction Equipment Air Quality Emission Factors

RBDM Alternative 3

Equipment	Type	Average Rated HP[1]	Loading Factors[2]	Emission Factors (lb/1000 HP-hr)[2]							Emission Factors (lb/hr)[3]						
				CO	NOx	VOC	PM_{10}	$PM_{2.5}$	SOx	CO_2e	CO	NOx	VOC	PM_{10}	$PM_{2.5}$	SOx	CO_2e
Asphalt paver	Diesel Pavers	130	59%	4.76	10.72	0.9	0.88	0.84	0.84	1224	3.65E-01	8.22E-01	6.90E-02	6.75E-02	6.44E-02	6.44E-02	93.85
Asphalt paver, CAT AP1055F	Diesel Pavers	225	59%	4.76	10.72	0.9	0.88	0.84	0.84	1224	6.32E-01	1.42E+00	1.19E-01	1.17E-01	1.12E-01	1.12E-01	162.42
Asphalt roller, 10 Ton	Diesel Rollers	130	59%	5.78	11.09	1.01	0.99	0.97	0.86	1244	4.43E-01	8.51E-01	7.75E-02	7.59E-02	7.44E-02	6.60E-02	95.39
Asphalt roller, CAT CB68B	Diesel Rollers	142	59%	5.78	11.09	1.01	0.99	0.97	0.86	1244	4.84E-01	9.29E-01	8.46E-02	8.29E-02	8.13E-02	7.21E-02	104.19
Backhoe loader	Diesel Tractors/Loaders/Backhoes	48	21%	14.64	15.61	3.42	2.36	2.27	1.01	1473	1.48E-01	1.57E-01	3.45E-02	2.38E-02	2.29E-02	1.02E-02	14.85
Chain saws	2 Stroke Chain Saws >6 HP	7	70%	779.31	2.12	165.53	21.52	19.80	0.31	1541	3.82E+00	1.04E-02	8.11E-01	1.05E-01	9.70E-02	1.52E-03	7.55
Generator, 10 kW	Diesel Generator Sets	13.41	43%	6.95	13.98	1.85	1.35	1.30	0.88	1261	4.01E-02	8.06E-02	1.07E-02	7.78E-03	7.50E-03	5.07E-03	7.27
Planter equipment	Diesel Tillers >6 HP	100	59%	8.33	13.56	1.37	1.19	1.15	0.84	1195	4.91E-01	8.00E-01	8.08E-02	7.02E-02	6.79E-02	4.96E-02	70.48
Crane	Diesel Cranes	320	43%	3.02	12.06	0.84	0.64	0.62	0.82	1186	4.16E-01	1.66E+00	1.16E-01	8.81E-02	8.53E-02	1.13E-01	163.16
Track Mounted Loco Crane	Diesel Cranes	200	43%	3.02	12.06	0.84	0.64	0.62	0.82	1186	2.60E-01	1.04E+00	7.22E-02	5.50E-02	5.33E-02	7.05E-02	101.98
Dewatering pump, 4-in.	Diesel Pumps	45	43%	6.92	14.09	1.76	1.37	1.32	0.88	1261	1.34E-01	2.73E-01	3.41E-02	2.65E-02	2.55E-02	1.70E-02	24.41
Dewatering pump, MWI-RWP006	Diesel Pumps	45	43%	6.92	14.09	1.76	1.37	1.32	0.88	1261	1.34E-01	2.73E-01	3.41E-02	2.65E-02	2.55E-02	1.70E-02	24.41
Dozer	Diesel Crawler Tractor/Dozer	200	59%	4.50	11.09	0.77	0.73	0.71	0.84	1199	5.31E-01	1.31E+00	9.09E-02	8.61E-02	8.38E-02	9.91E-02	141.48
Dozer	Diesel Crawler Tractor/Dozer	80	59%	4.50	11.09	0.77	0.73	0.71	0.84	1199	2.12E-01	5.23E-01	3.63E-02	3.45E-02	3.35E-02	3.96E-02	56.59
Dozer, CAT D5G	Diesel Crawler Tractor/Dozer	90	59%	4.50	11.09	0.77	0.73	0.71	0.84	1199	2.39E-01	5.89E-01	4.09E-02	3.88E-02	3.77E-02	4.46E-02	63.67
Brush Chipper	Diesel Chippers/Stump Grinders	130	43%	5.67	13.69	1.39	1.08	1.06	0.84	1226	3.17E-01	7.65E-01	7.77E-02	6.04E-02	5.93E-02	4.70E-02	68.52
Pile hammer, J&M 115	Diesel Crushing Equipment	175	43%	4.21	12.72	0.99	0.79	0.77	0.84	1213	3.17E-01	9.57E-01	7.45E-02	5.94E-02	5.79E-02	6.32E-02	91.24
Pile hammer, vibratory	Diesel Crushing Equipment	300	43%	4.21	12.72	0.99	0.79	0.77	0.84	1213	5.43E-01	1.64E+00	1.28E-01	1.02E-01	9.93E-02	1.08E-01	156.42
Pipelayer, CAT PL87	Diesel Other Material Handling	320	21%	12.08	18.32	3.37	2.18	2.12	0.99	1419	8.12E-01	1.23E+00	2.26E-01	1.46E-01	1.42E-01	6.65E-02	95.38
Crawler Rig, 6-8 ton hammer	Diesel Crushing Equipment	127	43%	4.21	12.72	0.99	0.79	0.77	0.84	1213	2.30E-01	6.95E-01	5.41E-02	4.31E-02	4.20E-02	4.59E-02	66.22
Excavator, hydraulic, 1.5 cy	Diesel Excavators	128	59%	3.75	10.03	0.75	0.71	0.68	0.84	1204	2.83E-01	7.57E-01	5.66E-02	5.36E-02	5.14E-02	6.34E-02	90.90
Excavator, hydraulic, CAT 330F L	Diesel Excavators	235	59%	3.75	10.03	0.75	0.71	0.68	0.84	1204	5.20E-01	1.39E+00	1.04E-01	9.84E-02	9.43E-02	1.16E-01	166.89
Loader, skid steer	Diesel Skid Steer Loaders	30	21%	19.58	16.01	4.85	3.11	3.02	1.06	1533	1.23E-01	1.01E-01	3.06E-02	1.96E-02	1.90E-02	6.68E-03	9.66
Front Loader, CAT 980H	Diesel Tractors/Loaders/Backhoes	318	21%	14.64	15.61	3.42	2.36	2.27	1.01	1473	9.78E-01	1.04E+00	2.28E-01	1.58E-01	1.52E-01	6.74E-02	98.35
18-Wheeler (with trailer)	Diesel Off-highway Trucks	510	59%	3.66	11.27	0.64	0.57	0.55	0.82	1193	1.10E+00	3.39E+00	1.93E-01	1.72E-01	1.65E-01	2.47E-01	359.09
Roller, compactor, CAT Compact CMV	Diesel Rollers	133	59%	5.78	11.09	1.01	0.99	0.97	0.86	1244	4.54E-01	8.70E-01	7.93E-02	7.77E-02	7.61E-02	6.75E-02	97.59
Roller, compactor	Diesel Rollers	7.5	59%	5.78	11.09	1.01	0.99	0.97	0.86	1244	2.56E-02	4.91E-02	4.47E-03	4.38E-03	4.29E-03	3.81E-03	5.50
Off-Road Dump Truck, 23 cy, CAT 770(	Diesel Off-highway Trucks	477	59%	3.66	11.27	0.64	0.57	0.55	0.82	1192	1.03E+00	3.17E+00	1.80E-01	1.60E-01	1.55E-01	2.31E-01	335.57
Dump Truck, 16 cy, International 2574	Diesel Dumpers/Tenders	370	21%	18.74	16.43	5.01	3.11	3.00	1.04	1513	1.46E+00	1.28E+00	3.89E-01	2.42E-01	2.33E-01	8.08E-02	117.54
Dump Truck, 12 cy	Diesel Dumpers/Tenders	220	21%	18.74	16.43	5.01	3.11	3.00	1.04	1513	8.66E-01	7.59E-01	2.31E-01	1.44E-01	1.39E-01	4.80E-02	69.89
Tanker Truck, 5000 gal.	Diesel Dumpers/Tenders	400	21%	18.74	16.43	5.01	3.11	3.00	1.04	1513	1.57E+00	1.38E+00	4.21E-01	2.61E-01	2.52E-01	8.74E-02	127.07
Pickup Truck, 3/4 Ton	Diesel Off-highway Trucks	400	59%	3.66	11.27	0.64	0.57	0.55	0.82	1192	8.64E-01	2.66E+00	1.51E-01	1.35E-01	1.30E-01	1.94E-01	281.40
Concrete truck	Diesel Off-highway Trucks	350	59%	3.66	11.27	0.64	0.57	0.55	0.82	1193	7.56E-01	2.33E+00	1.32E-01	1.18E-01	1.14E-01	1.69E-01	246.44
Cold Planner, CAT PM620	Diesel Scrapers	630	59%	4.70	10.98	0.66	0.68	0.66	0.82	1192	1.75E+00	4.08E+00	2.45E-01	2.53E-01	2.45E-01	3.05E-01	443.21
Train	Tier II Locomotive	4000	21%	2.82	28.60	1.11	0.70	0.68	ND	ND	2.37E+00	2.40E+01	9.34E-01	5.91E-01	5.74E-01	ND	ND

1. Average horsepower ratings were obtained from a review of various manufacturers' specifications
2. Loading factors and emission factors from USAFCEE *Air Emissions Guide For Air Force Mobile Sources*, July 2016, Section 4 and 5; except for the Train, which was provided by EPA Emission Factors for Locomotives, April 2009.
3. Emission Factors (lbs./hr.) = (Average Rated HP X Loading Factors X Emission Factors (lbs./1000 HP-hr.)) / 1000

This Page has been Intentionally Left Blank.

Projected Emissions for CY 2020
Construction Equipment
RBDM Alternative 3

Construction Equipment	Usage (hr)	Emissions (lb)						
		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
Asphalt paver	81	29.57	66.60	5.59	5.47	5.22	5.22	7,601.49
Asphalt paver, CAT AP1055F	18	11.37	25.62	2.15	2.10	2.01	2.01	2,923.65
Asphalt roller, 10 Ton	81	35.91	68.90	6.27	6.15	6.03	5.34	7,726.55
Asphalt roller, CAT CB68B	18	8.72	16.72	1.52	1.49	1.46	1.30	1,875.50
Backhoe loader	1116	164.69	175.60	38.47	26.55	25.54	11.36	16,567.60
Chain saws	90	343.68	0.93	73.00	9.49	8.73	0.14	679.58
Generator, 10 kW	693	27.77	55.86	7.39	5.39	5.19	3.52	5,040.25
Planter equipment	27	13.27	21.60	2.18	1.90	1.83	1.34	1,902.98
Crane	203	84.15	336.04	23.41	17.83	17.28	22.85	33,040.30
Track Mounted Loco Crane	135	35.06	140.02	9.75	7.43	7.20	9.52	13,766.79
Dewatering pump, 4-in.	405	54.23	110.42	13.79	10.74	10.34	6.90	9,884.57
Dewatering pump, MWI-RWP006	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	243	129.03	317.99	22.08	20.93	20.36	24.09	34,380.13
Dozer	1242	263.80	650.12	45.14	42.79	41.62	49.24	70,288.26
Dozer, CAT D5G	702	167.74	413.39	28.70	27.21	26.47	31.31	44,694.16
Brush Chipper	27	8.56	20.66	2.10	1.63	1.60	1.27	1,850.02
Pile hammer, J&M 115	203	64.15	193.83	15.09	12.04	11.73	12.80	18,476.53
Pile hammer, vibratory	54	29.33	88.61	6.90	5.50	5.36	5.85	8,446.41
Pipelayer, CAT PL87	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crawler Rig, 6-8 ton hammer	117	26.90	81.27	6.33	5.05	4.92	5.37	7,747.24
Excavator, hydraulic, 1.5 cy	396	112.15	299.96	22.43	21.23	20.34	25.12	35,997.76
Excavator, hydraulic, CAT 330F L	952	494.85	1,323.56	98.97	93.69	89.73	110.85	158,840.42
Loader, skid steer	2889	356.37	291.39	88.27	56.60	54.97	19.29	27,899.49
Front Loader, CAT 980H	479	468.54	499.59	109.45	75.53	72.65	32.32	47,135.00
18-Wheeler (with trailer)	99	109.03	335.72	19.07	16.98	16.38	24.43	35,550.01
Roller, compactor, CAT Compact CMV	27	12.25	23.50	2.14	2.10	2.06	1.82	2,634.95
Roller, compactor	1404	35.91	68.90	6.27	6.15	6.03	5.34	7,726.55
Off-Road Dump Truck, 23 cy, CAT 7700	817	841.28	2,590.50	147.11	131.02	126.42	188.48	274,080.32
Dump Truck, 16 cy, International 2574	3156	4,595.99	4,029.46	1,228.70	762.73	735.75	255.06	371,002.45
Dump Truck, 12 cy	1506	1,303.50	1,142.82	348.48	216.32	208.67	72.34	105,222.33
Tanker Truck, 5000 gal.	437	687.12	602.42	183.70	114.03	110.00	38.13	55,466.49
Pickup Truck, 3/4 Ton	2214	1,912.36	5,888.62	334.40	297.83	287.38	428.45	623,028.54
Concrete truck	54	40.81	125.67	7.14	6.36	6.13	9.14	13,307.49
Cold Planner, CAT PM620	9	15.72	36.73	2.21	2.27	2.21	2.74	3,988.90
Train	9	21.29	216.22	8.41	5.32	5.16	-	-
Total Emissions	**(lb./yr.):**	**12,505.1**	**20,259.3**	**2,916.6**	**2,017.9**	**1,946.8**	**1,412.9**	**2,048,772.7**
Total Emissions	**(tpy)**	**6.25**	**10.13**	**1.46**	**1.01**	**0.97**	**0.71**	**1,024.39**
Total Emissions	**(Metric Tons/yr.)**							**929.31**

Projected Emissions for CY 2021
Construction Equipment
RBDM Alternative 3

Construction Equipment	Usage (hr)	Emissions (lb)						
		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
Asphalt paver	27	9.86	22.20	1.86	1.82	1.74	1.74	2,533.83
Asphalt paver, CAT AP1055F	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt roller, 10 Ton	27	11.97	22.97	2.09	2.05	2.01	1.78	2,575.52
Asphalt roller, CAT CB68B	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Backhoe loader	279	41.17	43.90	9.62	6.64	6.38	2.84	4,141.90
Chain saws	36	137.47	0.37	29.20	3.80	3.49	0.05	271.83
Generator, 10 kW	747	29.94	60.22	7.97	5.82	5.60	3.79	5,433.00
Planter equipment	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane	34	14.02	56.01	3.90	2.97	2.88	3.81	5,506.72
Track Mounted Loco Crane	23	5.84	23.34	1.63	1.24	1.20	1.59	2,294.46
Dewatering pump, 4-in.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dewatering pump, MWI-RWP006	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	63	33.45	82.44	5.72	5.43	5.28	6.24	8,913.37
Dozer	333	70.73	174.31	12.10	11.47	11.16	13.20	18,845.40
Dozer, CAT D5G	117	27.96	68.90	4.78	4.54	4.41	5.22	7,449.03
Brush Chipper	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pile hammer, J&M 115	34	10.69	32.30	2.51	2.01	1.96	2.13	3,079.42
Pile hammer, vibratory	153	83.09	251.05	19.54	15.59	15.20	16.58	23,931.51
Pipelayer, CAT PL87	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crawler Rig, 6-8 ton hammer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator, hydraulic, 1.5 cy	18	5.10	13.63	1.02	0.97	0.92	1.14	1,636.26
Excavator, hydraulic, CAT 330F L	159	82.48	220.59	16.50	15.62	14.96	18.47	26,473.40
Loader, skid steer	954	117.68	96.22	29.15	18.69	18.15	6.37	9,212.92
Front Loader, CAT 980H	80	78.09	83.26	18.24	12.59	12.11	5.39	7,855.83
18-Wheeler (with trailer)	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor, CAT Compact CMV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor	135	3.45	6.62	0.60	0.59	0.58	0.51	742.94
Off-Road Dump Truck, 23 cy, CAT 7700	136	140.21	431.75	24.52	21.84	21.07	31.41	45,680.05
Dump Truck, 16 cy, International 2574	515	749.25	656.90	200.31	124.34	119.94	41.58	60,482.02
Dump Truck, 12 cy	595	515.17	451.67	137.73	85.50	82.47	28.59	41,586.17
Tanker Truck, 5000 gal.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Truck, 3/4 Ton	675	583.04	1,795.31	101.95	90.80	87.62	130.63	189,947.73
Concrete truck	9	6.80	20.95	1.19	1.06	1.02	1.52	2,217.92
Cold Planner, CAT PM620	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Train	0	0.00	0.00	0.00	0.00	0.00	-	-
Total Emissions	**(lb./yr.):**	**2,757.5**	**4,614.9**	**632.1**	**435.4**	**420.1**	**324.6**	**470,811.2**
Total Emissions	**(tpy)**	**1.38**	**2.31**	**0.32**	**0.22**	**0.21**	**0.16**	**235.41**
Total Emissions	**(Metric Tons/yr.)**							**213.56**

Projected Emissions for CY 2022
Construction Equipment
RBDM Alternative 3

Construction Equipment	Usage (hr)	Emissions (lb)						
		CO	NO_x	VOC	PM_{10}	$PM_{2.5}$	SO_2	CO_2e
Asphalt paver	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt paver, CAT AP1055F	18	11.37	25.62	2.15	2.10	2.01	2.01	2,923.65
Asphalt roller, 10 Ton	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Asphalt roller, CAT CB68B	18	8.72	16.72	1.52	1.49	1.46	1.30	1,875.50
Backhoe loader	351	51.80	55.23	12.10	8.35	8.03	3.57	5,210.78
Chain saws	18	68.74	0.19	14.60	1.90	1.75	0.03	135.92
Generator, 10 kW	576	23.08	46.43	6.14	4.48	4.32	2.92	4,189.30
Planter equipment	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crane	36	14.96	59.74	4.16	3.17	3.07	4.06	5,873.83
Track Mounted Loco Crane	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dewatering pump, 4-in.	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dewatering pump, MWI-RWP006	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dozer	54	28.67	70.67	4.91	4.65	4.52	5.35	7,640.03
Dozer	315	66.91	164.89	11.45	10.85	10.56	12.49	17,826.73
Dozer, CAT D5G	297	70.97	174.90	12.14	11.51	11.20	13.25	18,909.07
Brush Chipper	18	5.71	13.77	1.40	1.09	1.07	0.85	1,233.35
Pile hammer, J&M 115	90	28.51	86.15	6.70	5.35	5.21	5.69	8,211.79
Pile hammer, vibratory	180	97.76	295.36	22.99	18.34	17.88	19.50	28,154.71
Pipelayer, CAT PL87	261	211.87	321.32	59.11	38.24	37.18	17.36	24,893.21
Crawler Rig, 6-8 ton hammer	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Excavator, hydraulic, 1.5 cy	45	12.74	34.09	2.55	2.41	2.31	2.85	4,090.65
Excavator, hydraulic, CAT 330F L	810	421.15	1,126.43	84.23	79.74	76.37	94.34	135,183.33
Loader, skid steer	756	93.26	76.25	23.10	14.81	14.38	5.05	7,300.80
Front Loader, CAT 980H	36	35.20	37.53	8.22	5.67	5.46	2.43	3,540.66
18-Wheeler (with trailer)	72	79.29	244.16	13.87	12.35	11.92	17.77	25,854.56
Roller, compactor, CAT Compact CMV	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roller, compactor	81	2.07	3.97	0.36	0.35	0.35	0.31	445.76
Off-Road Dump Truck, 23 cy, CAT 7700	945	973.38	2,997.27	170.21	151.59	146.27	218.08	317,117.73
Dump Truck, 16 cy, International 2574	1412	2,055.28	1,801.94	549.46	341.08	329.02	114.06	165,908.66
Dump Truck, 12 cy	219	189.61	166.24	50.69	31.47	30.35	10.52	15,305.70
Tanker Truck, 5000 gal.	464	729.62	639.69	195.06	121.08	116.80	40.49	58,897.41
Pickup Truck, 3/4 Ton	585	505.30	1,555.94	88.36	78.69	75.93	113.21	164,621.36
Concrete truck	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cold Planner, CAT PM620	9	15.72	36.73	2.21	2.27	2.21	2.74	3,988.90
Train	0	0.00	0.00	0.00	0.00	0.00	-	-
Total Emissions	**(lb./yr.):**	**5,801.7**	**10,051.2**	**1,347.7**	**953.1**	**919.6**	**710.2**	**1,029,333.4**
Total Emissions	**(tpy)**	**2.90**	**5.03**	**0.67**	**0.48**	**0.46**	**0.36**	**514.67**
Total Emissions	**(Metric Tons/yr.)**							**466.90**

Source: Emission factors from USAFCEE Air Emissions Guide For Air Force Mobile Sources, July 2016, Section 4 and 5; except for the Train, which was provided by EPA Emission Factors for Locomotives, April 2009.

This Page has been Intentionally Left Blank.

Fugitive Dust Emissions (Site Preparation)
RBDM Alternative 3

CY 2019

Description:[1]	
Square feet:	270,686
Total acres of land disturbed:	3
Assumed number of 9-hr days:	7
Assumed equivalent acres/day:	0.444

Equation for Fugitive Dust Emissions (PM_{10})[2]

E_{TSP} (lb./yr.) = 80 * No. of 9-hr days * Acres/day

Calculation

E_{TSP} (lb./yr.) = 80 * 7 days * 0.444 acres/day

E_{TSP} = 248.56 lb./yr.

1.24E-01 tpy

CY 2020

Description:[1]	
Square feet:	18,579
Total acres of land disturbed:	0
Assumed number of 9-hr days:	0.5
Assumed equivalent acres/day:	0.427

Equation for Fugitive Dust Emissions (PM_{10})[2]

E_{TSP} (lb./yr.) = 80 * No. of 9-hr days * Acres/day

Calculation

E_{TSP} (lb./yr.) = 80 * 0.5 days * 0.427 acres/day

E_{TSP} = 17.06 lb./yr.

8.53E-03 tpy

CY 2021

Description:[1]	
Square feet:	39,615
Total acres of land disturbed:	0
Assumed number of 9-hr days:	1
Assumed equivalent acres/day:	0.455

Equation for Fugitive Dust Emissions (PM_{10})[2]

E_{TSP} (lb./yr.) = 80 * No. of 9-hr days * Acres/day

Calculation

E_{TSP} (lb./yr.) = 80 * 1 days * 0.460 acres/day

E_{TSP} = 36.38 lb./yr.

1.82E-02 tpy

CY 2022

Description:[1]	
Square feet:	87,120
Total acres of land disturbed:	1
Assumed number of 9-hr days:	2.5
Assumed equivalent acres/day:	0.400

Equation for Fugitive Dust Emissions (PM_{10})[2]

E_{TSP} (lb./yr.) = 80 * No. of 9-hr days * Acres/day

Calculation

E_{TSP} (lb./yr.) = 80 * 2.5 days * 0.400 acres/day

E_{TSP} = 80.00 lb./yr.

4.00E-02 tpy

Assumptions:

[1] The area of disturbance during site preparation is conservatively assumed to be 50 percent of the footprint.

[2]Emission factors and methodology from USAFCEE *Air Emissions Guide For Air Force Mobile Sources* (Section 5, August 2013).

Note: Assume PM= PM_{10}=$PM_{2.5}$

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2019
RBDM Alternative 3

Input Parameters:

Soil moved during exporting =	4,686	cy	
Soil moved during exporting =	7,591	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	14	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

3.34E-04	**lbs./ton**	**PM**
1.58E-04	**lbs./ton**	**PM_{10}**
2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

2.53	lbs./yr.	**1.27E-03**	**tons/yr.**	**PM**	**E1**
1.20	lbs./yr.	**5.99E-04**	**tons/yr.**	**PM_{10}**	**E1**
0.18	lbs./yr.	**9.07E-05**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

1.27E-04	**tons/yr.**	**PM**	**E2**
5.99E-05	**tons/yr.**	**PM_{10}**	**E2**
9.07E-06	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (4,686 cy/year of excavated soil)/(truck load)*(average distance traveled each way)

VMT = ((4,686 cy/yr.) / (12 cy/truck))*(50 miles/round trip*1% miles/unpaved roads)

VMT = 195 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

1,271	lbs./yr.	**6.35E-01**	**tons/yr.**	**PM**
343	lbs./yr.	**1.72E-01**	**tons/yr.**	**PM_{10}**
34	lbs./yr.	**1.72E-02**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2019 (Continued)
RBDM Alternative 3

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

6.35E-02	**tons/yr.**	**PM**	**E2**
1.72E-02	**tons/yr.**	**PM_{10}**	**E2**
1.72E-03	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from soil removal (tons/yr.) =

=E1+E2

6.37E-02	**tons/yr.**	**PM**
1.72E-02	**tons/yr.**	**PM_{10}**
1.72E-03	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2020
RBDM Alternative 3

Input Parameters:

Soil moved during exporting =	31,878	cy	
Soil moved during exporting =	51,642	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4		(Mean, Table 13.2.2-1, Page 13.2.2-3)
Material moisture content =	14		(Mean, Table 13.2.4, Page 13.2.4-2)

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

3.34E-04	**lbs./ton**	**PM**
1.58E-04	**lbs./ton**	**PM_{10}**
2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

17.22	lbs./yr.	**8.61E-03**	**tons/yr.**	**PM**	**E1**
8.15	lbs./yr.	**4.07E-03**	**tons/yr.**	**PM_{10}**	**E1**
1.23	lbs./yr.	**6.17E-04**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

8.61E-04	**tons/yr.**	**PM**	**E2**
4.07E-04	**tons/yr.**	**PM_{10}**	**E2**
6.17E-05	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (31,878 cy/year of excavated soil)/(truck load)*(average distance traveled each way)

VMT = ((31,878 cy/yr.) / (12 cy/truck))*(50 miles/round trip*1% miles/unpaved roads)

VMT = 1,328 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

8,655	lbs./yr.	**4.33E+00**	**tons/yr.**	**PM**
2,337	lbs./yr.	**1.17E+00**	**tons/yr.**	**PM_{10}**
234	lbs./yr.	**1.17E-01**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2020 (Continued)
RBDM Alternative 3

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

4.33E-01	**tons/yr.**	**PM**	**E2**
1.17E-01	**tons/yr.**	**PM_{10}**	**E2**
1.17E-02	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from soil removal (tons/yr.) =

=E1+E2

4.34E-01	**tons/yr.**	**PM**
1.17E-01	**tons/yr.**	**PM_{10}**
1.17E-02	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2021
RBDM Alternative 3

Input Parameters:

Soil moved during importing =	5,807	cy	
Soil moved during importing =	9,407	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4		(Mean, Table 13.2.2-1, Page 13.2.2-3)
Material moisture content =	14		(Mean, Table 13.2.4, Page 13.2.4-2)

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

3.34E-04	**lbs./ton**	**PM**
1.58E-04	**lbs./ton**	**PM_{10}**
2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

3.14	lbs./yr.	**1.57E-03**	**tons/yr.**	**PM**	**E1**
1.48	lbs./yr.	**7.42E-04**	**tons/yr.**	**PM_{10}**	**E1**
0.22	lbs./yr.	**1.12E-04**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

1.57E-04	**tons/yr.**	**PM**	**E2**
7.42E-05	**tons/yr.**	**PM10**	**E2**
1.12E-05	**tons/yr.**	**PM2.5**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (5,807 cy/year of excavated soil)/(truck load)*(average distance traveled each way)

VMT = ((5,807 cy/yr.) / (12 cy/truck))*(50 miles/round trip*1% miles/unpaved roads)

VMT = 242 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

1,577	lbs./yr.	**7.89E-01**	**tons/yr.**	**PM**
426	lbs./yr.	**2.13E-01**	**tons/yr.**	**PM_{10}**
43	lbs./yr.	**2.13E-02**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2021 (Continued)
RBDM Alternative 3

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

7.89E-02	**tons/yr.**	**PM**	**E2**
2.13E-02	**tons/yr.**	**PM_{10}**	**E2**
2.13E-03	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from soil import (tons/yr.) =

=E1+E2

7.90E-02	**tons/yr.**	**PM**
2.14E-02	**tons/yr.**	**PM_{10}**
2.14E-03	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2022
RBDM Alternative 3

Input Parameters:

Soil moved during importing =	9,082	cy	
Soil moved during importing =	14,713	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4		(Mean, Table 13.2.2-1, Page 13.2.2-3)
Material moisture content =	14		(Mean, Table 13.2.4, Page 13.2.4-2)

Emissions from rock/soil handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

3.34E-04	**lbs./ton**	**PM**
1.58E-04	**lbs./ton**	**PM_{10}**
2.39E-05	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from rock/soil handling and storage =

EF * tons/yr. of rock/soil loading/unloading

4.91	lbs./yr.	**2.45E-03**	**tons/yr.**	**PM**	**E1**
2.32	lbs./yr.	**1.16E-03**	**tons/yr.**	**PM_{10}**	**E1**
0.35	lbs./yr.	**1.76E-04**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from rock/soil handling and storage =

uncontrolled emissions * 0.1

2.45E-04	**tons/yr.**	**PM**	**E2**
1.16E-04	**tons/yr.**	**PM_{10}**	**E2**
1.76E-05	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (9,082 cy/year of excavated soil)/(truck load)*(average distance traveled each way)

VMT = ((9,082 cy/yr.) / (12 cy/truck))*(50 miles/round trip*1% miles/unpaved roads)

VMT = 378 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

2,464	lbs./yr.	**1.23E+00**	**tons/yr.**	**PM**
665	lbs./yr.	**3.33E-01**	**tons/yr.**	**PM_{10}**
67	lbs./yr.	**3.33E-02**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Rock/Soil Export and Import in CY 2022 (Continued)
RBDM Alternative 3

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

1.23E-01	**tons/yr.**	**PM**	**E2**
3.33E-02	**tons/yr.**	**PM_{10}**	**E2**
3.33E-03	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from soil import (tons/yr.) =

=E1+E2

1.23E-01	**tons/yr.**	**PM**
3.34E-02	**tons/yr.**	**PM_{10}**
3.34E-03	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2019
RBDM Alternative 3

Input Parameters:

Concrete moved during export =	693	cy	
Concrete moved during export =	1,122	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4		(Mean, Table 13.2.2-1, Page 13.2.2-3)
Material moisture content =	0.2		(Mean, Table 13.2.4, Page 13.2.4-2)

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

1.28E-01	**lbs./ton**	**PM**
6.04E-02	**lbs./ton**	**PM_{10}**
9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

143.35	lbs./yr.	**7.17E-02**	**tons/yr.**	**PM**	**E1**
67.80	lbs./yr.	**3.39E-02**	**tons/yr.**	**PM_{10}**	**E1**
10.27	lbs./yr.	**5.13E-03**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from concrete handling and storage =

uncontrolled emissions * 0.1

7.17E-03	**tons/yr.**	**PM**	**E2**
3.39E-03	**tons/yr.**	**PM_{10}**	**E2**
5.13E-04	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (693 cy/yr. of concrete/(truck load)*(average distance traveled each way)

VMT = ((693 cy/yr.) / (8 cy/truck))*(20 miles/round trip*1% miles/unpaved roads)

VMT = 17 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

111	lbs./yr.	**5.54E-02**	**tons/yr.**	**PM**
30	lbs./yr.	**1.50E-02**	**tons/yr.**	**PM_{10}**
3	lbs./yr.	**1.50E-03**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2019 (Continued)
RBDM Alternative 3

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

5.54E-03	**tons/yr.**	**PM**	**E2**
1.50E-03	**tons/yr.**	**PM_{10}**	**E2**
1.50E-04	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from concrete demolition (tons/yr.) =

=E1+E2

1.27E-02	**tons/yr.**	**PM**
4.89E-03	**tons/yr.**	**PM_{10}**
6.63E-04	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2020
RBDM Alternative 3

Input Parameters:

Concrete moved during export =	4,997	cy	
Concrete moved during export =	8,095	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	0.2	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

1.28E-01	**lbs./ton**	**PM**
6.04E-02	**lbs./ton**	**PM_{10}**
9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

1,033.85	lbs./yr.	**5.17E-01**	**tons/yr.**	**PM**	**E1**
488.98	lbs./yr.	**2.44E-01**	**tons/yr.**	**PM_{10}**	**E1**
74.05	lbs./yr.	**3.70E-02**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from concrete handling and storage =

uncontrolled emissions * 0.1

5.17E-02	**tons/yr.**	**PM**	**E2**
2.44E-02	**tons/yr.**	**PM_{10}**	**E2**
3.70E-03	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (4,997 cy/yr. of concrete/(truck load)*(average distance traveled each way)

VMT = ((4,997 cy/yr.) / (8 cy/truck))*(20 miles/round trip*1% miles/unpaved roads)

VMT = 125 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

815	lbs./yr.	**4.07E-01**	**tons/yr.**	**PM**
220	lbs./yr.	**1.10E-01**	**tons/yr.**	**PM_{10}**
22	lbs./yr.	**1.10E-02**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2020 (Continued)
RBDM Alternative 3

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

4.07E-02	**tons/yr.**	**PM**	**E2**
1.10E-02	**tons/yr.**	**PM_{10}**	**E2**
1.10E-03	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from concrete demolition (tons/yr.) =

=E1+E2

9.24E-02	**tons/yr.**	**PM**
3.54E-02	**tons/yr.**	**PM_{10}**
4.80E-03	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2021
RBDM Alternative 3

Input Parameters:

Concrete moved during import =	1,101	cy	
Concrete moved during import =	1,783	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4		(Mean, Table 13.2.2-1, Page 13.2.2-3)
Material moisture content =	0.2		(Mean, Table 13.2.4, Page 13.2.4-2)

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

1.28E-01	**lbs./ton**	**PM**
6.04E-02	**lbs./ton**	**PM_{10}**
9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

227.77	lbs./yr.	**1.14E-01**	**tons/yr.**	**PM**	**E1**
107.73	lbs./yr.	**5.39E-02**	**tons/yr.**	**PM_{10}**	**E1**
16.31	lbs./yr.	**8.16E-03**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from concrete handling and storage =

uncontrolled emissions * 0.1

1.14E-02	**tons/yr.**	**PM**	**E2**
5.39E-03	**tons/yr.**	**PM_{10}**	**E2**
8.16E-04	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (1,101 cy/yr. of concrete/(truck load)*(average distance traveled each way)

VMT = ((1,101 cy/yr.) / (8 cy/truck))*(20 miles/round trip*1% miles/unpaved roads)

VMT = 28 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

182	lbs./yr.	**9.12E-02**	**tons/yr.**	**PM**
49	lbs./yr.	**2.46E-02**	**tons/yr.**	**PM_{10}**
5	lbs./yr.	**2.46E-03**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2021 (Continued)
RBDM Alternative 3

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

9.12E-03	**tons/yr.**	**PM**	**E2**
2.46E-03	**tons/yr.**	**PM_{10}**	**E2**
2.46E-04	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from concrete import (tons/yr.) =

=E1+E2

2.05E-02	**tons/yr.**	**PM**
7.85E-03	**tons/yr.**	**PM_{10}**
1.06E-03	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2022
RBDM Alternative 3

Input Parameters:

Concrete moved during import =	3,947	cy	
Concrete moved during import =	6,394	tons	(1.62 tons/cy)
Mean wind speed =	9.0	mph	(Wilmington, DE)
Material silt content =	6.4	(Mean, Table 13.2.2-1, Page 13.2.2-3)	
Material moisture content =	0.2	(Mean, Table 13.2.4, Page 13.2.4-2)	

Emissions from concrete handling and storage piles (USEPA AP-42, Eq. 1, Section 13.2.4, January 1995)

$EF = k\ (0.0032)\ [U/5)^{1.3} / (M/2)^{1.4}]$

1.28E-01	**lbs./ton**	**PM**
6.04E-02	**lbs./ton**	**PM_{10}**
9.15E-03	**lbs./ton**	**$PM_{2.5}$**

where:

EF = emission factor, lbs./ton

U = mean wind speed, miles/hr. (mph)

M = material moisture content (%)

Therefore, total emissions from concrete handling and storage =

EF * tons/yr. of concrete loading/unloading

816.62	lbs./yr.	**0.408**	**tons/yr.**	**PM**	**E1**
386.24	lbs./yr.	**0.193**	**tons/yr.**	**PM_{10}**	**E1**
58.49	lbs./yr.	**0.0292**	**tons/yr.**	**$PM_{2.5}$**	**E1**

Assume fugitive dust from stockpiles is controlled using water sprays.

Assume 90% control efficiency from water spray.

Therefore, actual controlled emissions from concrete handling and storage =

uncontrolled emissions * 0.1

4.08E-02	**tons/yr.**	**PM**	**E2**
1.93E-02	**tons/yr.**	**PM_{10}**	**E2**
2.92E-03	**tons/yr.**	**$PM_{2.5}$**	**E2**

Emissions from driving dump trucks on unpaved roads (USEPA AP-42, Eqs. 1a and 2, Section 13.2.2, November 2006

$EF = [k(s/12)^a\ (W/3)^b][(365-p)/365]$

6.52	**lbs./VMT/truck**	**PM**
1.76	**lbs./VMT/truck**	**PM_{10}**
0.18	**lbs./VMT/truck**	**$PM_{2.5}$**

where:

k = particle size multiplier = 4.9 lb./VMT (PM), 1.5 lb./VMT (PM_{10}) and 0.15 lb./VMT ($PM_{2.5}$)

s = material silt content (%)

W = Weight of the vehicle (tons) = 40 tons

p = Number of days when precipitation was greater than 0.01 inches = 130 (Figure 13.2.2-1)

a = 0.7 for PM, 0.90 for PM_{10}, and 0.9 for $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

b = 0.45 for PM, PM_{10}, and $PM_{2.5}$ (Table 13.2.2-2, Page 13.2.2-5)

VMT = vehicle miles travelled by loaded & unloaded trucks on unpaved roads

VMT = (3,947 cy/yr. of concrete/(truck load)*(average distance traveled each way)

VMT = ((3,947 cy/yr.) / (8 cy/truck))*(20 miles/round trip*1% miles/unpaved roads)

VMT = 99 VMT/yr.

Therefore, total emissions from driving dump trucks on unpaved roads =

EF *VMT

645	lbs./yr.	**3.23E-01**	**tons/yr.**	**PM**
174	lbs./yr.	**8.71E-02**	**tons/yr.**	**PM_{10}**
17	lbs./yr.	**8.71E-03**	**tons/yr.**	**$PM_{2.5}$**

Fugitive Dust Emissions - Concrete Export and Import CY 2022 (Continued)
RBDM Alternative 3

Assume fugitive dust from unpaved roads is controlled using water sprays.
Assume 90% control efficiency from water spray

Therefore, actual controlled emissions from driving dump trucks on unpaved roads =

uncontrolled emissions * 0.1

3.23E-02	**tons/yr.**	**PM**	**E2**
8.71E-03	**tons/yr.**	**PM_{10}**	**E2**
8.71E-04	**tons/yr.**	**$PM_{2.5}$**	**E2**

Total annual fugitive emissions from concrete import (tons/yr.) =

=E1+E2

7.31E-02	**tons/yr.**	**PM**
2.80E-02	**tons/yr.**	**PM_{10}**
3.80E-03	**tons/yr.**	**$PM_{2.5}$**

This Page has been Intentionally Left Blank.

Emergency Generators - Potential Emissions

Equipment Information

Location:	East Riser Ditch Pump Station
Make:	ND
Model Number:	ND
Serial Number:	ND
Number of Identical Generators:	1
Generator Demand (hp):	2011.5
Generator Rating (kW)[1]:	1500
Permitted Source:	Title V
Fuel Burned:	Diesel
Projected Hours of Operation:	100
Fuel Sulfur Content (wt%):	0.0015
Fuel Heat Content (Btu/gal):	137,000

Potential Emissions - Criteria Pollutants

Criteria Pollutant	Emission Factor[2] (lb/hp-hr) >600 hp	Emissions (lb/yr)	Total (tpy)
$PM/PM_{10}/PM_{2.5}$	6.61E-05	1.33E+01	6.65E-03
SO_x	1.21E-05	2.44E+00	1.22E-03
NO_x	8.99E-03	1.81E+03	9.05E-01
VOC	2.43E-04	4.88E+01	2.44E-02
CO	9.70E-04	1.95E+02	9.76E-02

Potential Emissions - HAPs

HAP	Emission Factor[2] (lb/hp-hr) >600 hp	Emissions (lb/yr)	Total (tpy)
Acetaldehyde	1.76E-07	3.55E-02	1.77E-05
Acrolein	5.52E-08	1.11E-02	5.55E-06
Benzene	5.43E-06	1.09E+00	5.46E-04
Formaldehyde	5.52E-07	1.11E-01	5.55E-05
Naphthalene	9.10E-07	1.83E-01	9.15E-05
Polycyclic Aromatic Hydrocarbons (PAHs)[3]	5.74E-07	1.15E-01	5.77E-05
Toluene	1.97E-06	3.96E-01	1.98E-04
Xylenes	1.35E-06	2.72E-01	1.36E-04
	Total HAP	**2.22E+00**	**1.11E-03**

Potential Emissions - GHGs

GHG	Emission Factor[4] (lbs./hp-hr.)	Total (lb/yr)	Total (tpy)	Total (metric tpy)
CO_2e	1.16	233,334.00	116.67	105.84

Equipment Information

Location:	Losen Slote Pump Station A
Make:	ND
Model Number:	ND
Serial Number:	ND
Number of Identical Generators:	1
Generator Demand (hp):	469.35
Generator Rating (kW)[1]:	350
Permitted Source:	Title V
Fuel Burned:	Diesel
Projected Hours of Operation:	100
Fuel Sulfur Content (wt%):	0.0015
Fuel Heat Content (Btu/gal):	137,000

Potential Emissions - Criteria Pollutants

Criteria Pollutant	Emission Factor[2] (lb/hp-hr) <600 hp	Emissions (lb/yr)	Total (tpy)
$PM/PM_{10}/PM_{2.5}$	2.20E-04	1.03E+01	5.17E-03
SO_x	1.21E-05	5.70E-01	2.85E-04
NO_x	9.92E-03	4.66E+02	2.33E-01
VOC	0.00E+00	0.00E+00	0.00E+00
CO	3.09E-03	1.45E+02	7.24E-02

Potential Emissions - HAPs

HAP	Emission Factor[2] (lb/hp-hr) <600 hp	Emissions (lb/yr)	Total (tpy)
Acetaldehyde	5.37E-06	2.52E-01	1.26E-04
Acrolein	6.48E-07	3.04E-02	1.52E-05
Benzene	6.53E-06	3.06E-01	1.53E-04
Formaldehyde	8.26E-06	3.88E-01	1.94E-04
Naphthalene	5.94E-07	2.79E-02	1.39E-05
Polycyclic Aromatic Hydrocarbons (PAHs)[3]	1.18E-06	5.54E-02	2.77E-05
Toluene	2.86E-06	1.34E-01	6.71E-05
Xylenes	2.00E-06	9.39E-02	4.69E-05
	Total HAP	**1.29E+00**	**6.44E-04**

Potential Emissions - GHGs

GHG	Emission Factor[4] (lbs./hp-hr.)	Total (lb/yr)	Total (tpy)	Total (metric tpy)
CO_2e	1.16	54,444.60	27.22	24.70

ND = No Data

1. It is anticipated that there will be four generators, two identical at each of the proposed pump stations. Generator sizes conservatively estimated based on the cfs capacity of each pump station.
2. Criteria pollutant emission factors from manufacture's specification for a Caterpillar 3512C (for the 1500 kW generators) and Caterpillar C13 (for the 350 kW generator) converted from g/hp-hr to lb/hp-hr using 453.6 g to lb conversion factor.
HAP emission factors from AP-42, Tables 3.3-2 (<600 hp) and 3.4-3 and 3.4-4 (>600 hp), October 1996 and converted from lb/MMBtu to lb/hp-hr using average brake-specific fuel consumption (BSFC) = 7 MMBtu/1000 hp-hr.
3. For inventory purposes, assume PAH is the same as Polycyclic Organic Matter (POM).
4. Emission factor from USAFCEE Air Emissions Guide For Air Force Stationary Sources, July 2016.
5. ND = No Data

This Page has been Intentionally Left Blank.

Appendix I: Sediment Scour and Deposition Analysis

This Page has been Intentionally Left Blank.

Table of Contents

1.0 Water Column and Sediment Impact Assessments I-1
1.1 Introduction I-1
1.2 Methodology I-1
1.3 Analysis I-3
1.3.1 Alternative 1 ..... I-3
1.3.2 Alternative 2 ..... I-22
1.3.3 Alternative 3 ..... I-33
2.0 Conclusions I-37
2.1 Alternative 1 ..... I-37
2.2 Alternative 2 ..... I-37
2.3 Alternative 3 ..... I-38
3.0 References I-39

List of Tables

Table I-1: Alternative 1 Comparison of Existing Condition, Future No Action, and Future With Project Mean Shear Stress I-13
Table I-2: Alternative 1 Comparison of Existing Condition, Future No Action, and Future With Project Peak Shear Stress I-14
Table I-3: East Riser Ditch Below Tide Gate Sediment Size Class Data I-17
Table I-4: Comparison of Berry's Creek Existing Condition, Future No Action, and Future With Project Mean Shear Stress I-18
Table I-5: Comparison of Berry's Creek Existing Condition, Future No Action, and Future With Project Peak Shear Stress I-18
Table I-6: East Riser Ditch Sediment Size Class Data I-25
Table I-7: Comparison of Alternative 2 Existing Condition, Future No Action, and Future With Project Mean Shear Stress I-26
Table I-8: Comparison of Alternative 2 Existing Condition, Future No Action, and Future With Project Mean Shear Stress I-27
Table I-9: Comparison of Losen Slote Alternative 3 Existing Condition, Future No Action, and Future With Project Mean Shear Stress I-34
Table I-10: Comparison of Losen Slote Alternative 3 Existing Condition, Future No Action, and Future With Project Peak Shear Stress I-35

List of Figures

Figure I-1: Alternative 1 MIKE21 Model Output Locations I-5
Figure I-2: Alternative 1 HEC-RAS Berry's Creek Model Output Locations I-6
Figure I-3: Model Depth at Hackensack River Locations – 100-Year Storm Return Period I-7
Figure I-4: Model Depth Averaged Velocity at Hackensack River Locations – 100-Year Storm Return Period I-8
Figure I-5: Grain Size Data Locations. Alternative 1 ..... I-9

Figure I-6: Shear Stress at Hackensack River Locations – 100-Year Storm Return Period.....I-12
Figure I-7: Hours Exceeding Critical Shear Stress for All Storms and Locations – Alternative 1 .....I-15
Figure I-8: Depth, Velocity, and Shear Stress at Tributary Locations (East & West Riser Ditches, Losen Slote, DePeyster Creek) – 100-Year Storm Return Period.....I-19
Figure I-9: Alternative 1 HEC-RAS Berry's Creek Model Output Locations I-20
Figure I-10: Lower Berry's Creek Depth, Velocity, and Shear Stress – 100-Year Storm Return Period.....I-21
Figure I-11: Berry's Creek Hours Exceeding Critical Shear Stress for All Storms and Locations – Alternative 1.....I-22
Figure I-12: Alternative 2 East Riser Ditch, East Riser Outlet, and Losen Slote Model Output Locations I-23
Figure I-13: Alternative 2 East Riser Ditch and East Riser Outlet Depth, Velocity, and Shear Stress – 100-Year Storm Return Period I-24
Figure I-14: Alternative 2 East Riser Ditch and East Riser Outlet Hours Exceeding Critical Shear Stress for All Storms and Locations I-29
Figure I-15: Alternative 2 Losen Slote Depth, Velocity, and Shear Stress – 100-Year Storm Return Period.....I-30
Figure I-16: Alternative 2 Losen Hours Exceeding Critical Shear Stress for All Storms and Locations I-31
Figure I-17: Alternative 3 Losen Slote Depth, Velocity, and Shear Stress – 100-Year Storm Return Period.....I-32
Figure I-18: Alternative 3 Losen Hours Exceeding Critical Shear Stress for All Storms and Locations I-36

Attachments

Attachment I-1: Additional Figures

Acronyms and Abbreviations

dyn/cm^2	dynes per square centimeter
ft	feet
ft/s	feet per second
HEC	Hydrologic Engineering Center
µm	micron
NOAA	National Oceanic and Atmospheric Administration
RAS	River Analysis System
RBDM	Rebuild by Design Meadowlands
USDA	US Department of Agriculture

1.0 Water Column and Sediment Impact Assessments

1.1 Introduction

The Rebuild by Design Meadowlands (RBDM) project includes an analysis of potential increases in instream velocity that would result from implementation of the alternative flood control measures. Increasing instream velocity could inadvertently promote the scour and resuspension of bottom sediment into the water column, subsequently transporting them to other locations. In the Project Area, many of the bottom sediments contain high concentrations of legacy contaminants, and the resuspension and transport of these contaminated sediments could adversely impact water quality, and these sediments could be deposited in less contaminated areas. The analysis provides an estimate of the relative potential for each Project Alternative to scour and resuspend bottom sediments during 2, 10, 50, and 100-year storm return periods (the design storms). Project alternatives include the No Action Alternative and Build Alternatives 1, 2, and 3. Results for the existing condition and future No Action Alternative are compared to the future Build Alternatives 1, 2 and 3 for the above design storms.

The analysis evaluates the potential for resuspension of the sediment bed particles due to hydrodynamic forces of the overlying water body. Shear stress is the measure of the force of moving fluid on the sediment bed to cause sediment particles to become suspended in the water column. Critical shear stress is the threshold at which erosion is expected to begin. In this analysis computed shear stress is compared to the minimum critical shear stress to evaluate when resuspension of the sediment bed may begin to occur. Calculations of shear stress consider time variable water depth, velocity, and sediment grain size. MIKE21 and Hydrologic Engineering Center's (HEC) - River Analysis System (RAS) modeling of various storm events provides the depth and velocity for Alternative 1. The MIKE21 model domain and study area for Alternative 1 includes the Hackensack River from Newark Bay to the Oradell Dam. Project Area tributaries (East and West Riser Ditches, Losen Slote, and DePeyster Creek) from downstream of their respective tide gates to the Hackensack River are also included in Alternative 1. The HEC-RAS model provides the information to evaluate effects of the proposed Berry's Creek Storm Surge Barrier in Lower Berry's Creek under Alternative 1. HEC-RAS and InfoWorks model results for the various storm events in East Riser Ditch above and below the tide gate, and Losen Slote upstream of its tide gate, provide the information needed to evaluate Alternatives 2 and 3. The following subsections describe the methodology, analyses, and conclusions.

1.2 Methodology

The analysis of the potential for resuspension of bottom sediments within the study area is performed for the existing, future No Action, and future Build Alternative conditions. The approach to evaluate potential impacts associated with each alternative relative to the No Action alternative includes evaluation of hydrodynamic model results with respect to changes in depth and velocity as well as evaluation of sediment resuspension (scour) potential. As described subsequently, the screening level transport results indicate limited impacts are expected for the majority of the waterbodies evaluated. A relatively detailed evaluation of the magnitude of resuspension (scour) potential over time and space provides further details with regard to these results.

The existing condition includes 2016 sea level and normal tides. The future No Action and future Build Alternative conditions include a 2075 sea level rise of 2.4 feet (ft) and normal tides (see **Section 4.17** of the Environmental Impact Statement (EIS)). Storms with return periods of 2, 10, 50 and 100 years are the design storms selected for assessment, to represent both short- and long-term return periods.

Comparisons are made of the simulated depths, depth-averaged velocities, and shear stresses associated with the different alternatives.

The following equation serves as the basis for evaluating total bed shear stress (τt) (Wilcock 1996):

$$\tau_t = \rho \left[\frac{\kappa U(z_b)}{ln\left(\frac{z_b}{z_0}\right)} \right]^2 \qquad \textbf{Equation 1}$$

Where:

τt = total bed shear stress

ρ = water density

K = von Karman's constant = 0.4

U = horizontal velocity at the reference height

zb = distance from the bottom to the reference height

zo = bottom roughness parameter based on the median particle diameter, zo = D50/15 for a moveable bed

D50 = median particle diameter

Note that the transport models compute depth averaged velocities while **Equation 1** calls for an estimate of a near-bed boundary layer velocity. Although the model information is limited to depth–averaged velocities, this is sufficient for purposes of this screening level assessment. The reason is that this same approximation applies to both the base case and to each project alternative under consideration, and because tidal flows tend to control the magnitude of current speeds (leading to comparable velocities for the alternatives under consideration).

The analysis based on **Equation 1** uses mean particle diameters developed from available grain size data for the surficial bed sediment (D50). Limited grain size data for the Hackensack River locations of interest are available from the recent report entitled Final Expanded Site Inspection Report for the Lower Hackensack River (US Environmental Protection Agency, CTI and Associates, EEE Consulting, Inc. April 2017). The National Oceanic and Atmospheric Administration (NOAA) Query Manager provides a compilation of grain size data in the tributaries (NOAA 2016). The cumulative percentage passing each sieve size is calculated from these data. The D50 is then estimated by linear interpolation between the two values bracketing the median (i.e., 50%):

$$D_{50} = y_l + \left(\frac{(y_u - y_l)(x_{50} - x_l)}{x_u - x_l} \right) \qquad \textbf{Equation 2}$$

Where:

D50 = median grain size diameter

Yl = grain size of lower sieve bracket

Yu = grain size of upper sieve bracket

Xl = cumulative % passing lower bracket

Xu = cumulative % passing upper bracket

X50 = cumulative % at D50

Time variable shear stresses for the existing, future No Action and future Build Alternatives were compared to the critical shear stress at each location to evaluate changes in the potential for sediment scour due to the Alternative under consideration. The analysis used the typical critical shear stress to erode bedded sediment of 2 dynes per square centimeter (dyn/cm2) (Julien 1998) (Berry's Creek Study Area Cooperating PRP Group 2016).

1.3 Analysis

1.3.1 Alternative 1

Hackensack River and Tributaries (East and West Riser Diches, DePeyster Creek, Losen Slote)

The analysis considered MIKE21 model outputs of depth and depth-averaged current speed for 54 stations consisting of 3 evenly spaced stations across the river at each of 18 locations along the Hackensack River and 1 centerline location on each of four tributaries (East Riser and West Riser Ditches, Losen Slote, DePeyster Creek) downstream of the tide gates and in proximity to the Hackensack. The three evenly spaced stations in the Hackensack River are referred to as the east, center, and west stations in the following discussions. Hackensack River locations are spaced 1 mile apart and each is named in accordance with its distance (miles) from the mouth at Newark Bay. **Figure I-1** shows the locations of these 58 points. HEC-RAS model outputs at six stations below the surge barrier on Lower Berry's Creek were also analyzed for effects of the storm surge barrier at creek location 4,480 ft. **Figure I-2** shows the Lower Berry's Creek stations.

The MIKE21 model was run for three days for each storm event. **Figure I-3** compares the existing, future No Action and future Alternative 1 depths in the Hackensack River for the 100-year storm return period. The top panel displays results for the station closest to the east bank, the center panel for the centerline station and the bottom panel for the station closest to the west bank. Note that transects 8 through 17 are located in proximity to the Project Area, as delineated by the light gray vertical lines. Location 18, the most upstream location, is 4.0 miles upstream of the Project Area, and Location 1, the most downstream location, is 1.0 mile from the mouth of the Hackensack River. Model results are displayed with "box and whisker" plots that show model output statistics for six-minute time intervals for storms of three-day duration[9]. Future Alternative 1 depths are unchanged relative to the future No Action Alternative. This indicates that Alternative 1 would not lead to a materially significant change in Hackensack River water depth. Future No Action and future Alternative 1 depths, however, increase compared to existing condition depths. The assumed sea level rise that occurs over the planning horizon (through 2075) controls the magnitude of this increase over time. Although projected freshwater inputs increase markedly during the 100-year storm event, tidal flows (not altered by the Build Alternative) appear to control the hydrodynamics of the system.

Figure I-4 presents depth-averaged velocity at the Hackensack River for the 100-year storm return period. Similar to depth, overall future No Action and Alternative 1 velocities increase compared to existing condition velocities. When comparing future with project to the future without project condition, velocities are comparable. Analogous figures for the 2-year, 10-year, and 50-year storm return periods, demonstrating predicted depth and velocity changes from the existing condition as compared to the future conditions, but minimal differences between future No Action and Alternative 1, are included in **Attachment I-1** . Marked changes in depth and/or velocity would indicate that the bottom shear stress

[9] Statistics for each box and whisker diagram are the maximum (unfilled dot), and the 99, 95, 75, 50, 25, 10 and 1 percentiles (horizontal lines) of the model output.

between conditions would change. Conversely, negligible changes in depth or velocity indicate that the bottom shear stresses would be essentially the same. Depth and velocity comparisons indicate that the change in shear stress is likely the result of sea level rise, and not related to Alternative 1.

Calculations of bottom shear stress provide support for the preceding inferences. Shear stress is calculated using **Equation 1**. The D50 grain size is calculated using **Equation 2** and available data (US Environmental Protection Agency, CTI and Associates, EEE Consulting, Inc. April 2017).

Figure I-5 displays the sample locations for the grain size data (yellow & orange symbols). Although not collected in conjunction with this study, these grain size data provide a first order estimate of grain size characteristics near model output locations. Grain size data nearest each MIKE21 output location were analyzed. A sensitivity analysis of calculated shear stresses, based on MIKE21 model results for the 50-year storm future No Action Alternative and D50 values of 5, 10, 25, 50, and 100 microns (μm), supports use of the calculated D50 grain sizes in **Equation 1**. For example, an increase from 25 μm to 50 μm in the shear stress calculation yielded an average difference of only +6.5% in peak shear stress between the 22 locations. An increase from 50 μm to 100 μm yielded an average difference of +14.3% in peak shear stress. The interpolated D50s for 22 samples nearest the model output locations were between 20 μm and 200 μm, and 86% of these were between 20 μm and 50 μm. Given that much of the data falls within the 20 μm to 50 μm range, a potential difference of +/-6.5% error in calculated shear stress may typically occur. Additionally, any error incurred at a particular location would be the same for all three Alternatives. Thus, on a relative basis, the conclusion that there would not be a significant change in bottom shear stress should be robust (distributions of grain size data and interpolated values for use in **Equation 1** for the 22 locations are presented in **Attachment I-1**).

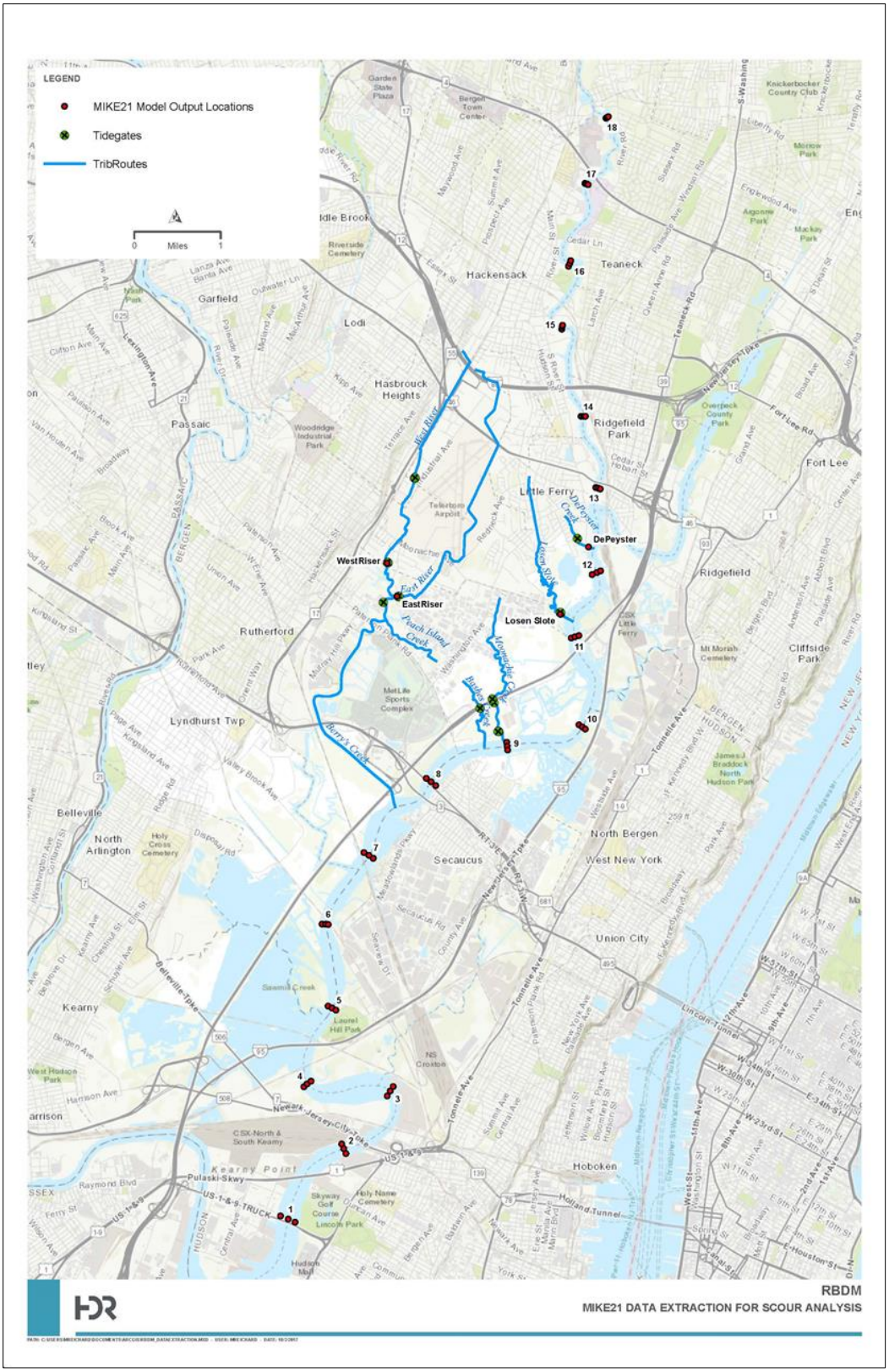


Figure I-1: Alternative 1 MIKE21 Model Output Locations

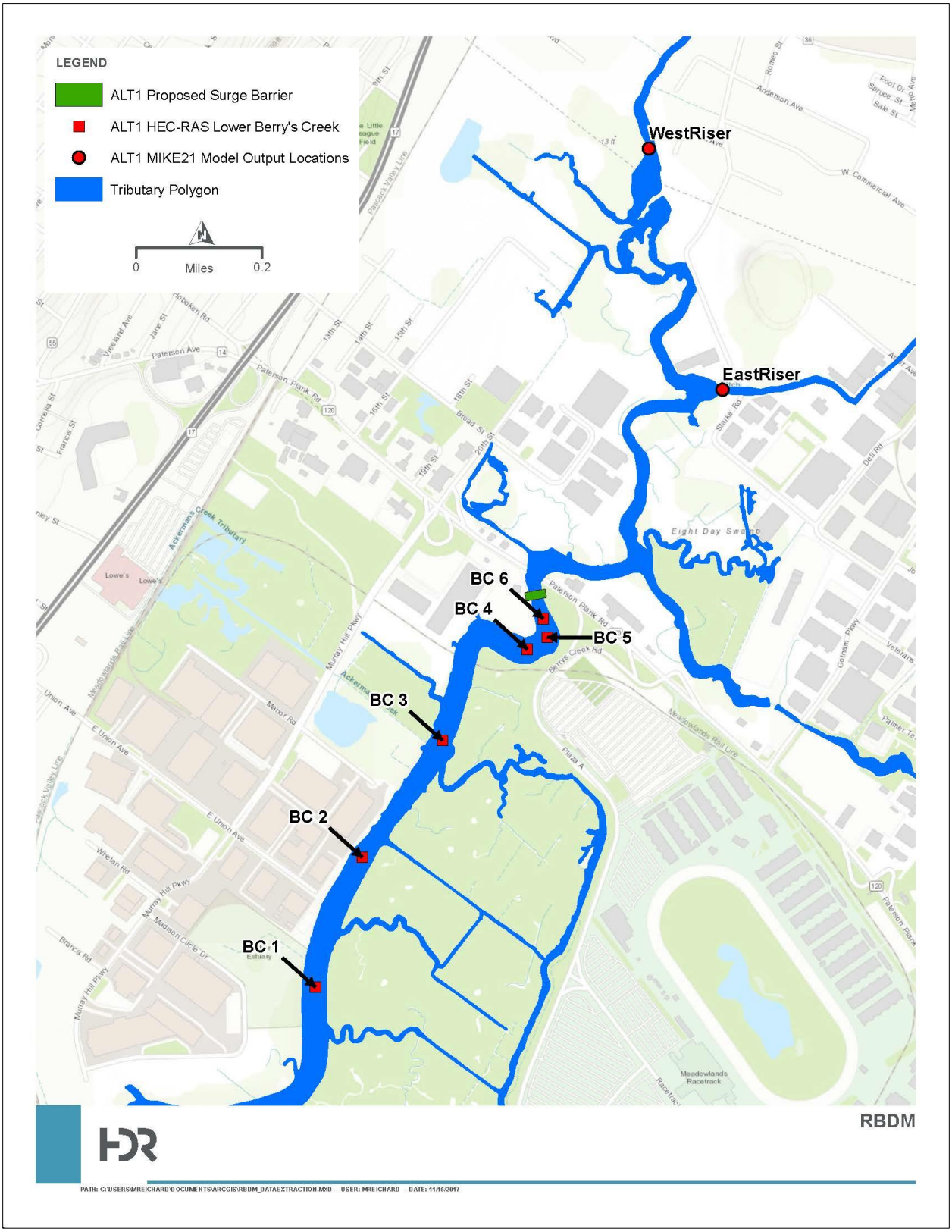


Figure I-2: Alternative 1 HEC-RAS Berry's Creek Model Output Locations

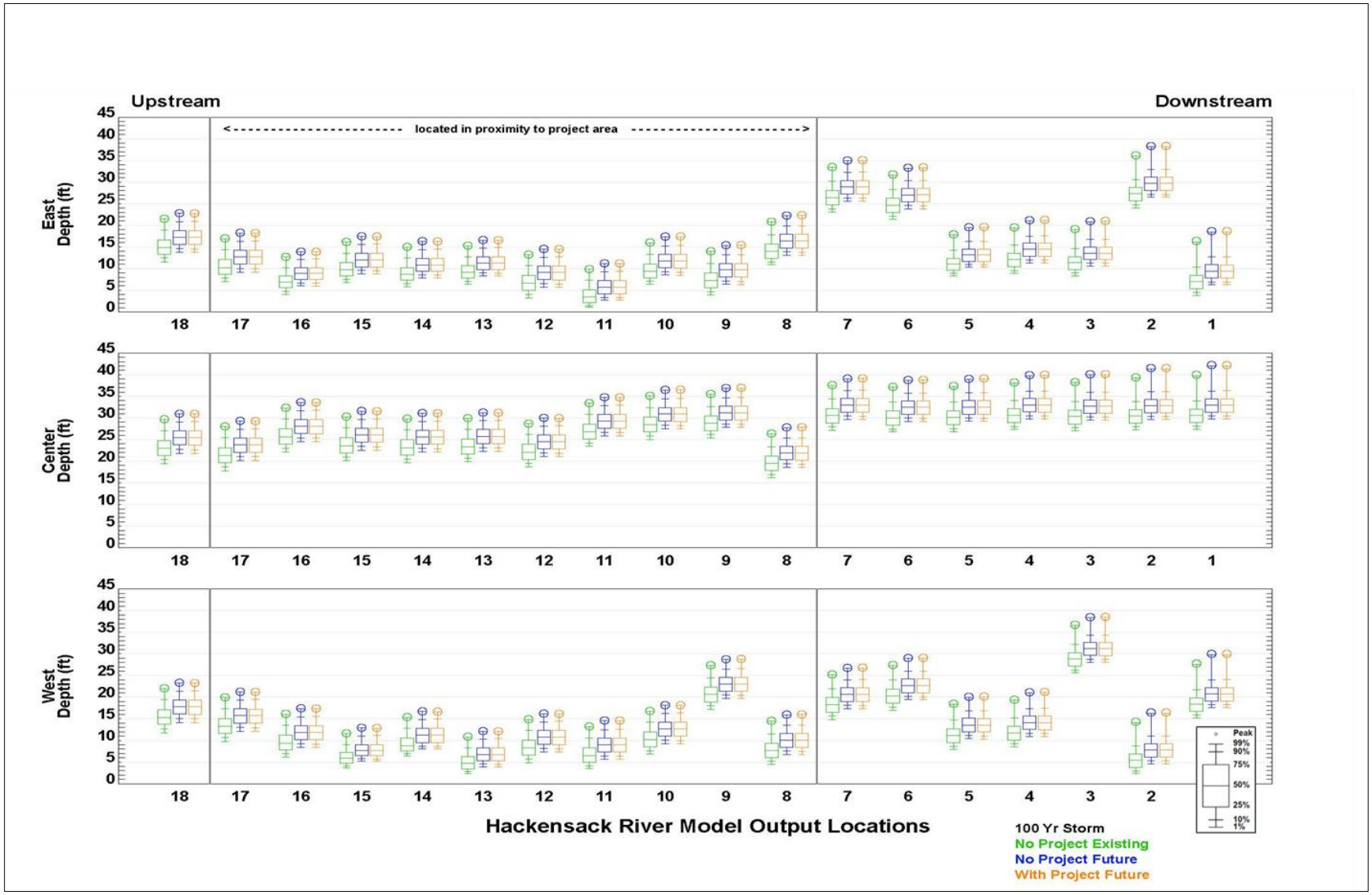


Figure I-3: Model Depth at Hackensack River Locations – 100-Year Storm Return Period

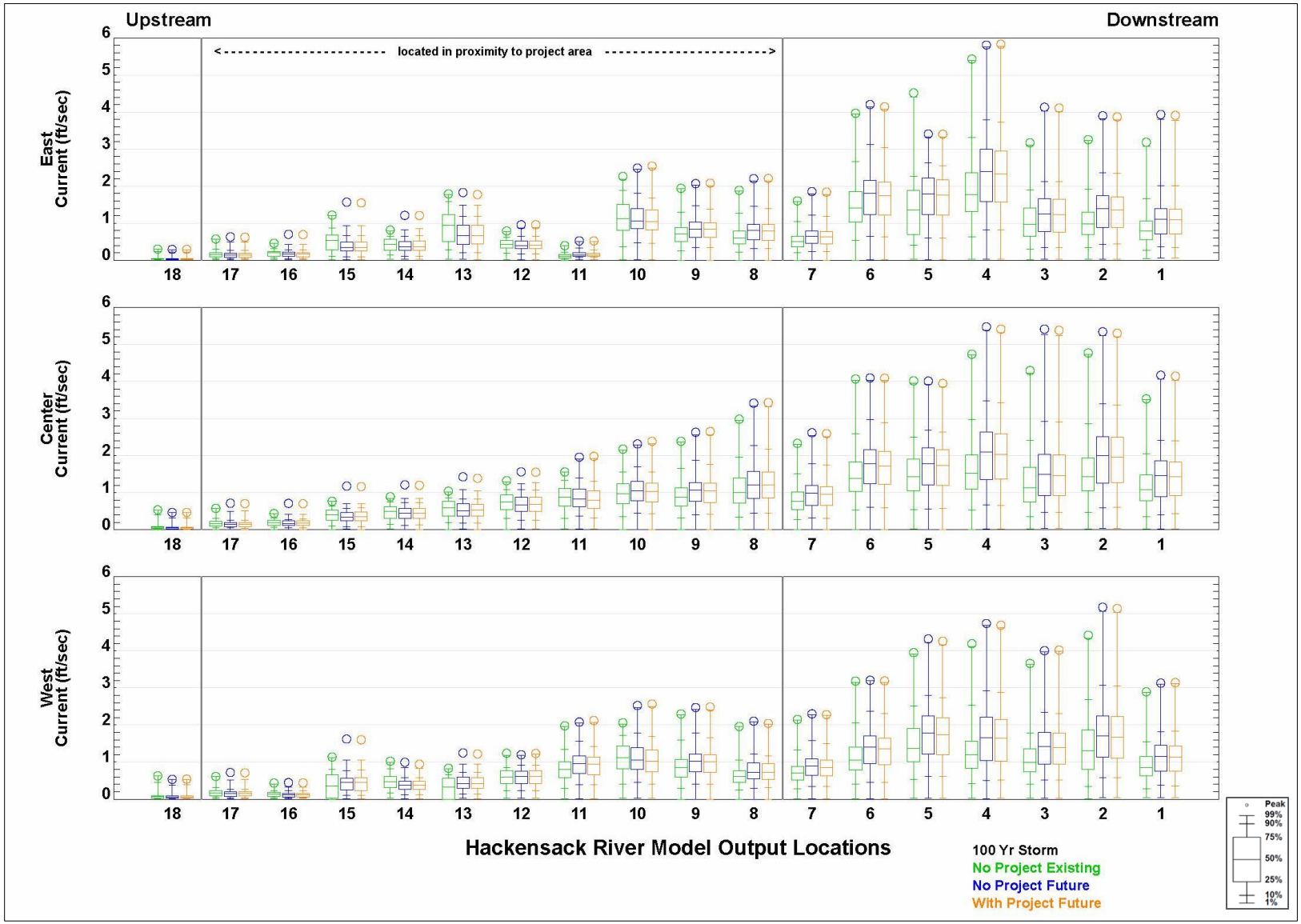


Figure I-4: Model Depth Averaged Velocity at Hackensack River Locations – 100-Year Storm Return Period

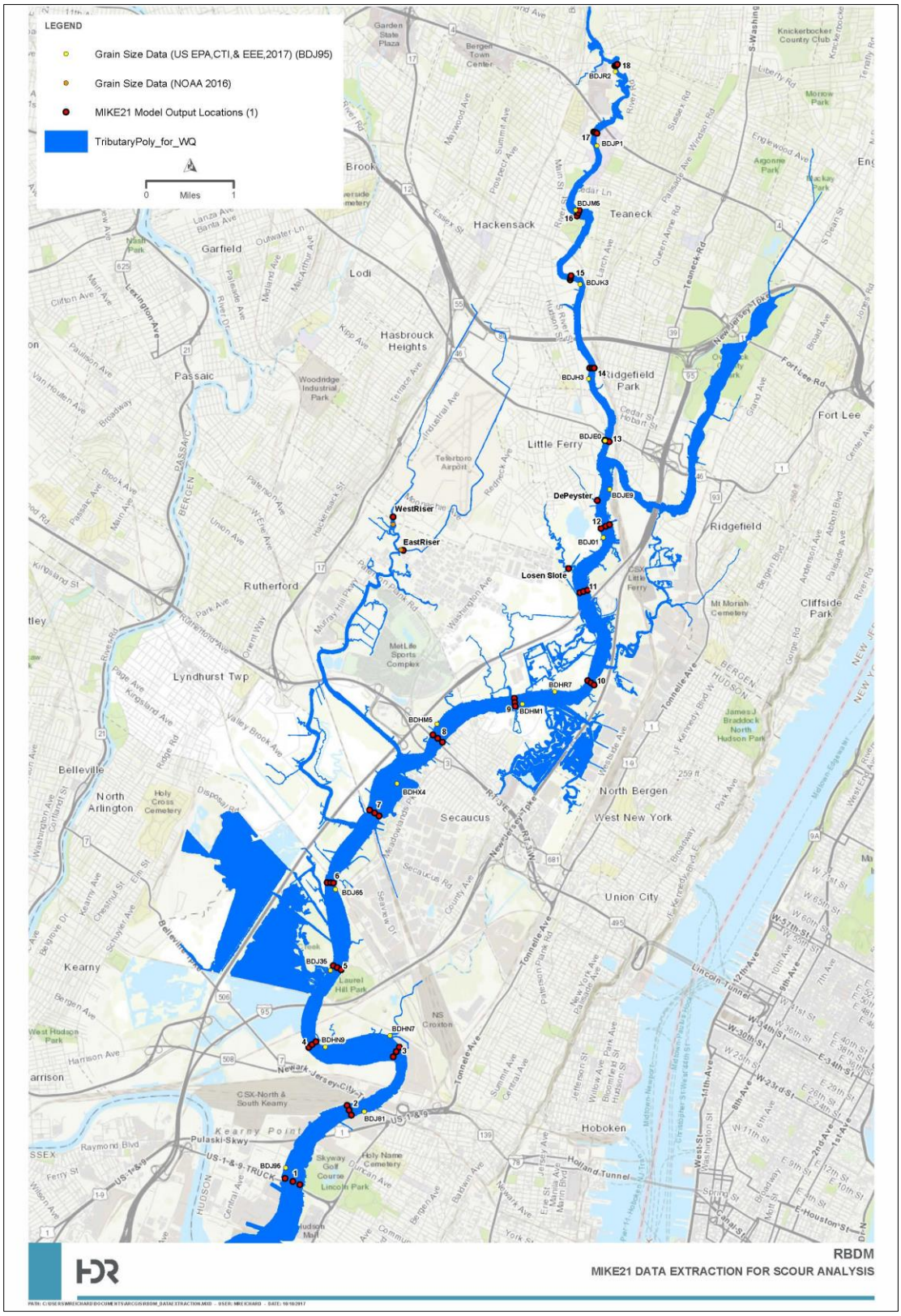


Figure I-5: Grain Size Data Locations. Alternative 1

Figure I-6 presents shear stresses calculated from **Equation 1** for the 100-year storm. Critical shear stress is represented on the figure by the horizontal line at 2 dyn/cm^2. Shear stresses are lowest in the upstream areas of the river and generally below the critical shear stress between points 18 and 12. Shear stresses begin to increase above the critical level downstream of Location 12. These trends are evidenced for both current and future conditions and reflect changing hydrodynamic conditions moving towards the mouth of the Hackensack River. Similar to depth and velocity, predicted shear stresses for the future No Action Alternative and Alternative 1 are similar but increased compared to the existing condition further indicating that the increase is due to sea level rise and not implementation of Alternative 1. Analogous figures of shear stresses for the existing and future conditions for the 2-year, 10-year, and 50-year storms demonstrating similar trends under various storm conditions are included in **Attachment I-1**.

Table I-1 and **Table I-2** present comparisons of mean and peak shear stresses for all Hackensack River locations for four storm return periods under existing and future conditions. In most cases when the existing shear stress is below the critical shear stress, indicating that scour is not expected to occur, shear stress for the future cases are also below the critical threshold across the storm return periods. Conversely, in most cases when the existing condition shear stress exceeds the critical threshold, shear stresses for the future cases exceed the critical threshold across storm return periods. This demonstrates that, in most cases, the likelihood that scour would or would not occur is the same under both existing and future conditions. Mean shear stresses for both existing and future conditions are generally below the critical shear stress with shear tending to increase to between 2 dyn/cm^2 and up to 7 dyn/cm^2 at downstream locations. Peak shear stresses can exceed 30 dys/cm^2 towards the mouth of the Hackensack River indicative of higher velocities and depths. Even at these higher shear areas, mean and peak shear stresses for the future No Action Alternative and Alternative 1 are comparable but higher than the existing cases, again pointing to increased potential for scour due to sea level rise rather than Alternative 1.

The duration of exceedances of critical shear stress during the 72-hour storm event follows a similar trend. **Figure I-7** shows bar charts of hours that the threshold is exceeded for the four storm return periods at each of the Hackensack River locations and for existing and future conditions. Both future with and without projections have more hours when the critical shear stress is exceeded than the existing condition, but are comparable to each other. Future conditions exceed the threshold for 3 more hours on average, and for a maximum of 25 more hours when compared to the existing condition exceedance times. However, Alternative 1 shear stresses exceed the threshold for 0.4 hour less on average and for a maximum of 0.6 hour more as compared to the future No Action Alternative.

Highlighted cells in **Table I-1** and **Table I-2** indicate locations where the respective mean or peak shear stresses for the existing case are below the critical threshold but the future cases exceed the threshold. These differences occur for both the future No Action Alternative and Alternative 1 cases. In these cases, the changes are from below the critical threshold to between 2.01 to at most 2.99 dyn/cm^2. Although an exceedance is projected, the higher shear stress value only marginally exceeds the conservative threshold for resuspension that is assumed. That is, the 2 dyn/cm^2 threshold is a lower limit of where scour may begin to occur and so these higher values indicate only the potential for scour to occur. Given that such results reflect localized areas, the impact of these results should be of limited consequence, if any. Of considerably greater importance to consider are the minimal differences in shear stresses between the future No Action Alternative and Alternative 1 cases, which are comparable in almost all cases. Alternative 1 shear stresses are in almost all cases slightly (negligibly) lower than the future No Action option. Thus, implementation of Alternative 1 is not predicted to have an impact and

the predicted increases in shear stresses across all locations and storms. Predicted increases in shear stresses are attributable to future sea level rise and not Alternative 1. In summation, the above analyses indicate that implementation of Alternative 1 would not affect bottom shear stresses along the Hackensack River enough to cause a significant increase in sediment transport via sediment resuspension and, therefore, in contaminant transport.

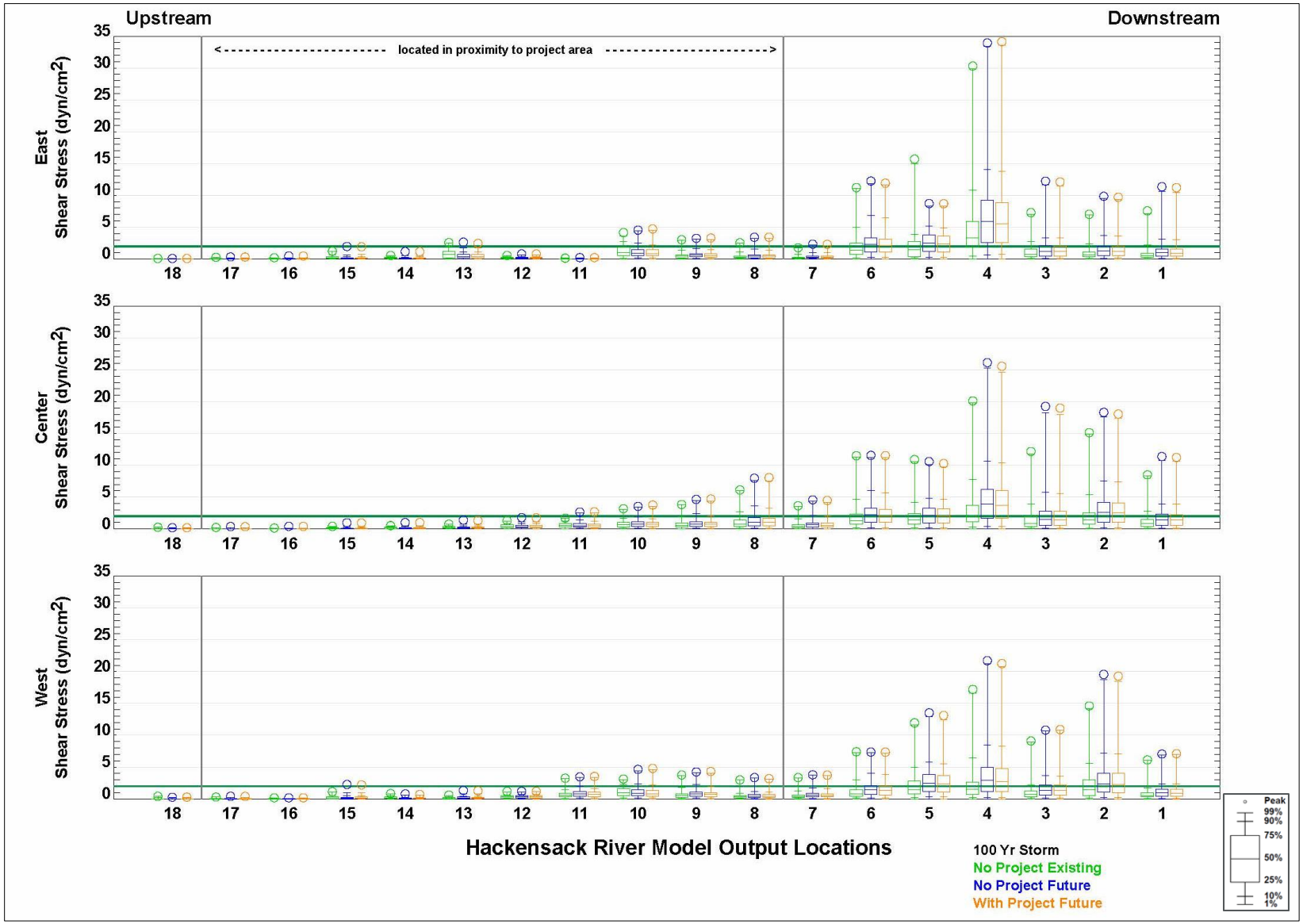


Figure I-6: Shear Stress at Hackensack River Locations – 100-Year Storm Return Period

Table I-1: Alternative 1 Comparison of Existing Condition, Future No Action, and Future With Project Mean Shear Stress

Location	Mean Shear Stress (dyne/cm^2)											
	2 Year Storm			10 Year Storm			50 Year Storm			100 Year Storm		
	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project
W1	0.59	0.83	0.84	0.51	0.73	0.74	0.66	0.95	0.95	0.89	1.28	1.26
C1	0.92	1.26	1.27	0.79	1.11	1.11	1.02	1.45	1.45	1.39	1.96	1.93
E1	0.60	0.89	0.89	0.53	0.79	0.79	0.72	1.08	1.08	0.97	1.47	1.45
W2	1.62	2.24	2.24	1.46	1.95	1.94	1.83	2.51	2.50	2.47	3.39	3.33
C2	1.57	2.29	2.30	1.38	1.99	2.00	1.79	2.61	2.60	2.42	3.54	3.48
E2	0.73	1.10	1.11	0.63	0.97	0.97	0.84	1.29	1.29	1.15	1.76	1.73
W3	0.80	1.22	1.22	0.69	1.07	1.07	0.92	1.40	1.40	1.22	1.93	1.89
C3	1.01	1.48	1.48	0.88	1.29	1.28	1.20	1.76	1.75	1.62	2.45	2.41
E3	0.85	1.11	1.10	0.73	0.97	0.96	0.93	1.25	1.24	1.22	1.66	1.63
W4	1.68	2.63	2.63	1.43	2.29	2.28	1.97	2.99	2.97	2.64	3.95	3.86
C4	2.33	3.41	3.40	2.00	2.96	2.94	2.65	3.87	3.84	3.52	5.13	5.01
E4	3.58	5.06	5.05	3.14	4.28	4.27	3.92	5.54	5.52	5.23	7.35	7.19
W5	1.61	2.13	2.10	1.38	1.77	1.74	1.70	2.26	2.22	2.25	2.92	2.82
C5	1.49	1.87	1.84	1.25	1.55	1.52	1.53	1.96	1.92	2.01	2.52	2.42
E5	1.53	2.14	2.10	1.29	1.83	1.79	1.62	2.22	2.17	2.07	2.68	2.57
W6	0.89	1.28	1.25	0.77	1.07	1.04	0.98	1.38	1.34	1.33	1.79	1.70
C6	1.42	1.97	1.93	1.23	1.64	1.60	1.55	2.11	2.05	2.08	2.73	2.59
E6	1.50	2.05	2.01	1.29	1.71	1.67	1.63	2.22	2.16	2.22	2.90	2.76
W7	0.37	0.52	0.51	0.32	0.45	0.43	0.41	0.58	0.56	0.56	0.78	0.73
C7	0.42	0.59	0.58	0.37	0.50	0.48	0.47	0.66	0.63	0.65	0.88	0.83
E7	0.19	0.28	0.27	0.17	0.23	0.23	0.22	0.31	0.30	0.29	0.41	0.39
W8	0.32	0.43	0.42	0.28	0.36	0.35	0.35	0.47	0.45	0.46	0.59	0.56
C8	0.78	1.01	0.99	0.68	0.84	0.81	0.85	1.11	1.07	1.14	1.47	1.41
E8	0.29	0.43	0.42	0.25	0.36	0.35	0.33	0.48	0.46	0.45	0.63	0.61
W9	0.50	0.68	0.66	0.44	0.57	0.54	0.56	0.75	0.71	0.75	0.97	0.91
C9	0.53	0.70	0.68	0.47	0.58	0.56	0.59	0.77	0.73	0.78	1.00	0.95
E9	0.41	0.54	0.52	0.36	0.45	0.43	0.45	0.59	0.56	0.60	0.76	0.72
W10	0.93	0.79	0.72	0.76	0.67	0.60	0.85	0.84	0.75	1.10	1.12	1.01
C10	0.60	0.65	0.61	0.51	0.54	0.50	0.60	0.70	0.64	0.79	0.91	0.85
E10	1.03	0.87	0.83	0.89	0.69	0.64	0.95	0.89	0.83	1.26	1.18	1.10
W11	0.56	0.64	0.60	0.46	0.54	0.50	0.56	0.70	0.65	0.74	0.91	0.85
C11	0.51	0.44	0.41	0.42	0.38	0.34	0.47	0.48	0.42	0.61	0.64	0.58
E11	0.01	0.02	0.02	0.01	0.02	0.02	0.02	0.03	0.02	0.02	0.04	0.03
W12	0.31	0.26	0.27	0.25	0.23	0.24	0.29	0.28	0.29	0.34	0.34	0.35
C12	0.42	0.30	0.31	0.33	0.26	0.27	0.36	0.31	0.32	0.44	0.39	0.40
E12	0.16	0.13	0.13	0.13	0.11	0.11	0.15	0.13	0.13	0.18	0.17	0.17
W13	0.12	0.14	0.15	0.10	0.14	0.14	0.13	0.16	0.17	0.15	0.20	0.20
C13	0.24	0.18	0.18	0.19	0.16	0.16	0.21	0.19	0.19	0.26	0.22	0.22
E13	0.88	0.43	0.44	0.71	0.36	0.37	0.72	0.39	0.41	0.83	0.47	0.48
W14	0.24	0.11	0.12	0.18	0.09	0.09	0.18	0.11	0.11	0.23	0.13	0.13
C14	0.17	0.13	0.14	0.14	0.12	0.13	0.16	0.14	0.15	0.19	0.16	0.16
E14	0.15	0.11	0.12	0.13	0.10	0.11	0.14	0.12	0.13	0.17	0.14	0.15
W15	0.21	0.20	0.21	0.20	0.19	0.19	0.23	0.20	0.21	0.22	0.23	0.23
C15	0.13	0.09	0.10	0.11	0.08	0.09	0.12	0.10	0.10	0.14	0.11	0.11
E15	0.28	0.13	0.14	0.22	0.11	0.11	0.23	0.13	0.13	0.28	0.15	0.15
W16	0.03	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.03	0.02	0.02
C16	0.04	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.03	0.03
E16	0.05	0.04	0.04	0.04	0.03	0.03	0.05	0.04	0.04	0.05	0.04	0.04
W17	0.04	0.03	0.03	0.04	0.03	0.03	0.04	0.03	0.03	0.04	0.03	0.03
C17	0.04	0.03	0.03	0.04	0.03	0.03	0.04	0.03	0.03	0.04	0.03	0.03
E17	0.04	0.03	0.03	0.04	0.03	0.03	0.04	0.03	0.03	0.04	0.03	0.03
W18	0.05	0.04	0.04	0.05	0.04	0.04	0.05	0.04	0.04	0.04	0.03	0.03
C18	0.04	0.03	0.03	0.04	0.03	0.03	0.03	0.02	0.02	0.03	0.02	0.02
E18	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
WR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.03	0.00
ER	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.00
LS	0.02	0.14	0.73	0.03	0.11	0.54	0.05	0.15	0.71	0.17	0.20	0.77
De	0.07	0.07	0.07	0.06	0.06	0.07	0.07	0.08	0.08	0.08	0.10	0.10

Highlighted cells represent exceedance of critical shear stress (2 dyne/cm^2) for future conditions versus exsiting conditions

Table I-2: Alternative 1 Comparison of Existing Condition, Future No Action, and Future With Project Peak Shear Stress

Location	Peak Shear Stress (dyne/cm^2)											
	2 Year Storm			10 Year Storm			50 Year Storm			100 Year Storm		
	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project
W1	3.32	3.99	4.16	4.41	4.96	5.21	5.51	7.70	7.68	6.13	7.05	7.11
C1	4.61	5.40	5.61	6.15	6.89	7.16	9.31	13.08	13.06	8.49	11.37	11.23
E1	2.87	3.42	3.54	4.46	6.48	6.43	8.43	13.12	13.10	7.56	11.35	11.22
W2	8.52	7.38	7.65	11.40	12.59	12.46	17.40	21.65	21.59	14.61	19.57	19.29
C2	8.07	9.93	10.29	10.82	12.33	12.93	16.24	20.31	20.25	15.14	18.32	18.05
E2	3.59	4.81	5.02	4.80	5.86	6.22	8.00	10.77	10.73	7.02	9.85	9.70
W3	4.92	6.32	6.54	6.52	7.65	8.01	7.02	9.20	9.17	9.11	10.82	10.90
C3	4.75	6.22	6.23	8.90	10.66	10.50	15.98	18.72	18.65	12.18	19.24	19.00
E3	3.58	3.86	3.87	5.61	6.39	6.30	9.91	11.27	11.24	7.30	12.23	12.10
W4	7.80	9.94	10.22	11.90	15.02	14.71	20.98	24.99	24.83	17.21	21.72	21.25
C4	11.36	13.84	14.23	15.01	17.11	17.48	23.97	28.80	28.61	20.13	26.14	25.56
E4	16.42	21.01	21.65	21.51	25.45	26.47	30.14	33.55	33.32	30.30	33.94	34.15
W5	6.78	8.14	8.20	9.12	10.34	10.48	12.58	13.45	13.24	11.93	13.51	13.13
C5	6.33	7.33	7.39	8.44	9.43	9.54	10.44	10.77	10.59	10.90	10.59	10.27
E5	9.21	9.91	10.04	12.27	13.67	13.72	12.77	10.34	10.41	15.69	8.72	8.68
W6	4.03	5.20	5.22	5.41	6.39	6.46	8.22	8.29	8.01	7.40	7.36	7.34
C6	6.38	8.17	8.20	8.55	9.93	10.06	12.17	12.02	11.63	11.51	11.56	11.53
E6	6.13	8.10	8.18	8.21	9.69	9.93	13.94	14.11	13.64	11.22	12.25	11.90
W7	1.79	2.49	2.48	2.36	2.95	3.00	3.20	3.60	3.41	3.36	3.80	3.73
C7	1.71	2.29	2.28	2.59	3.15	2.92	4.57	4.83	4.58	3.66	4.58	4.49
E7	0.84	1.11	1.10	1.18	1.50	1.39	2.14	2.38	2.26	1.76	2.33	2.30
W8	1.65	2.25	2.15	2.19	2.64	2.56	2.32	2.69	2.47	3.00	3.36	3.17
C8	2.64	3.73	3.56	4.82	5.26	4.73	8.29	8.23	7.61	6.13	7.96	8.05
E8	1.17	1.64	1.57	1.98	2.17	1.96	3.34	3.46	3.20	2.55	3.42	3.44
W9	1.94	2.82	2.64	2.81	3.27	3.11	4.80	4.64	4.16	3.77	4.25	4.31
C9	1.90	2.71	2.54	3.02	3.27	2.99	5.15	5.05	4.51	3.85	4.64	4.71
E9	1.62	2.26	2.11	2.13	2.62	2.48	3.50	3.51	3.16	3.02	3.25	3.29
W10	2.74	2.38	2.31	3.36	2.67	2.31	3.23	4.98	4.93	3.13	4.65	4.80
C10	2.05	2.34	2.07	2.55	2.68	2.42	3.40	3.53	3.35	3.19	3.55	3.76
E10	3.68	3.25	3.16	4.75	2.98	2.64	4.79	4.72	4.72	4.15	4.54	4.74
W11	2.07	2.40	2.11	2.57	2.74	2.46	3.51	3.43	3.16	3.25	3.48	3.52
C11	1.54	1.31	1.27	1.87	1.53	1.33	1.66	2.75	2.73	1.71	2.65	2.71
E11	0.08	0.11	0.10	0.11	0.13	0.12	0.10	0.15	0.12	0.14	0.22	0.22
W12	1.18	0.88	0.92	1.38	1.15	1.24	1.18	1.42	1.40	1.21	1.19	1.19
C12	1.28	1.02	1.03	1.43	1.15	1.14	1.28	2.16	2.13	1.30	1.79	1.77
E12	0.47	0.41	0.41	0.52	0.53	0.53	0.55	0.97	0.97	0.55	0.80	0.80
W13	0.63	0.61	0.61	0.72	0.83	0.79	0.86	1.70	1.64	0.61	1.34	1.28
C13	0.91	0.76	0.76	0.79	0.93	0.88	0.96	1.71	1.62	0.76	1.41	1.33
E13	4.81	3.70	3.72	3.74	1.97	1.83	4.88	3.15	3.30	2.58	2.63	2.47
W14	1.73	0.97	1.00	0.84	0.50	0.72	1.54	1.25	1.13	0.86	0.78	0.71
C14	0.68	0.67	0.67	0.63	0.66	0.65	0.79	1.26	1.23	0.53	1.02	1.00
E14	0.54	0.57	0.58	0.56	0.77	0.76	0.81	1.44	1.43	0.54	1.17	1.16
W15	1.29	1.51	1.52	1.26	1.54	1.50	1.70	2.78	2.71	1.13	2.26	2.21
C15	0.67	0.56	0.56	0.46	0.66	0.64	0.69	1.20	1.17	0.42	0.98	0.96
E15	2.10	1.36	1.36	1.19	1.30	1.26	2.03	2.40	2.34	1.23	1.97	1.92
W16	0.36	0.15	0.15	0.16	0.14	0.13	0.28	0.26	0.25	0.19	0.19	0.18
C16	0.25	0.20	0.20	0.17	0.28	0.28	0.29	0.49	0.47	0.16	0.41	0.40
E16	0.25	0.28	0.28	0.22	0.34	0.33	0.35	0.58	0.57	0.21	0.49	0.48
W17	0.37	0.31	0.32	0.25	0.26	0.25	0.37	0.48	0.47	0.30	0.40	0.39
C17	0.35	0.25	0.25	0.21	0.24	0.23	0.31	0.44	0.43	0.25	0.37	0.36
E17	0.55	0.25	0.25	0.21	0.20	0.20	0.35	0.38	0.37	0.28	0.33	0.32
W18	0.47	0.32	0.32	0.30	0.23	0.23	0.41	0.28	0.28	0.40	0.28	0.28
C18	0.30	0.23	0.23	0.21	0.16	0.16	0.27	0.20	0.20	0.27	0.20	0.20
E18	0.10	0.09	0.09	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.08	0.08
WR	0.00	0.08	0.00	0.01	0.13	0.00	0.02	0.17	0.00	0.14	0.37	0.13
ER	0.01	0.09	0.00	0.00	0.00	0.00	0.03	0.09	0.00	0.12	0.17	0.06
LS	0.22	1.01	1.86	0.59	1.18	1.83	1.11	1.42	2.25	1.34	0.95	2.88
De	0.51	0.39	0.39	0.58	0.37	0.41	0.46	0.44	0.47	0.38	0.35	0.38

Highlighted cells represent exceedance of critical shear stress (2 dyne/cm^2) for future conditions versus exsiting conditions

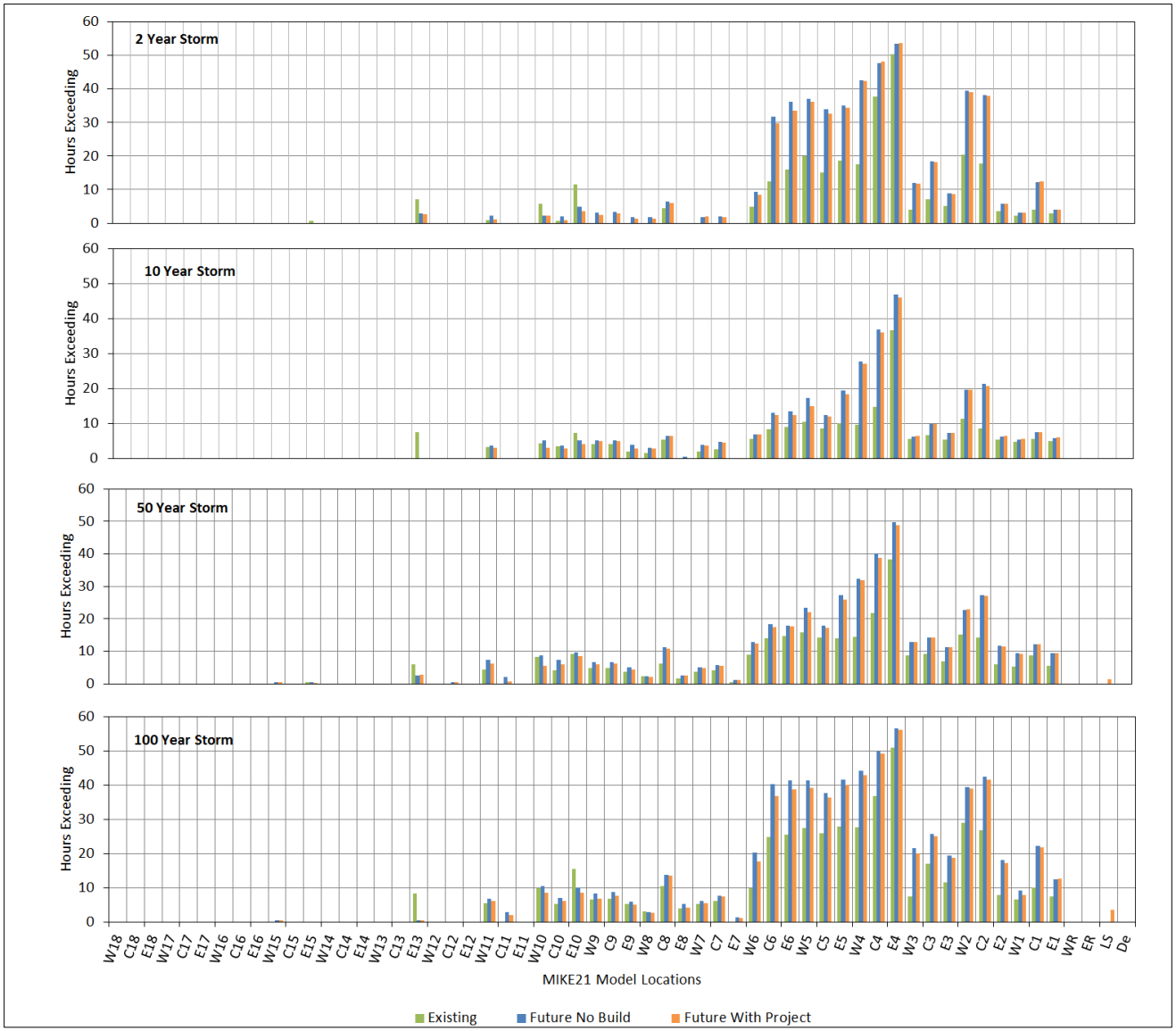


Figure I-7: Hours Exceeding Critical Shear Stress for All Storms and Locations – Alternative 1

Figure I-8 shows comparisons of depth, depth-averaged velocity, and shear stress for the tributaries (East and West Riser Ditches, Losen Slote, and DePeyster Creek) for the 100-year storm downstream of their respective southernmost tide gates. Depths tend to increase under future cases. Velocities are generally comparable across existing and future conditions with the exception of Losen Slote. The velocity at Losen Slote increases from 1.28 feet per second (ft/s) and 1.09 ft/s under current and future No Action conditions, respectively, to 1.90 ft/s for the future Alternative 1 condition. Similar figures for the 2-year, 10-year and 50-year storms are included in **Attachment I-1**. **Table I-1** and **Table I-2** present mean and peak shear stresses in the four tributary locations over the range of storm return periods and existing and future conditions. Mean shear stresses in the tributaries are generally low, less than 0.8 dyn/cm^2. Peak shear stresses are less than the critical threshold for all scenarios and storms except for Losen Slote for Alternative 1 for the 50-year and 100-year storms. Peak shear stresses exceeding the threshold for the 50-year storm increase from 1.42 dyn/cm^2 for future No Action to 2.25 dyn/cm^2, and for the 100-year storm increase from 0.95 dyn/cm^2 to 2.88 dyn/cm^2. These moderate increases are likely due to increases in velocity mentioned above. The critical shear stress threshold is exceeded for 1.4 hours for the 50-year storm and 3.5 hours for the 100-year storm, as shown in **Figure I-7**. Since shear stresses during these short durations of exceedances are near the 2 dyn/cm^2 threshold and slightly above shear stresses under the future No Action scenario, these would not cause a significant increase in sediment transport at this location in the Losen Slote and, hence, in contaminant transport is not expected under Alternative 1.

Berry's Creek

Effects of the Alternative 1 proposed storm surge barrier and pump station in Berry's Creek have been assessed using HEC-RAS model outputs for the storm return periods 2-year, 10-year, 50-year, and 100-year. The storm surge barrier and pump station are located in Berry's Creek immediately below Paterson Plank Road. The potential for sediment transport was analyzed at three model transect stations located closest to the surge barrier at 150 ft, 300 ft, and 530 ft downstream of the barrier and three stations located farther downstream at 1,900 ft, 3,090 ft and 4,250 ft below the barrier.

Figure I-9 shows the location of the six model output stations (BC1, BC2, BC3, BC4, BC5, BC6), storm surge barrier, and pump station. Shear stresses were calculated at each location over the three-day model run per each storm and scenario (existing, future No Action, future Alternative 1) using **Equation 1**. Sediment grain size (D_{50}=0.018 mm) applied in **Equation 1** and calculated from NOAA data below the East Riser tide gate, shown in **Table I-3**, can be categorized as silt according to the US Department of Agriculture (USDA) classification system (USDA, 1951). This categorization is in agreement with conclusions in the recent Berry's Creek Remedial Investigation report that the majority of Berry's Creek sediments are fine-grained silt and clay representative of low velocity systems (Berry's Creek Study Area Cooperating PRP Group 2016). **Figure I-10** shows depth, depth-averaged velocity, and shear stresses calculated at six stations in Berry's Creek. Expectedly, model output depths as shown on the upper panel of **Figure I-10** indicate higher depths under future conditions. These are likely due to sea level rise and not Alternative 1, as depths for future No Action and future Alternative 1 depths are comparable. The second panel of **Figure I-10** shows Berry's Creek velocities. Alternative 1 velocities directly below the storm surge barrier are lower than the existing and Future No Action conditions. This reflects slowing velocity as waters moving upstream come in contact with the surge barrier. Velocities at the three stations farther away from the barrier (B1, B2, B3) are comparable to existing and future No Action conditions as these portions of the Creek are less affected by the barrier.

Shear stresses shown in the bottom panel of **Figure I-10** often exceed the critical threshold of 2 dyn/cm^2, which indicates sediment scour can occur in Berry's Creek under the existing and future

scenarios. **Table I-4** and **Table I-5** show mean and peak shear stresses, respectively. Peak shear stresses often exceed the critical threshold during the existing and future. However, peak shear stresses for Alternative 1 are consistently less than those for the existing or future No Action conditions. Alternative 1 provides a water quality benefit with a reduction in shear stresses leading to less sediment scour and relocation in stations B6, B5, B4 within 300 ft of the barrier. Further, the benefit of Alternative 1 is seen in the duration of exceedances of the critical threshold in **Figure I-11** where the duration of potential scour is reduced by several hours when the compared to the existing and future No Action conditions.

Table I-3: East Riser Ditch Below Tide Gate Sediment Size Class Data

East Riser Ditch Below Tide Gate Class Size	USDA Particle size, Upper Range (mm)	Percent of Sample Passing Size Class	Cumulative Percent of Sample Passing of Sample (%)
Clay	<0.002	37.0	37.0
Silt	0.05	39.4	76.4
Sand	2.0	23.0	99.4
Gravel	75	1.3	100.7
D50	0.018	-	-

Table I-4: Comparison of Berry's Creek Existing Condition, Future No Action, and Future With Project Mean Shear Stress

Location	Mean Shear Stress (dyn/cm^2)											
	2-Year Storm			10-Year Storm			50-Year Storm			100-Year Storm		
	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project
BC 6	0.54	0.86	0.02	0.87	1.18	0.05	1.15	1.56	0.20	1.34	2.08	0.37
BC 5	0.23	0.37	0.01	0.37	0.51	0.02	0.49	0.67	0.09	0.57	0.89	0.16
BC 4	0.36	0.54	0.02	0.58	0.73	0.03	0.76	0.97	0.13	0.88	1.27	0.23
BC 3	0.53	0.70	0.20	0.85	0.96	0.32	1.13	1.29	0.83	1.30	1.70	1.27
BC 2	0.29	0.49	0.14	0.45	0.62	0.20	0.59	0.82	0.50	0.69	1.09	0.76
BC 1	0.30	0.50	0.16	0.46	0.63	0.22	0.61	0.83	0.51	0.70	1.11	0.77

Table I-5: Comparison of Berry's Creek Existing Condition, Future No Action, and Future With Project Peak Shear Stress

Location	Peak Shear Stress (dyn/cm^2)											
	2-Year Storm			10-Year Storm			50-Year Storm			100-Year Storm		
	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project
BC 6	3.62	3.81	0.51	4.69	4.36	0.78	5.26	6.27	1.67	5.78	8.14	2.99
BC 5	1.54	1.61	0.22	1.99	1.86	0.33	2.20	2.66	0.71	2.43	3.45	1.27
BC 4	2.58	2.59	0.34	3.34	2.96	0.52	3.65	4.08	1.07	3.97	5.11	1.85
BC 3	4.40	3.89	3.41	6.03	4.51	4.14	6.74	6.52	5.78	7.39	8.36	7.57
BC 2	1.97	1.96	1.68	2.61	2.28	2.08	3.07	3.63	3.07	3.51	5.05	4.45
BC 1	2.13	2.01	1.73	2.98	2.37	2.11	3.58	3.90	3.24	4.13	5.75	4.91

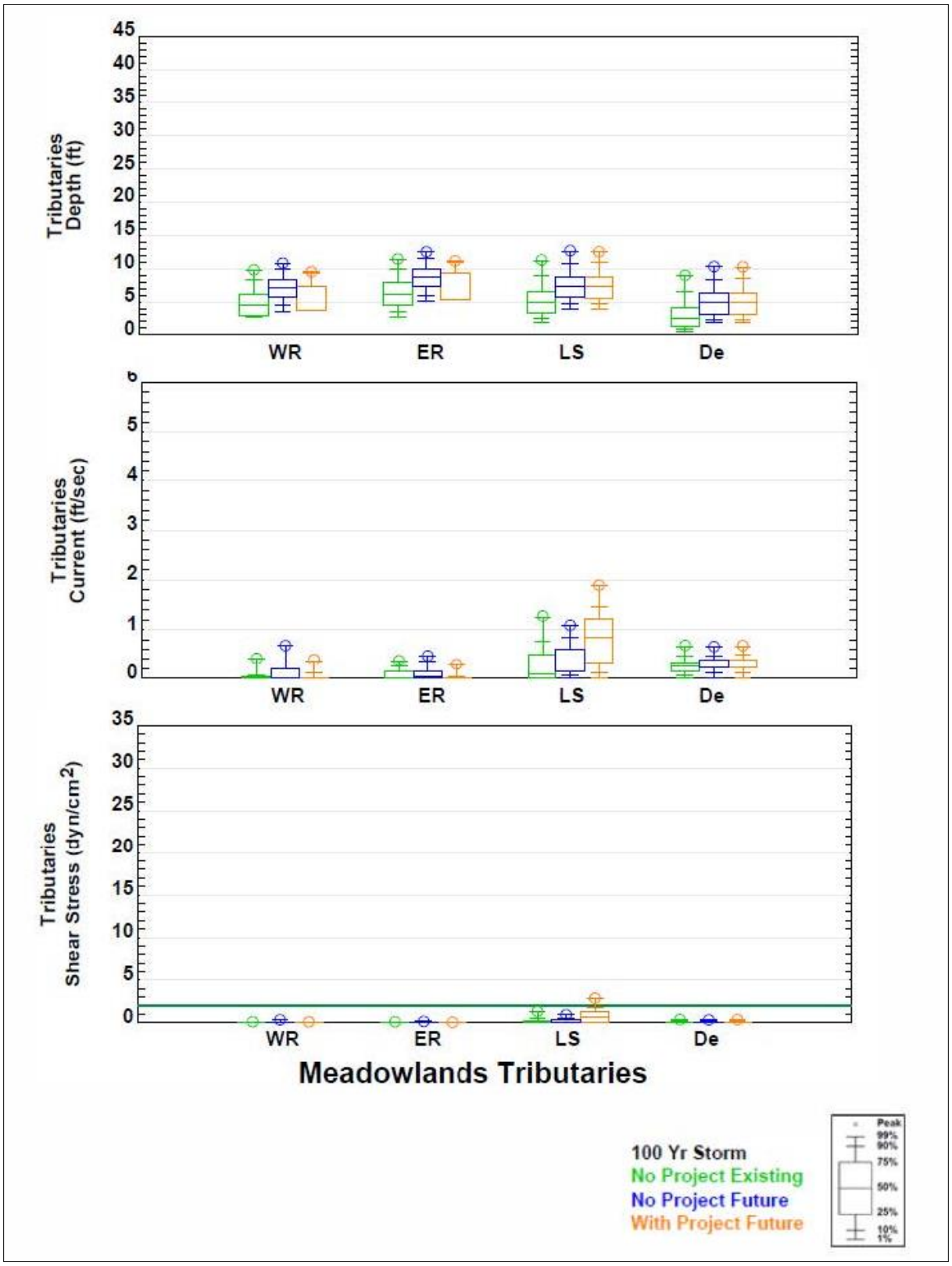


Figure I-8: Depth, Velocity, and Shear Stress at Tributary Locations (East & West Riser Ditches, Losen Slote, DePeyster Creek) – 100-Year Storm Return Period

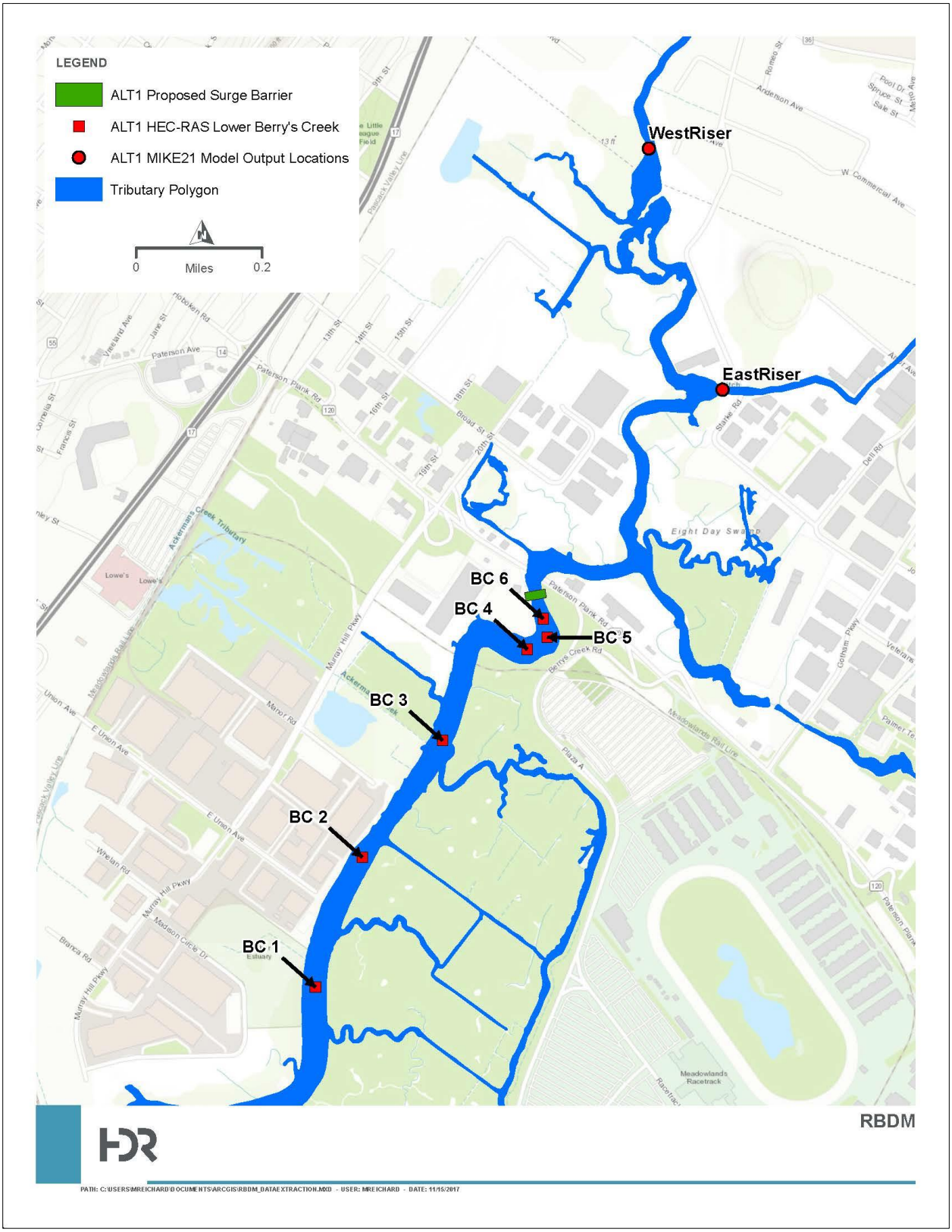


Figure I-9: Alternative 1 HEC-RAS Berry's Creek Model Output Locations

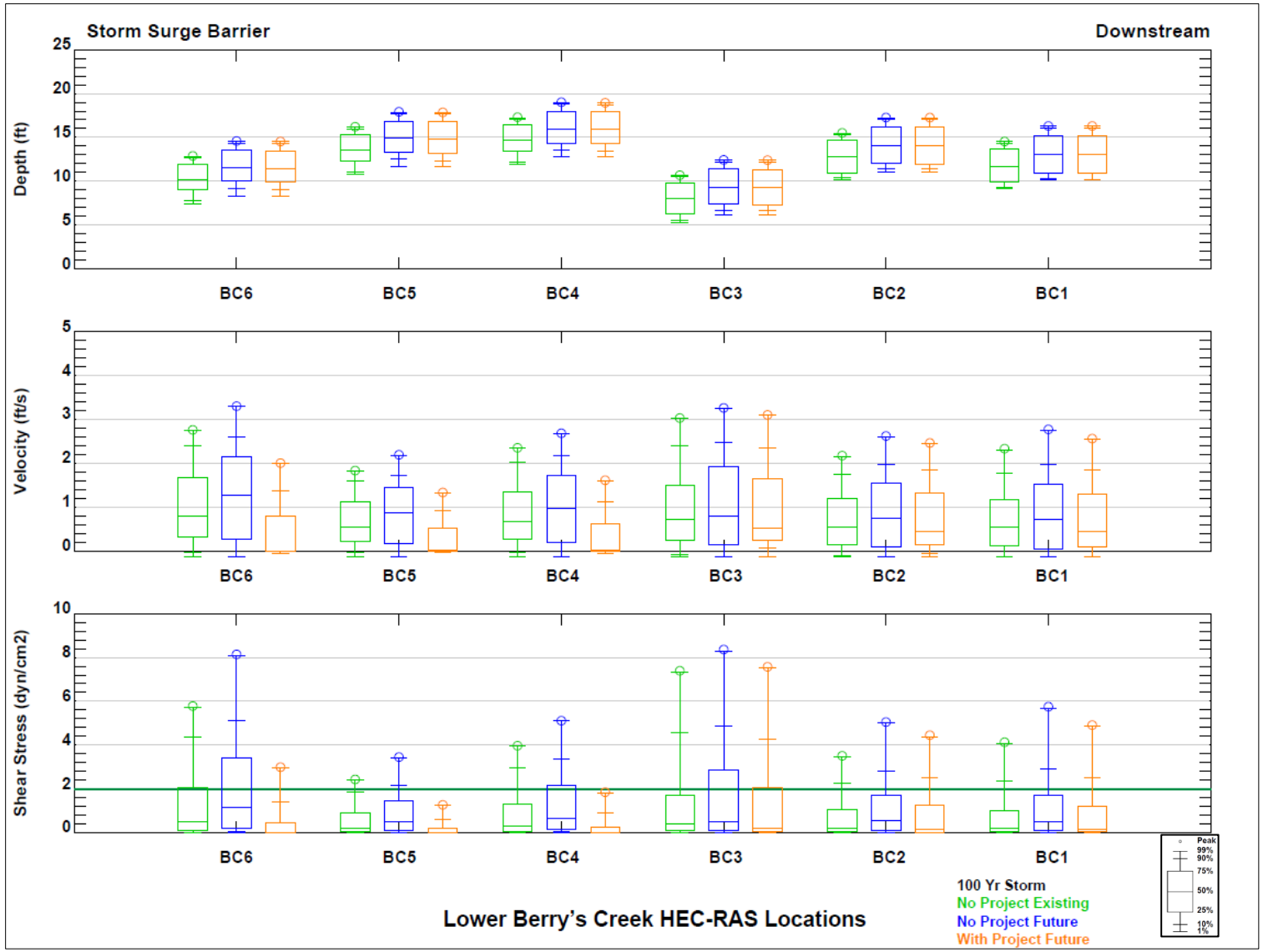


Figure I-10: Lower Berry's Creek Depth, Velocity, and Shear Stress – 100-Year Storm Return Period

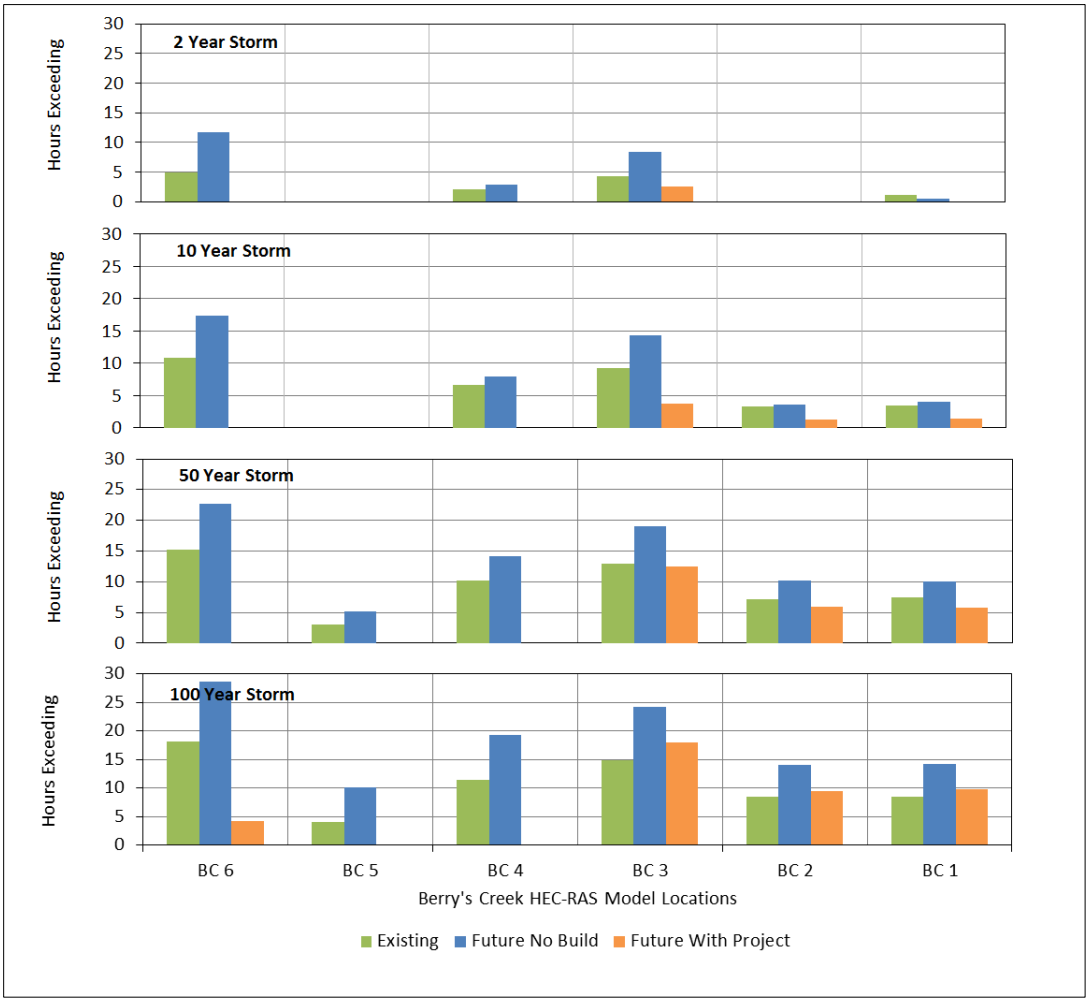


Figure I-11: Berry's Creek Hours Exceeding Critical Shear Stress for All Storms and Locations – Alternative 1

1.3.2 Alternative 2

The Alternative 2 analyses pertain to East Riser Ditch and Losen Slote. Improvements to East Riser Ditch include dredging from the tide gate to Moonachie Avenue and also installation of the pump station immediately northeast of the tide gate. Improvements to Losen Slote include installation of Pump Station A and Pump Station C each with a force main to collect stormwater and discharge into the marshy open reach to the south of the residential area below Joseph Street.

The scour analysis for East Riser Ditch uses HEC-RAS model outputs of depth and depth-averaged current speed at the center point at each of eight locations upstream of the tide gate at the mouth of the tributary. An additional nine stations below the tide gate are analyzed to assess downstream impacts of the proposed pump station. Model output locations for East Riser Ditch are shown in **Figure I-12**. Stations ER1 to ER8 are above the tide gate. Station ER1 is located 0.25 mile upstream of the tide gate, and the remaining stations are evenly spaced 0.5 mile apart to the head of the tributary for a total assessed distance of 3.53 miles. Stations ER-A to ER-I are below the proposed East Riser tide gate and pump station. Impacts directly below the tide gate are accessed for the first six transects (ER D to ER-I)

below the tide gate. Three additional stations (ER-A, ER-B, ER-C) are located 0.05 mile, 0.30 mile, and 0.55 mile farther downstream of station ER-D.

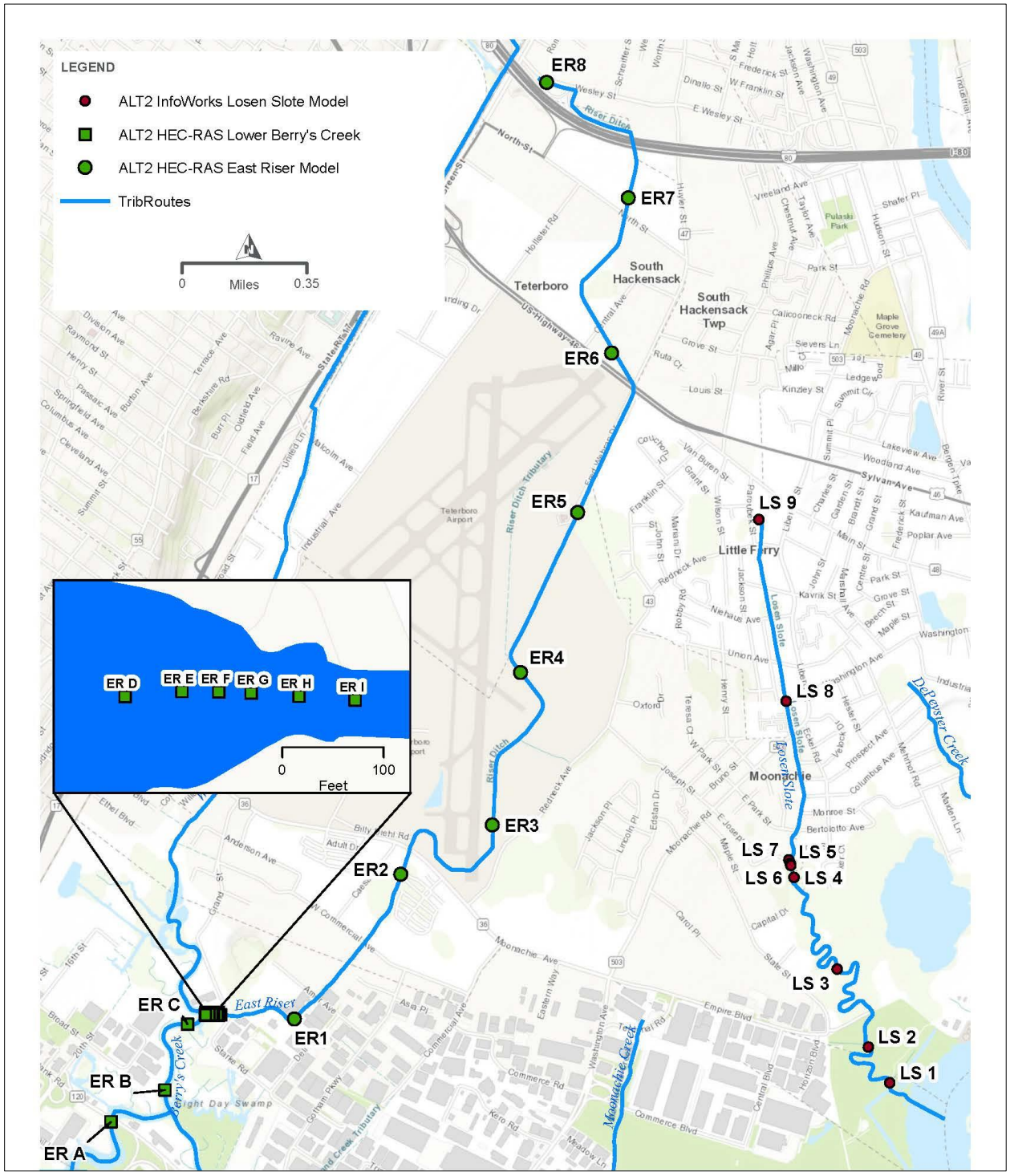


Figure I-12: Alternative 2 East Riser Ditch, East Riser Outlet, and Losen Slote Model Output Locations

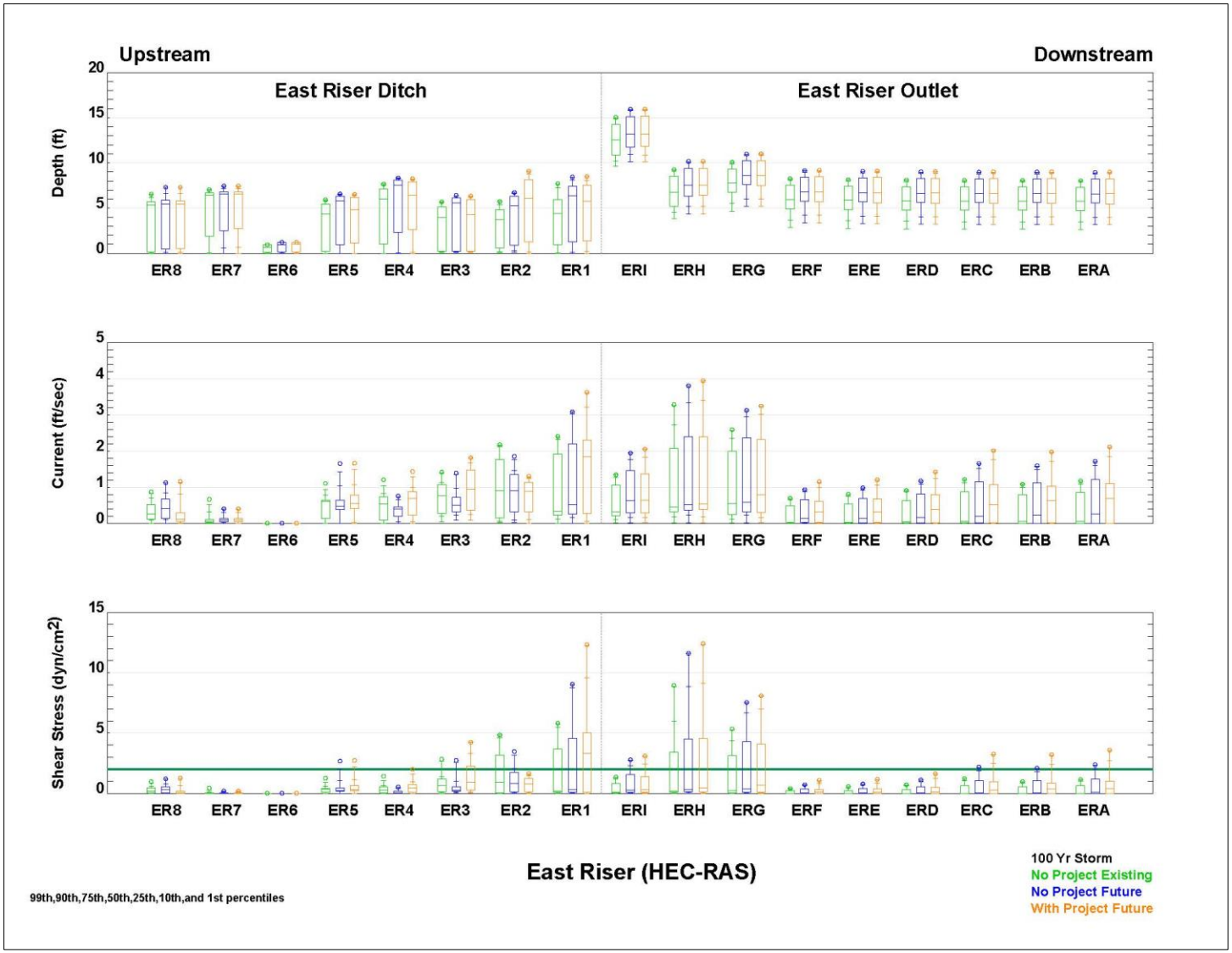


Figure I-13: Alternative 2 East Riser Ditch and East Riser Outlet Depth, Velocity, and Shear Stress – 100-Year Storm Return Period

Calculations of bottom shear stress for East Riser Ditch and below the East Riser Ditch outlet for the 100-year storm return period using **Equation 1** are shown in **Figure I-13**. The D_{50} grain size is calculated for East Riser Ditch using **Equation 2** and available data (NOAA, 2016). Limited grain size data between mile points 0.25 and 0.50 yield an interpolated D_{50} of 6.0 µm. **Table I-6** shows the available grain size data for East Riser Ditch. The D_{50} developed for the Berry's Creek analysis and presented in **Table I-3** is applied for stations below the East Riser Ditch outlet. Uncertainty in the D_{50} applied in the shear stress calculation is recognized. Similar to the Alternative 1 derivation of D_{50}, these data are limited and also not collected in conjunction with this study, however these grain size data provide a first order estimate of tributary grain size. Additionally, any error incurred at a particular location will be the same for all three Alternatives. Thus, on a relative basis, the conclusion that there would not be a significant change in bottom shear stress should be robust.

Table I-6: East Riser Ditch Sediment Size Class Data

Class Size	USDA Particle size, Upper Range (mm)	Percent Passing	Cumulative Percent Passing
Clay	<0.002	17.7	17.7
Silt	0.05	26.6	44.3
Sand	2.0	49.7	94.0
Gravel	75	6.0	100
D50 (mm)	0.060	-	-

The bottom panel of **Figure I-13** compares HEC-RAS model existing, future No Action Alternative, and future Alternative 2 shear stresses in East Riser Ditch and below the East Riser Ditch outlet for the 100-year storm return period. **Table I-7** and **Table I-8** show mean and peak shear stresses, respectively, for all storms and locations. Alternative 2 shear stresses between ER5 and ER8 are generally comparable to the future No Action Alternative but higher than the existing scenario indicating future conditions cause higher shear stresses rather than Alternative 2. Although peak shear stress at ER3 exceeds the critical shear stress for existing, future No Action Alternative and future Alternative 2, with respective values of 2.82 dyn/cm^2, 2.72 dyn/cm^2, and 4.22 dyn/cm^2, these results indicate that scour is more likely at this location under Alternative 2 and appears to be due to higher velocities at ER3.

Table I-7: Comparison of Alternative 2 Existing Condition, Future No Action, and Future With Project Mean Shear Stress

Location	Mean Shear Stress (dyn/cm2)											
	2-Year Storm			10-Year Storm			50-Year Storm			100-Year Storm		
	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project
ER1	0.64	0.62	0.35	1.14	1.04	0.73	1.51	1.77	1.98	1.65	2.39	3.35
ER2	0.95	0.77	0.26	1.24	1.02	0.42	1.50	1.05	0.62	1.58	0.98	0.71
ER3	0.58	0.44	1.92	0.62	0.53	1.86	0.69	0.53	1.66	0.70	0.45	1.32
ER4	0.20	0.18	0.35	0.26	0.23	0.48	0.28	0.22	0.53	0.29	0.16	0.45
ER5	0.34	0.28	0.59	0.35	0.27	0.68	0.31	0.29	0.54	0.31	0.38	0.48
ER6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ER7	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02
ER8	0.26	0.19	0.04	0.14	0.15	0.05	0.20	0.27	0.11	0.23	0.32	0.15
ER A	0.10	0.19	0.17	0.17	0.29	0.28	0.31	0.55	0.54	0.40	0.77	0.81
ER B	0.42	0.62	0.49	0.76	1.10	0.95	1.48	2.09	1.97	1.89	2.65	2.71
ER C	0.35	0.48	0.38	0.63	0.84	0.75	1.14	1.56	1.51	1.41	2.02	2.09
ER D	0.11	0.09	0.04	0.14	0.10	0.06	0.11	0.12	0.11	0.10	0.17	0.22
ER E	0.15	0.12	0.05	0.19	0.13	0.08	0.14	0.14	0.12	0.12	0.19	0.23
ER F	0.16	0.15	0.07	0.23	0.17	0.10	0.18	0.20	0.17	0.17	0.26	0.33
ER H	0.19	0.20	0.08	0.29	0.28	0.17	0.29	0.38	0.33	0.28	0.52	0.65
ER G	0.15	0.16	0.07	0.23	0.22	0.14	0.23	0.34	0.31	0.24	0.50	0.65
ER I	0.17	0.18	0.08	0.26	0.26	0.16	0.27	0.38	0.35	0.27	0.56	0.72
LS9	0.07	0.07	0.16	0.09	0.09	0.19	0.11	0.12	0.23	0.12	0.13	0.24
LS8	0.06	0.07	0.07	0.15	0.16	0.20	0.29	0.30	0.40	0.35	0.34	0.46
LS7	0.15	0.16	0.19	0.27	0.26	0.36	0.42	0.49	0.73	0.51	0.57	0.96
LS6	0.16	0.16	0.19	0.27	0.25	0.34	0.40	0.42	0.64	0.47	0.43	0.78
LS5	0.38	0.35	0.20	0.47	0.46	0.35	0.67	0.74	0.65	0.79	0.79	0.80
LS4	0.48	0.46	0.05	0.61	0.62	0.07	0.88	1.04	0.12	1.05	1.19	0.14
LS3	0.09	0.07	0.07	0.14	0.11	0.10	0.18	0.16	0.16	0.21	0.14	0.15
LS2	0.06	0.06	0.05	0.11	0.10	0.09	0.17	0.17	0.17	0.21	0.17	0.17
LS1	0.44	0.51	0.45	0.78	0.91	0.85	1.51	1.60	1.61	2.02	1.82	1.82

Highlighted cells represent exceedance of critical shear stress (2 dynes/cm^2) for future conditions versus existing conditions

Table I-8: Comparison of Alternative 2 Existing Condition, Future No Action, and Future With Project Mean Shear Stress

Location	Peak Shear Stress (dyn/cm2)											
	2-Year Storm			10-Year Storm			50-Year Storm			100-Year Storm		
	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project
ER1	2.88	3.79	1.59	5.55	6.44	3.37	6.35	8.19	6.52	5.80	9.03	12.32
ER2	3.39	3.72	1.03	4.48	4.71	1.33	4.88	4.42	1.86	4.83	3.45	1.64
ER3	2.25	1.98	5.15	2.71	2.73	4.33	2.89	2.89	4.30	2.82	2.72	4.22
ER4	0.72	0.87	0.99	1.46	1.72	2.20	1.77	1.07	2.78	1.41	0.52	1.98
ER5	1.18	1.32	1.31	1.32	1.44	1.48	1.27	1.51	2.01	1.25	2.66	2.72
ER6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ER7	0.15	0.18	0.19	0.42	0.72	0.96	0.48	1.23	1.61	0.42	0.17	0.17
ER8	1.37	1.35	0.22	1.03	0.97	0.21	0.95	0.94	0.79	0.96	1.19	1.25
ER A	0.10	0.19	0.17	0.17	0.29	0.28	0.31	0.55	0.54	0.40	0.77	0.81
ER B	0.42	0.62	0.49	0.76	1.10	0.95	1.48	2.09	1.97	1.89	2.65	2.71
ER C	0.35	0.48	0.38	0.63	0.84	0.75	1.14	1.56	1.51	1.41	2.02	2.09
ER D	0.11	0.09	0.04	0.14	0.10	0.06	0.11	0.12	0.11	0.10	0.17	0.22
ER E	0.15	0.12	0.05	0.19	0.13	0.08	0.14	0.14	0.12	0.12	0.19	0.23
ER F	0.16	0.15	0.07	0.23	0.17	0.10	0.18	0.20	0.17	0.17	0.26	0.33
ER H	0.19	0.20	0.08	0.29	0.28	0.17	0.29	0.38	0.33	0.28	0.52	0.65
ER G	0.15	0.16	0.07	0.23	0.22	0.14	0.23	0.34	0.31	0.24	0.50	0.65
ER I	0.17	0.18	0.08	0.26	0.26	0.16	0.27	0.38	0.35	0.27	0.56	0.72
LS9	0.32	0.32	1.01	0.32	0.32	0.80	0.32	0.33	0.88	0.32	0.32	0.98
LS8	0.85	0.91	1.29	0.93	0.93	1.55	1.13	1.35	1.68	1.25	1.54	1.73
LS7	2.98	3.18	6.20	3.32	3.46	6.95	3.42	3.85	7.40	3.41	4.02	9.07
LS6	2.90	2.98	6.07	3.19	3.24	6.32	3.09	3.01	5.83	2.93	2.71	5.99
LS5	2.57	2.61	6.26	2.78	3.11	6.60	3.48	3.98	6.07	3.71	4.38	6.28
LS4	3.39	3.47	0.69	3.79	3.98	0.85	4.42	6.48	0.98	5.27	7.09	1.11
LS3	0.61	0.54	0.57	0.63	0.61	0.59	0.69	0.59	0.71	0.70	0.60	0.71
LS2	0.76	0.77	0.72	0.81	0.84	0.85	1.16	0.97	0.97	1.24	0.82	0.83
LS1	10.07	9.89	9.68	9.86	10.05	9.96	14.05	10.66	10.88	16.26	14.06	13.98

Highlighted cells represent exceedance of critical shear stress (2 dynes/cm^2) for future conditions versus existing conditions

Alternative 2 elevated shear stress at ER1, where in comparison, the existing and No Action scenarios predicted for the 100-year storm only. Alternative 2 mean and peak shear stresses at ER1 of 3.35 dyn/cm2 and 12.32 dyn/cm2, respectively, indicate greater potential for scour compared to future No Action Alternative mean and peak shear stresses of 2.39 dyn/cm2 and 9.03 dyn/cm2. However, Alternative 2 shear stresses at ER1 are less than the future No Action case for the 2-yr, 10-yr, and 50-yr storms indicating that the 100-year storm may lead to more scour while more frequent storms would not result in potential sediment scour and relocation of contaminates beyond that expected under future No Action conditions.

It should be noted that a benefit is realized at ER2 for all storm return periods where shear stress exceeds the critical threshold for the existing and future No Action conditions, but is below the critical threshold under Alternative 2. For the all storms, both future No Action Alternative, and future Alternative 2 shear stresses below the East Riser Ditch outlet are, in general, elevated relative to the existing case indicating effects of sea level rise rather than effects under Alternative 2.

Hours of exceedances of critical shear stress across scenarios, all East Riser locations, and all storms are shown in **Figure I-14**. Elevated shear stress under Alternative 2 at ER3 for all storms and for ER1 under the 100-yr storm coincide with longer times of exceedance indicating a longer duration of potential scour. Hours of exceedances at other East Riser stations are similar across storms and the three scenarios.

Alternative 2 analyses for Losen Slote uses InfoWorks model outputs. Nine output locations along Losen Slote were analyzed and are shown in **Figure I-12**. Station LS1 represents the first model segment upstream of the southernmost tide gate in proximity to the Hackensack River. Stations LS2 and LS3 are located 0.5 and 1.0 miles upstream of LS1. The proposed force mains enter Losen Slote at LS7, which is 0.5 mile upstream of LS3. Stations LS6, LS5, and LS4 are within 200 ft below LS7 and have been included in order to assess localized impacts of discharges from the force mains. Stations LS8 and LS9 are spaced evenly 0.5 mile apart to the head of Losen Slote for an analysis covering a total distance of 2.25 miles.

Figure I-15 compares existing, future No Action and Alternative 2 depths, velocities, and shear stresses in Losen Slote for the 100-year storm. As has been evident at other stations, in general, future with and without project depths are comparable but increased relative to the existing conditions pointing to future impacts rather than Alternative 2 impacts. Only at station LS5 is depth greater than the existing or future No Action conditions and may reflect inputs from the force main discharges at LS7. Alternative 2 velocities at LS7, LS6, and LS5 are elevated relative to both the existing and future No Action predicted velocities, again likely due to force main discharges. However, Alternative 2 velocity at LS4 is noticeably lower than the other conditions.

Calculations of shear stress for Losen Slote, using **Equation 1** for the 100-yr storm, are shown in **Figure I-15**. The East Riser D_{50} was applied in Losen Slote shear stress calculations as no grain size data are available. Shear stresses are below the critical threshold at LS9, LS8, LS3, and LS2 for the three scenarios and all storms. Alternative 2 shear stresses in LS7, LS6, and LS5 are increased compared to both existing and future No Action conditions. This may reflect a localized effect of force main discharges as these stations are within 100 ft of the discharges. These results indicate that the design of planned energy dissipation structures in Losen Slote at the force main discharges may need to be revisited. Shear stress is lower than existing and future No Action conditions 200 ft downstream of the force main discharges at LS4 and returns to levels similar to existing and future No Action conditions at LS3 and LS2. Existing, future No Action, and Alternative 2 shear stress levels are comparable to one

another and well above the critical threshold above the tide gate at LS1 for all storms. **Table I-7** and **Table I-8** show mean and peak shear stresses, respectively, for all storms and locations. **Figure I-16** compares times of exceedances of the critical threshold across all scenarios, storms, and locations.

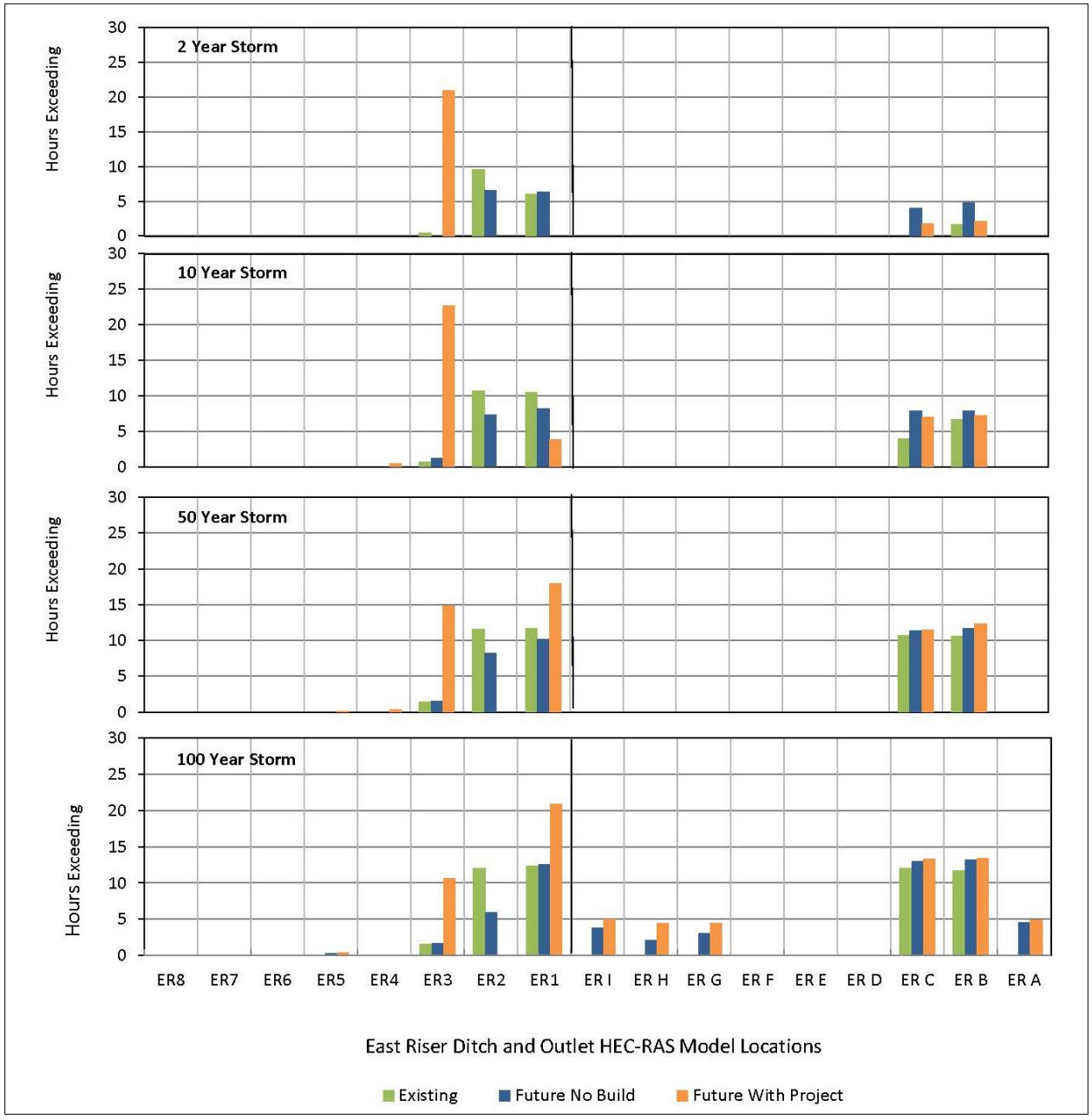


Figure I-14: Alternative 2 East Riser Ditch and East Riser Outlet Hours Exceeding Critical Shear Stress for All Storms and Locations

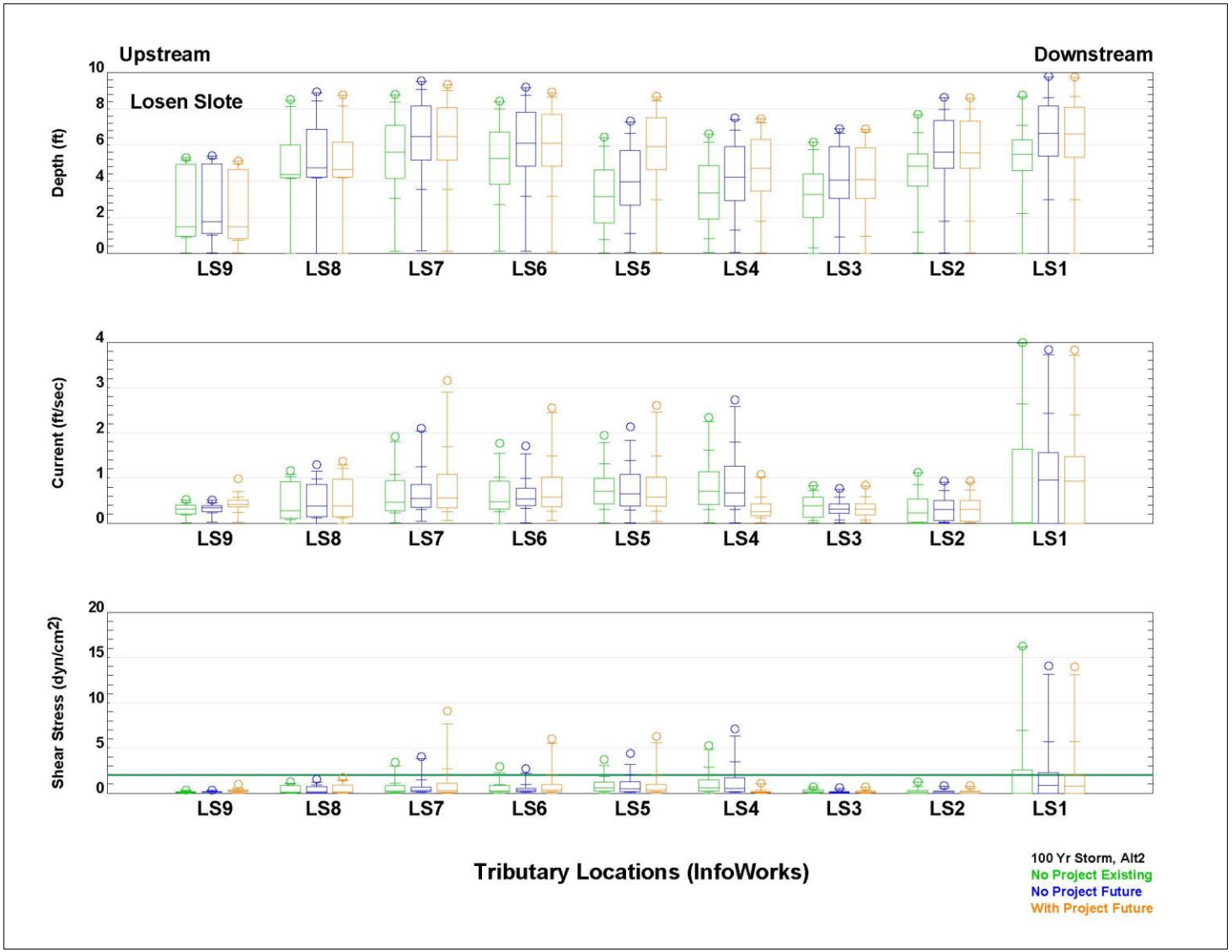


Figure I-15: Alternative 2 Losen Slote Depth, Velocity, and Shear Stress – 100-Year Storm Return Period

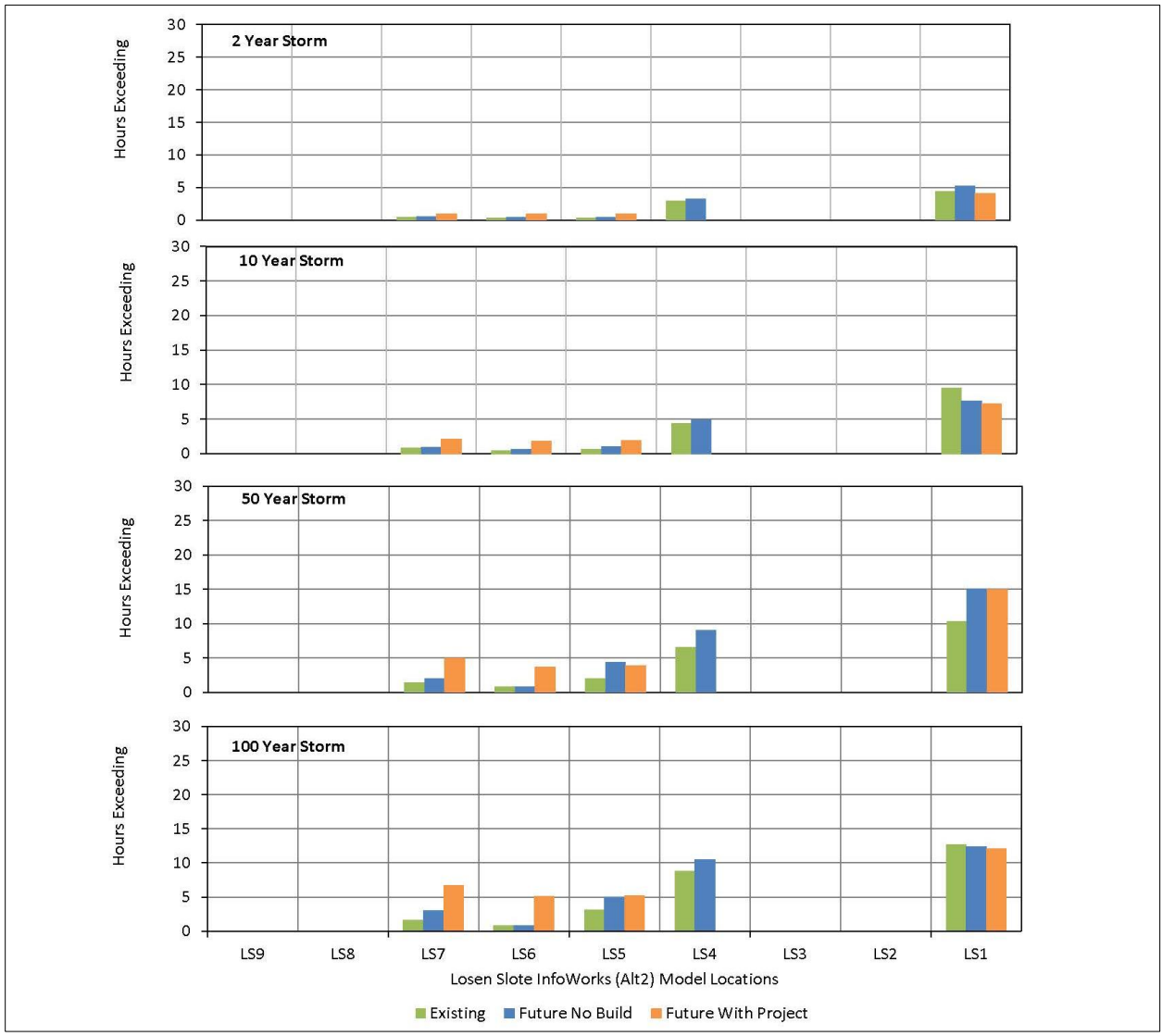


Figure I-16: Alternative 2 Losen Hours Exceeding Critical Shear Stress for All Storms and Locations

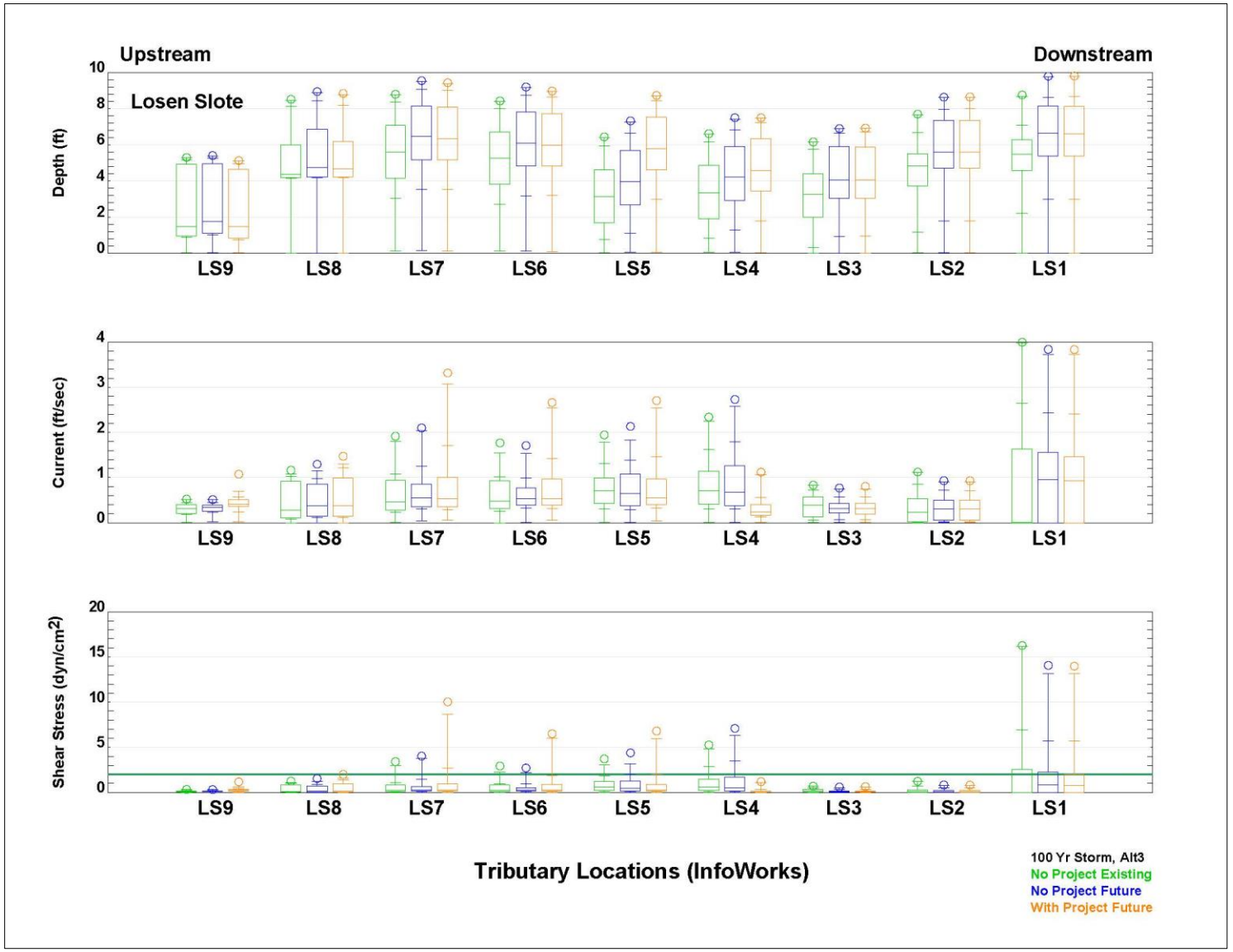


Figure I-17: Alternative 3 Losen Slote Depth, Velocity, and Shear Stress – 100-Year Storm Return Period

1.3.3 Alternative 3

The Alternative 3 (*Build Plan*) is similar to Alternative 2. For modeling purposes the primary difference is removal of Pump Station C from the Losen Slote drainage improvements. Therefore, this section will include analyses for Losen Slote only and Alternative 2 analyses presented above for East Riser Ditch and East Riser Ditch outlet also apply under Alternative 3.

The Alternative 3 analysis for Losen Slote uses InfoWorks model outputs. Nine output locations along Losen Slote were analyzed and are the same as those analyzed under Alternative 2. **Figure I-17** compares existing, future No Action and Alternative 3 depth, velocity and shear stress in Losen Slote for the 100-year storm. Similar to Alternative 2, in general future with and without project depths are comparable but increased relative to the existing conditions reflecting future impacts rather than Alternative 3 impacts. Only at station LS5 is maximum depth greater than the existing or future No Action conditions and may reflect inputs from the force main discharge at LS7. Alternative 3 velocities at LS7, LS6, and LS 5 are elevated relative to both the existing and future predicted velocities, again likely due to the force main discharge. However, Alternative 3 velocity at LS4 is noticeably lower than the other conditions.

Calculations of shear stress for Losen Slote, using **Equation 1** for the 100-yr storm, are shown in **Figure I-17**. Results are similar to Alternative 2 analyses. Shear stresses are below the critical threshold at LS9, LS8, LS3, and LS2 for the three scenarios and all storms. Alternative 3 shear stresses in LS7, LS6, and LS5 are increased compared to both existing and future No Action conditions. This may reflect a localized effect of the force main discharge as these stations are within 100 ft of the discharge. These results indicate that the design of planned energy dissipation structures in Losen Slote at the discharge points may need to be revisited. Shear stress is lower than existing and future No Action conditions 200 ft downstream of the force main discharge at LS4 and returns to levels similar to existing and future No Action conditions at LS3 and LS2. Shear stress levels are comparable to one another and well above the critical threshold at LS1 just above the tide gate under all three scenarios and all storms. **Table I-9** and **Table I-10** show mean and peak shear stresses, respectively, for all storms and locations. **Figure I-18** compares times of exceedances of the critical threshold across all scenarios, storms, and locations.

Table I-9: Comparison of Losen Slote Alternative 3 Existing Condition, Future No Action, and Future With Project Mean Shear Stress

Location	Mean Shear Stress (dyn/cm^2)											
	2-Year Storm			10-Year Storm			50-Year Storm			100-Year Storm		
	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project
LS9	0.07	0.07	0.16	0.09	0.09	0.19	0.11	0.12	0.23	0.12	0.13	0.24
LS8	0.06	0.07	0.08	0.15	0.16	0.21	0.29	0.30	0.41	0.35	0.34	0.47
LS7	0.15	0.16	0.16	0.27	0.26	0.34	0.42	0.49	0.74	0.51	0.57	0.95
LS6	0.16	0.16	0.17	0.27	0.25	0.32	0.40	0.42	0.64	0.47	0.43	0.76
LS5	0.38	0.35	0.18	0.47	0.46	0.33	0.67	0.74	0.66	0.79	0.79	0.78
LS4	0.48	0.46	0.04	0.61	0.62	0.07	0.88	1.04	0.14	1.05	1.19	0.14
LS3	0.09	0.07	0.07	0.14	0.11	0.11	0.18	0.16	0.16	0.21	0.14	0.14
LS2	0.06	0.06	0.06	0.11	0.10	0.10	0.17	0.17	0.17	0.21	0.17	0.17
LS1	0.44	0.51	0.50	0.78	0.91	0.90	1.51	1.60	1.63	2.02	1.82	1.80

Table I-10: Comparison of Losen Slote Alternative 3 Existing Condition, Future No Action, and Future With Project Peak Shear Stress

Location	Peak Shear Stress (dyn/cm^2)											
	2-Year Storm			10-Year Storm			50-Year Storm			100-Year Storm		
	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project	Existing	Future No Action	Future With Project
LS9	0.32	0.32	1.01	0.32	0.32	0.80	0.32	0.33	0.88	0.32	0.32	1.17
LS8	0.85	0.91	1.35	0.93	0.93	1.62	1.13	1.35	3.17	1.25	1.54	1.99
LS7	2.98	3.18	4.57	3.32	3.46	5.71	3.42	3.85	7.48	3.41	4.02	10.02
LS6	2.90	2.98	4.46	3.19	3.24	5.38	3.09	3.01	5.90	2.93	2.71	6.50
LS5	2.57	2.61	4.65	2.78	3.11	5.57	3.48	3.98	6.14	3.71	4.38	6.79
LS4	3.39	3.47	0.48	3.79	3.98	0.65	4.42	6.48	2.75	5.27	7.09	1.19
LS3	0.61	0.54	0.53	0.63	0.61	0.60	0.69	0.59	0.72	0.70	0.60	0.64
LS2	0.76	0.77	0.77	0.81	0.84	0.82	1.16	0.97	1.01	1.24	0.82	0.81
LS1	10.07	9.89	10.03	9.86	10.05	9.86	14.05	10.66	11.46	16.26	14.06	13.98

Note: Highlighted cells represent exceedance of critical shear stress (2 dynes/cm^2) for future conditions versus existing conditions

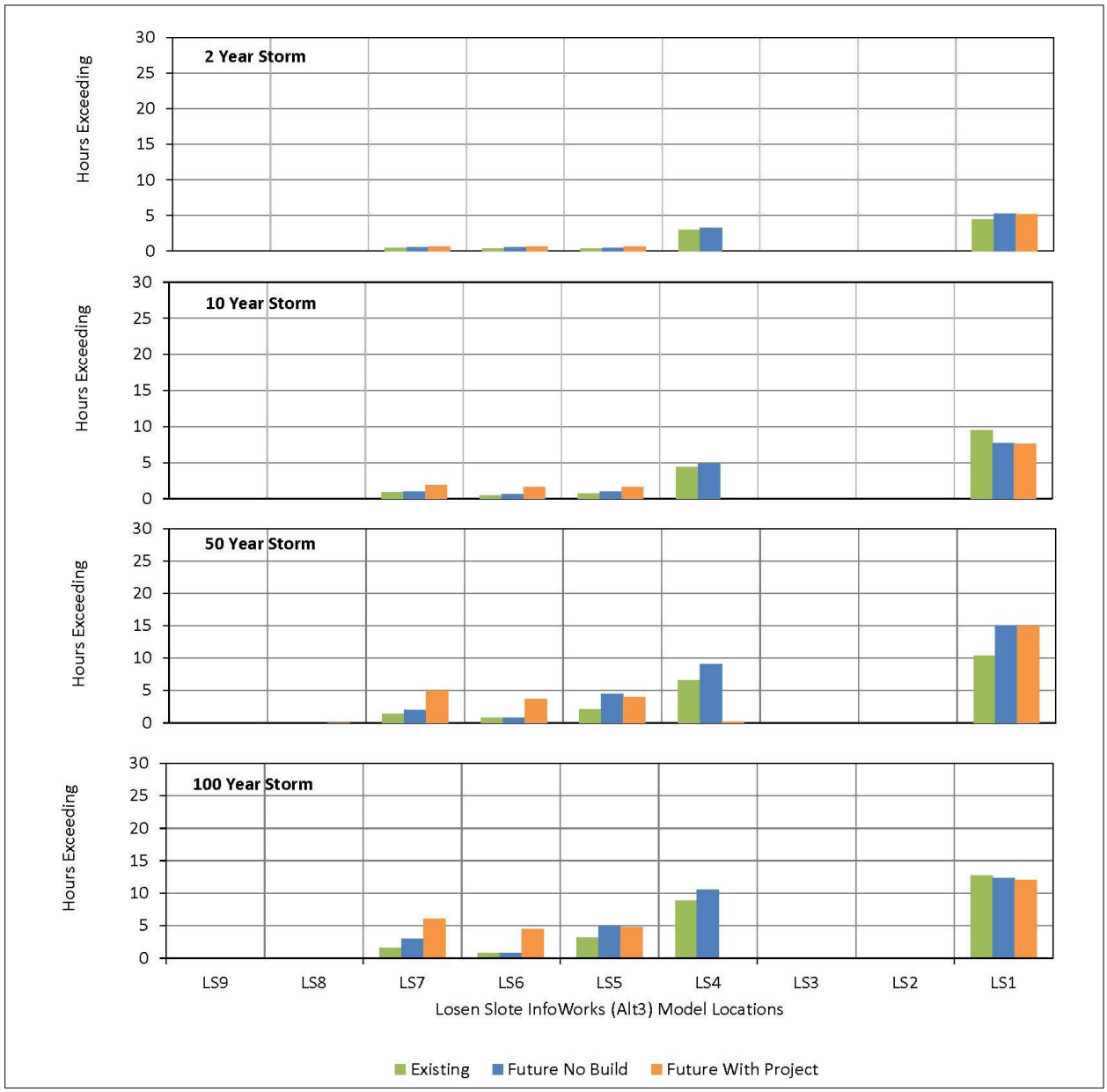


Figure I-18: Alternative 3 Losen Hours Exceeding Critical Shear Stress for All Storms and Locations

2.0 Conclusions

The above analysis indicates that some increase in sediment resuspension may occur under future conditions likely due to effects of sea level rise. Only a limited change in runoff, channel velocity, and shear stress are predicted for any given alternative, relative to the No Action Alternative. Therefore, it is not likely that implementation of Alternatives 1, 2, or 3 would be sufficient to markedly exacerbate the degree of resuspension of bottom sediments that occurs within the study area for most locations and may provide a benefit for some areas. However, some areas are predicted to experience sediment resuspension.

2.1 Alternative 1

Analyses of Hackensack River areas and four tributaries below their respective tide gates (West Riser Ditch, East Riser Ditch, DePeyster Creek, Losen Slote) under Alternative 1 indicate that sediment impacts are the result of future sea level rise rather than implementation of Alternative 1. An analysis of Lower Berry's Creek under Alternative 1 indicates that a potential benefit may be realized. Berry's Creek Shear stresses under existing and future conditions often exceeded the critical threshold of 2 dyn/cm2, indicating sediment scour can occur; however, peak shear stresses under Alternative 1 in stations B6, B5, B4 within 300 ft of the storm surge barrier are consistently less than those for the existing or future No Action conditions. Further, a potential benefit of Alternative 1 in Berry's Creek can be seen in the duration of exceedances of the critical threshold where the duration of potential scour is reduced by several hours when the compared to the existing and future No Action conditions.

2.2 Alternative 2

Analyses for Alternative 2 in East Riser Ditch and below the East Riser Ditch outlet for all storms indicate sediment impacts in the upper reach of East Riser Ditch between stations ER5 and ER8 are due to sea level rise rather than implementation of Alternative 2. Potential additional movement of contaminated sediments beyond existing and future No Action conditions may occur at station ER3, upstream of planned dredging activities. Velocities are predicted to increase at this location due to planned improvements resulting in higher shear stresses and scouring of sediments.

Under existing conditions and the future No Action Alternative, there is a high likelihood of sediment scour at ER1 above the tide gate. Under Alternative 2 further elevated shear stress is predicted at ER1 in comparison to the No Action scenario for the 100-year storm only. Unlike the 100-yr storm, Alternative 2 shear stresses at ER1 under the 2-yr, 10-yr, and 50-yr storms are comparable to the future No Action Alternative indicating that the 100-year storm may lead to more resuspension while more frequent storms would not result in potential sediment scour and relocation of contaminants beyond that expected under future No Action conditions. Hours of exceedances of critical shear stress are increased coincident with elevated shear stress under Alternative 2 at ER3 for all storms and for ER1 under the 100-yr storm indicating a longer duration of potential scour. Hours of exceedances at other stations are similar across all storms and the three scenarios.

It should be noted that under Alternative 2 a benefit is realized at ER2 for all storm return periods where shear stress exceeds the critical threshold for the existing and future No Action conditions, but is below the critical threshold under Alternative 2. For the four storm return periods, future Alternative 2 shear stresses below the East Riser Ditch outlet are elevated relative to the existing case but are similar to the future No Action Alternative, indicating increases are due to sea level rise and not implementation of Alternative 2.

Analyses indicate that Alternative 2 planned improvements would not impact Losen Slote sediments in the upper reaches (LS9, LS8) and in reaches below planned force main discharges (LS3, LS2). Alternative 2 shear stresses in LS7, LS6, and LS5 are increased compared to both existing and future No Action conditions reflecting localized effects of force main discharges as these stations are within 100 ft of the discharges. Design of planned energy dissipation structures in Losen Slote at the force main discharges will be revisited during the design phase of this project. Shear stress is lower than existing and future No Action conditions 200 ft downstream of the force main discharges at LS4 and returns to levels similar to existing and future No Action conditions at LS3 and LS2. Existing, future No Action, and Alternative 2 shear stress levels are comparable to one another and well above the critical threshold above the tide gate at LS1 for all storms. Shear stress and the potential to redistribute contaminated sediments would be the same or less in Losen Slote under Alternative 2 with inclusion of scour pads or other engineering structures in the vicinity of the force main discharges during the design phase.

2.3 Alternative 3

The Alternative 3 (*Build Plan*) is similar to Alternative 2 with the only difference being elimination of one of two pump stations that discharge into Losen Slote. Therefore, only analyses for Losen Slote have been completed to evaluate Alternative 3 and Alternative 2 analyses presented above for East Riser Ditch and East Riser Ditch outlet also apply under Alternative 3.

Analyses indicate that Alternative 3 planned improvements would not impact Losen Slote sediments in the upper reaches (LS9, LS8) and in reaches below planned force main discharges (LS3, LS2). Alternative 3 shear stresses in LS7, LS6, and LS5 are increased compared to both existing and future No Action conditions reflecting localized effects of the force main discharge as these stations are within 100 ft of the discharge. Design of planned energy dissipation structures in Losen Slote at the force main discharge will be revisited during the design phase of this project. Shear stress is lower than existing and future No Action conditions 200 ft downstream of the force main discharge at LS4 and returns to levels similar to existing and future No Action conditions at LS3 and LS2. Existing, future No Action, and Alternative 2 shear stress levels are comparable to one another and well above the critical threshold above the tide gate at LS1 for all storms. Shear stress and the potential to redistribute contaminated sediments would be the same or less in Losen Slote under Alternative 3 with inclusion of scour pads or other engineering structures in the vicinity of the force main discharge during the design phase.

Uncertainty in the preceding analysis should be recognized. This uncertainty reflects the need to specify several model inputs that are not precisely known (e.g., critical shear stress, D50, etc.). However, the objective is not so much to evaluate the absolute magnitude of the shear stress, but the change in shear stress that may result from implementation of a given alternative. As a result, the analysis should be considered particularly sufficient for assessing whether or not a given alternative would alter in-channel flow conditions to a significant enough degree that scour potential would be markedly increased.

Overall, sediments within Project Area waterbodies would be unaffected by the selected Alternative. In some cases a benefit may be realized. The actual impact on water quality at localized areas where sediment scour may occur such as East Riser Ditch above the planned dredging area (ER3), at the East Riser Pump station (ER1), or in Losen Slote near the force main discharge(s) will be further investigated during the design stage of the project. Additional site-specific information would be collected to determine the level of impact and design of appropriate mitigation structures.

3.0 References

Berry's Creek Study Area Cooperating PRP Group. 2016. Draft Remedial Investigation Report: Berry's Creek Study Area Remedial Investigation. 2016.

Julien, P. Y. Erosion and Sedimentation. New York: Cambridge University Press, 1998. Print.

NOAA. 2016. National Oceanic and Atmospheric Administration Query Manager. https://response.restoration.noaa.gov/querymanager Accessed August, 2016.

US Environmental Protection Agency, CTI and Associates, EEE Consulting, INC. 2017. Final Expanded Site Inspection Report for the Lower Hackensack River Bergen and Hudson Counties New Jersey. Site ID No. NJN000201845. Prepared for the U.S. Army Corps of Engineers, Kansas City District. Contract No. W912DQ-13-D-3014. April 2017.

US Department of Agriculture (USDA). 1951. Soil Survey Manual, USDA Agricultural Handbook No.18, US Government Printing Office. Washington, D.C.

Wilcock. 1996. Estimating Local Bed Shear Stress from Velocities. Water Resources Research, Vol. 32, No. 11, Pages 3361-3366. November 1996.

This Page has been Intentionally Left Blank.

Attachment I-1: Additional Figures

This Page has been Intentionally Left Blank.

Figure I-19 through **Figure I-45** below illustrate depth, depth-averaged velocity, and shear stress in the Hackensack River, the Alternative 1 tributary (West Riser, East Riser, Losen Slote, and DePeyster), and in Berry's Creek for 2, 10, and 50-year storms under Alternative 1. Grain size distributions for Alternative 1 shear stress calculations are also presented. The same factors, depth, depth-average velocity, and shear stress are also presented below for East Riser Ditch and Losen Slote under Alternative 2; only Losen Slote is provided under Alternative 3. The figures are based on modeling from MIKE 21, HEC-RAS, and InfoWorks.

List of Figures

Figure I-19: Alternative 1 Hackensack River MIKE 21 Model Depth for 2-Year Storm I-45
Figure I-20: Alternative 1 Hackensack River MIKE 21 Model Depth for 10-Year Storm I-46
Figure I-21: Alternative 1 Hackensack River MIKE 21 Model Depth for 50-Year Storm I-47
Figure I-22: Alternative 1 Hackensack River MIKE 21 Model Depth-Averaged Velocity for 2-Year Storm I-48
Figure I-23: Alternative 1 Hackensack River MIKE 21 Model Depth-Averaged Velocity for 10-Year Storm I-49
Figure I-24: Alternative 1 Hackensack River MIKE 21 Model Depth-Averaged Velocity for 50-Year I-50
Figure I-25: Alternative 1 Hackensack River MIKE 21 Model Shear Stress for 2-Year Storm I-51
Figure I-26: Alternative 1 Hackensack River MIKE 21 Model Shear Stress for 10-Year Storm I-52
Figure I-27: Alternative 1 Hackensack River MIKE 21 Model Shear Stress for 50-Year Storm I-53
Figure I-28: Alternative 1 Tributary (West Riser, East Riser, Losen Slote, DePeyster) MIKE 21 Model Depth, Depth-Averaged Velocity, Shear Stress for 2-Year Storm I-54
Figure I-29: Alternative 1 Tributary (West Riser, East Riser, Losen Slote, DePeyster) MIKE 21 Model Depth, Depth-Averaged Velocity, Shear Stress for 10-Year Storm I-55
Figure I-30: Alternative 1 Tributary (West Riser, East Riser, Losen Slote, DePeyster) MIKE 21 Model Depth, Depth-Averaged Velocity, Shear Stress for 50-Year Storm I-56
Figure I-31: Grain Size Distributions for Alternative 1 Shear Stress Calculations (Page 1 of 3) I-57
Figure I-32: Grain Size Distributions for Alternative 1 Shear Stress Calculations (Page 2 of 3) I-58
Figure I-33: Grain Size Distributions for Alternative 1 Shear Stress Calculations (Page 3 of 3) I-59
Figure I-34: Alternative 1 Berry's Creek HEC-RAS Model Depth, Depth-Averaged Velocity, Shear Stress for 2-Year Storm I-60
Figure I-35: Alternative 1 Berry's Creek HEC-RAS Model Depth, Depth-Averaged Velocity, Shear Stress for 10-Year Storm I-61
Figure I-36: Alternative 1 Berry's Creek HEC-RAS Model Depth, Depth-Averaged Velocity, Shear Stress for 50-Year Storm I-62
Figure I-37: Alternative 2 East Riser Ditch and Outlet HEC-RAS Model Depth, Depth-Averaged Velocity, Shear Stress for 2-Year Storm I-63
Figure I-38: Alternative 2 East Riser Ditch and Outlet HEC-RAS Model Depth, Depth-Averaged Velocity, Shear Stress for 10-Year Storm I-64
Figure I-39: Alternative 2 East Riser Ditch and Outlet HEC-RAS Model Depth, Depth-Averaged Velocity, Shear Stress for 50-Year Storm I-65
Figure I-40: Alternative 2 Losen Slote InfoWorks Model Depth, Depth-Averaged Velocity, Shear Stress for 2-Year Storm I-66
Figure I-41: Alternative 2 Losen Slote InfoWorks Model Depth, Depth-Averaged Velocity, Shear Stress for 10-Year Storm I-67
Figure I-42: Alternative 2 Losen Slote InfoWorks Model Depth, Depth-Averaged Velocity, Shear Stress for 50-Year Storm I-68

Figure I-43: Alternative 3 Losen Slote InfoWorks Model Depth, Depth-Averaged Velocity, Shear Stress for 2-Year Storm I-69
Figure I-44: Alternative 3 Losen Slote InfoWorks Model Depth, Depth-Averaged Velocity, Shear Stress for 10-Year Storm I-70
Figure I-45: Alternative 3 Losen Slote InfoWorks Model Depth, Depth-Averaged Velocity, Shear Stress for 50-Year Storm I-71

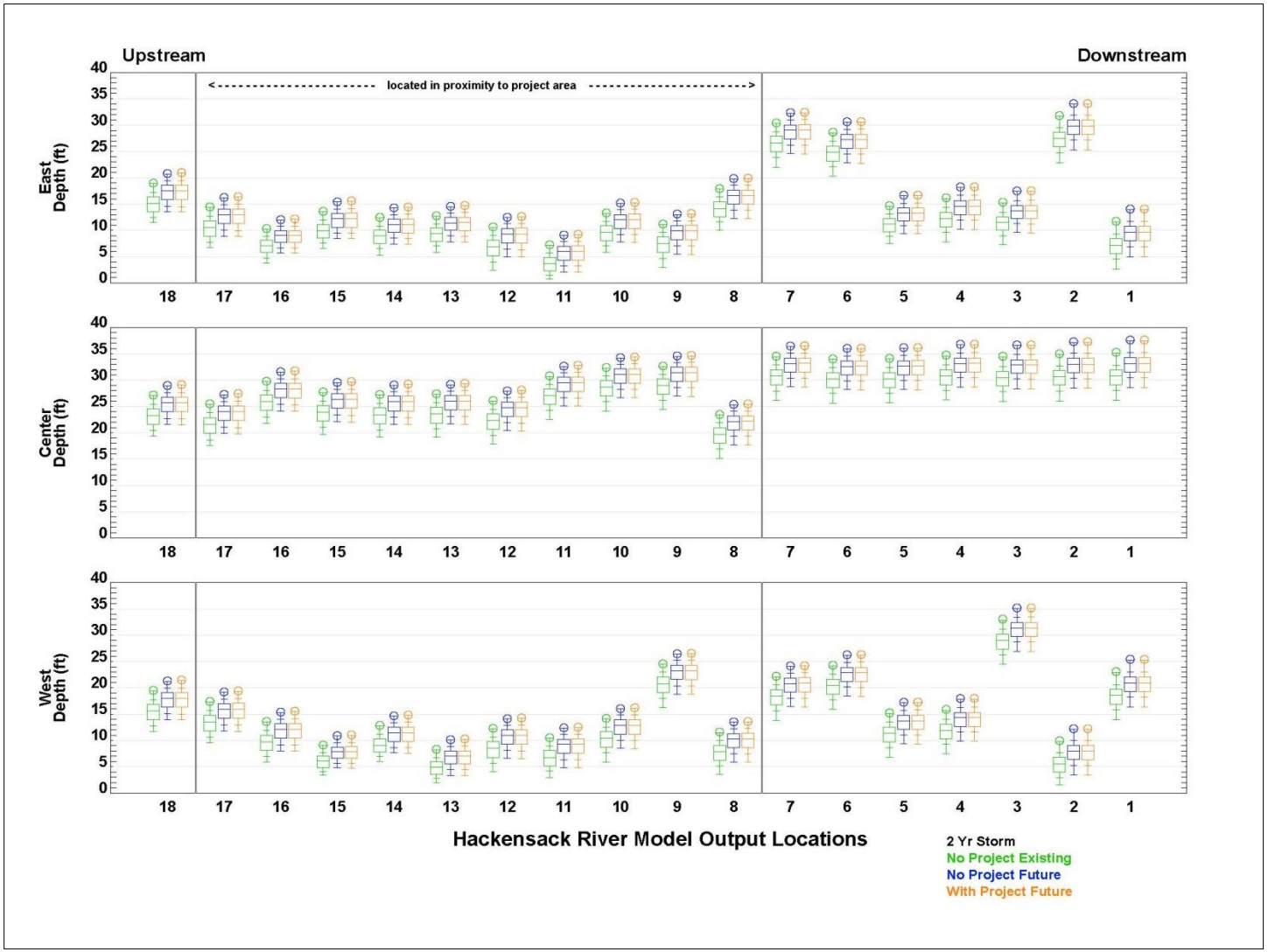


Figure I-19: Alternative 1 Hackensack River MIKE 21 Model Depth for 2-Year Storm

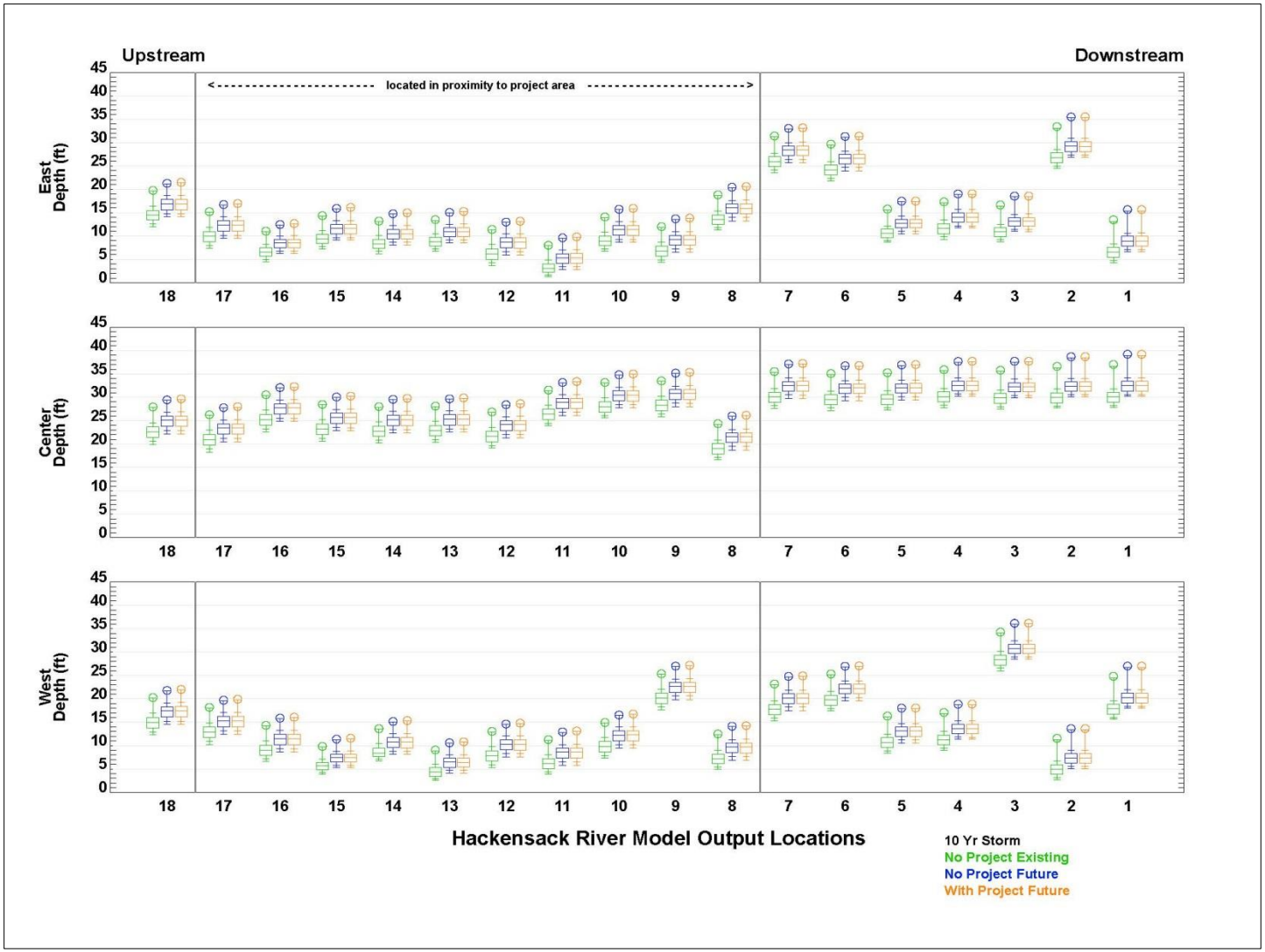


Figure I-20: Alternative 1 Hackensack River MIKE 21 Model Depth for 10-Year Storm

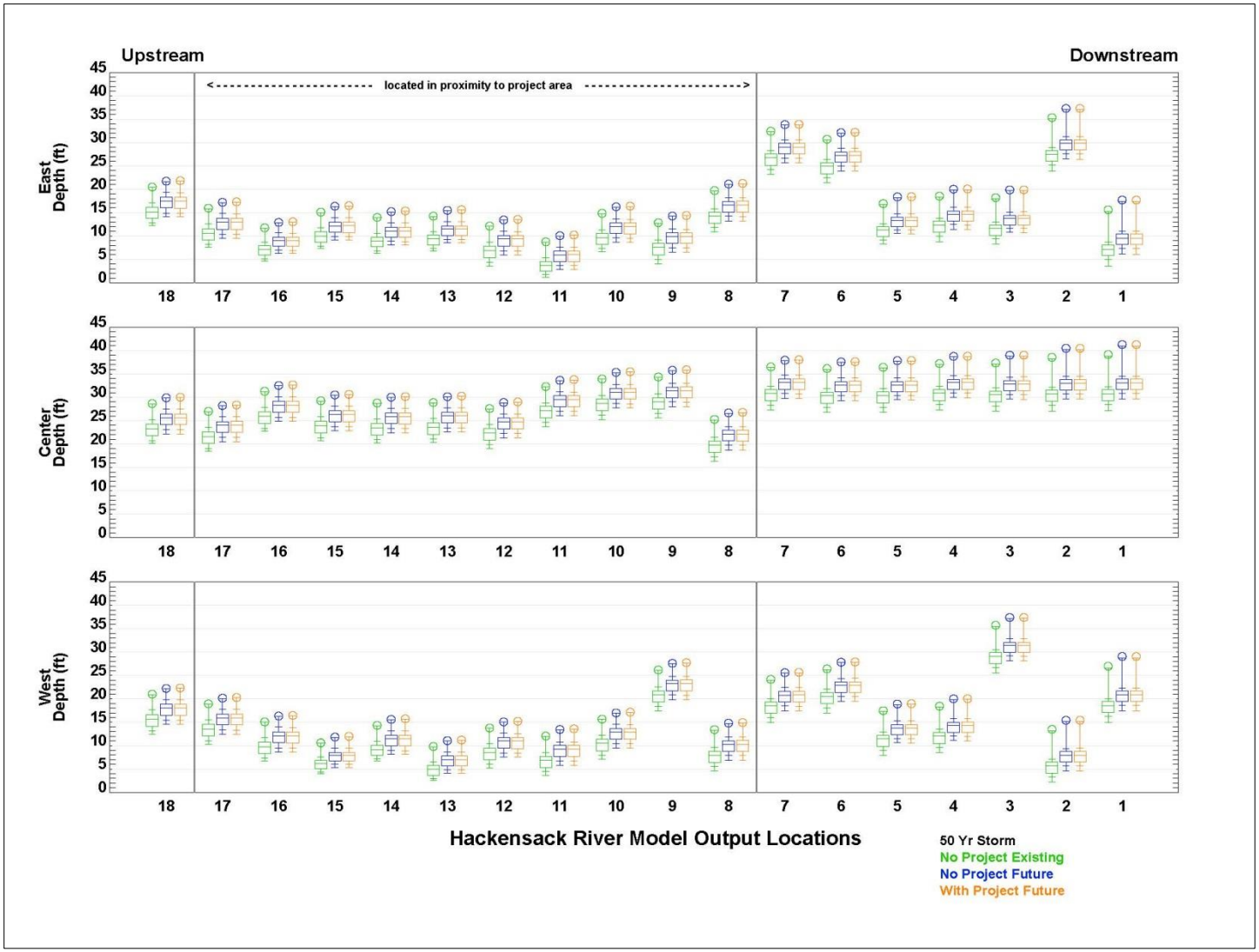


Figure I-21: Alternative 1 Hackensack River MIKE 21 Model Depth for 50-Year Storm

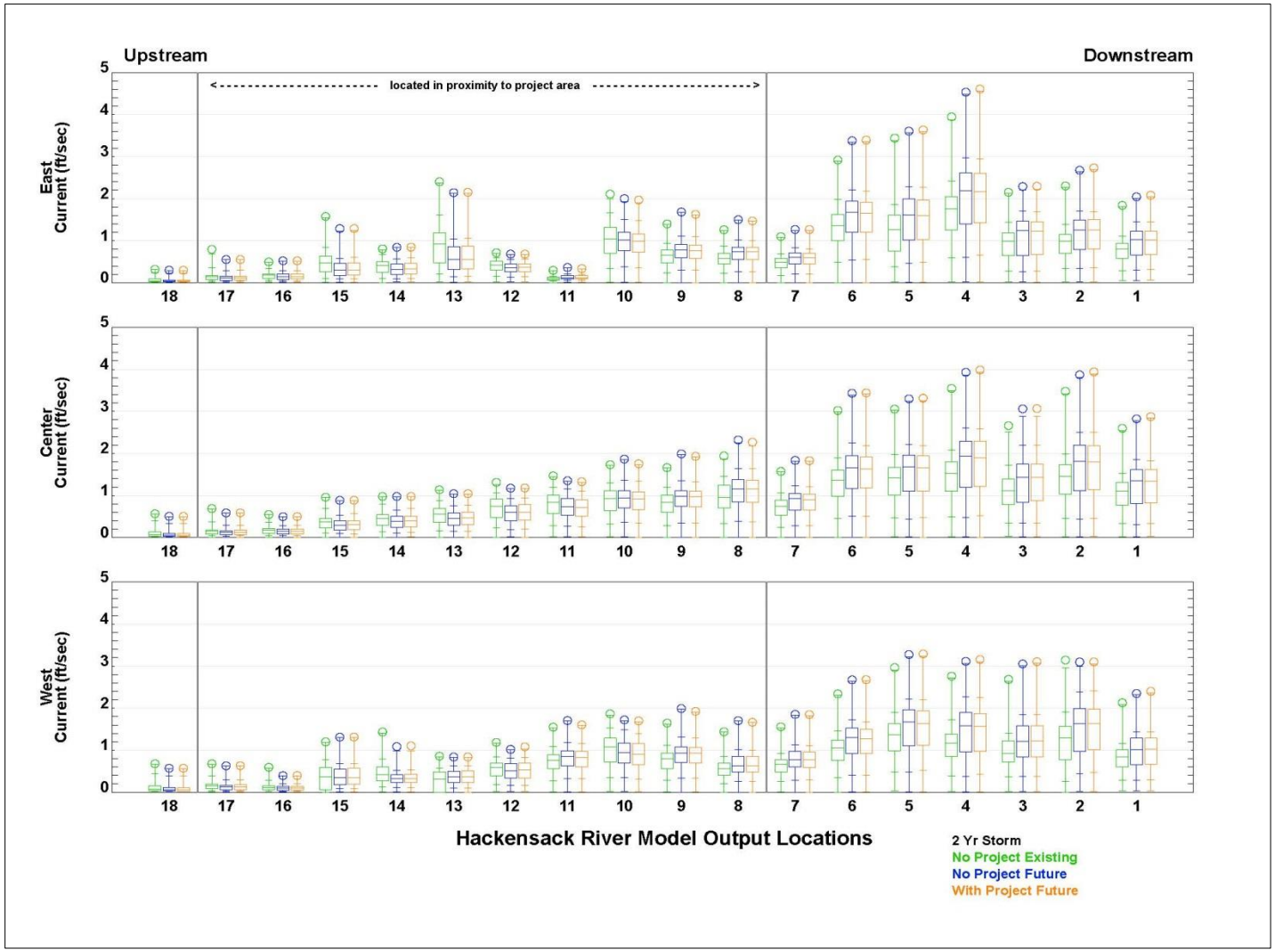


Figure I-22: Alternative 1 Hackensack River MIKE 21 Model Depth-Averaged Velocity for 2-Year Storm

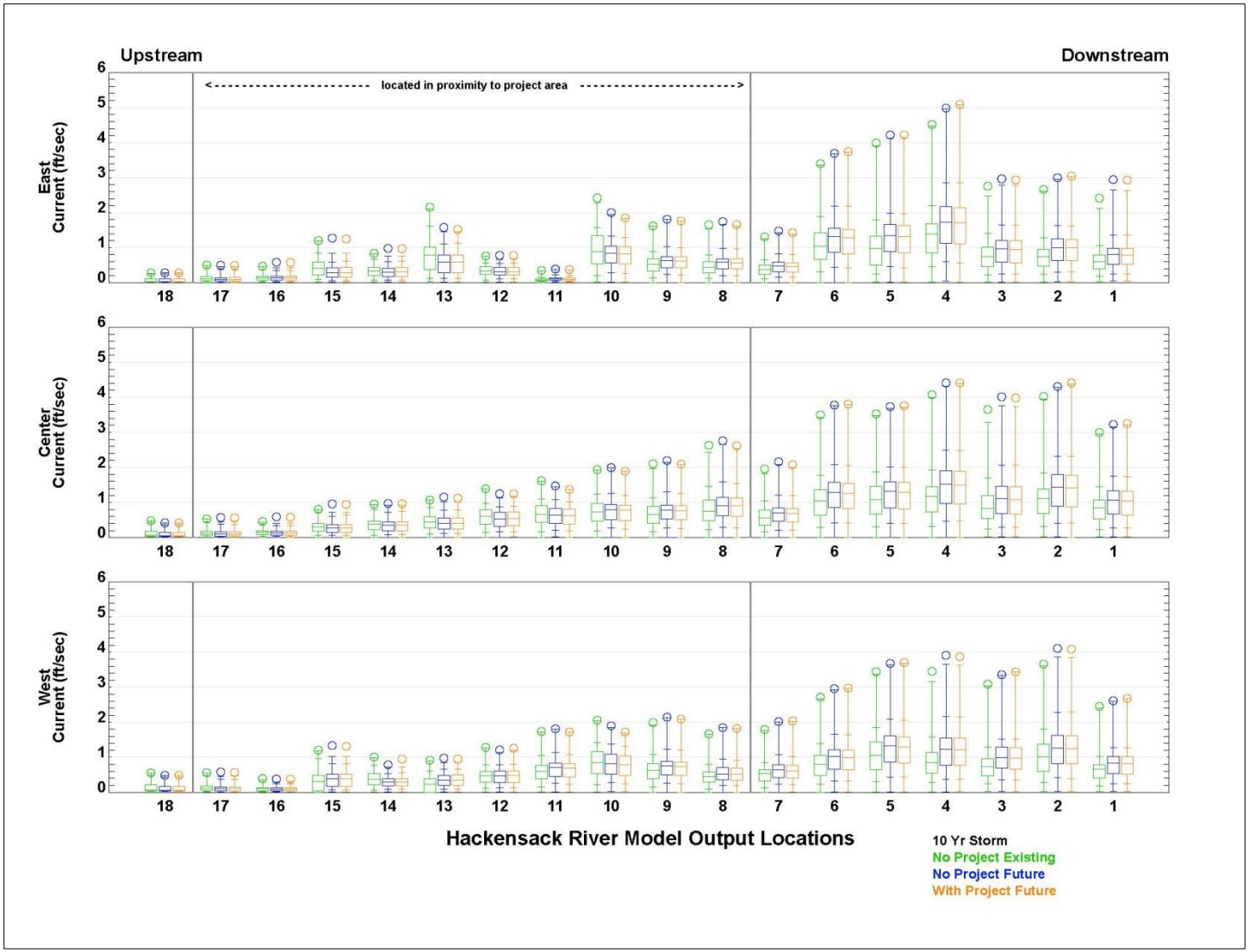


Figure I-23: Alternative 1 Hackensack River MIKE 21 Model Depth-Averaged Velocity for 10-Year Storm

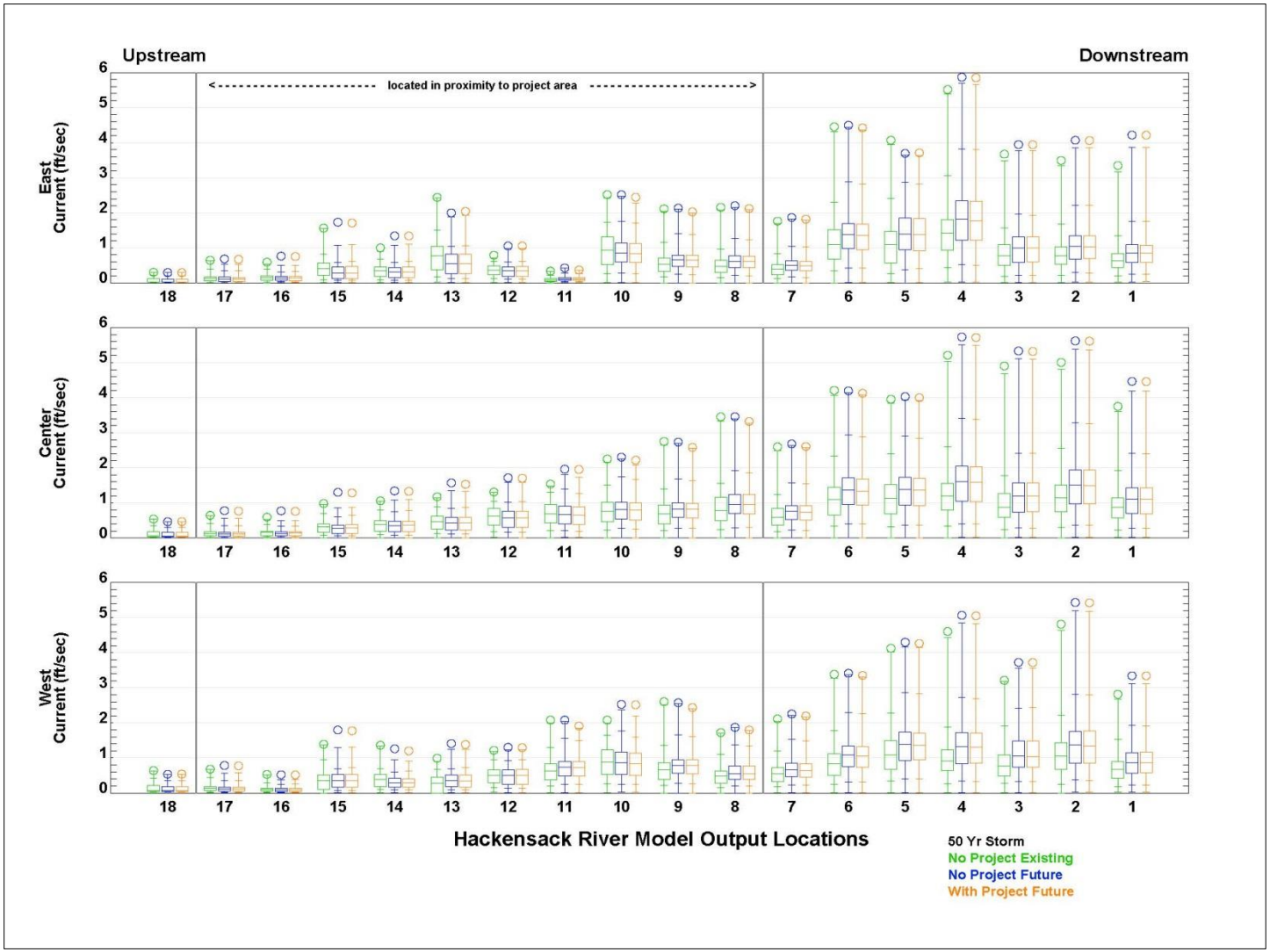


Figure I-24: Alternative 1 Hackensack River MIKE 21 Model Depth-Averaged Velocity for 50-Year

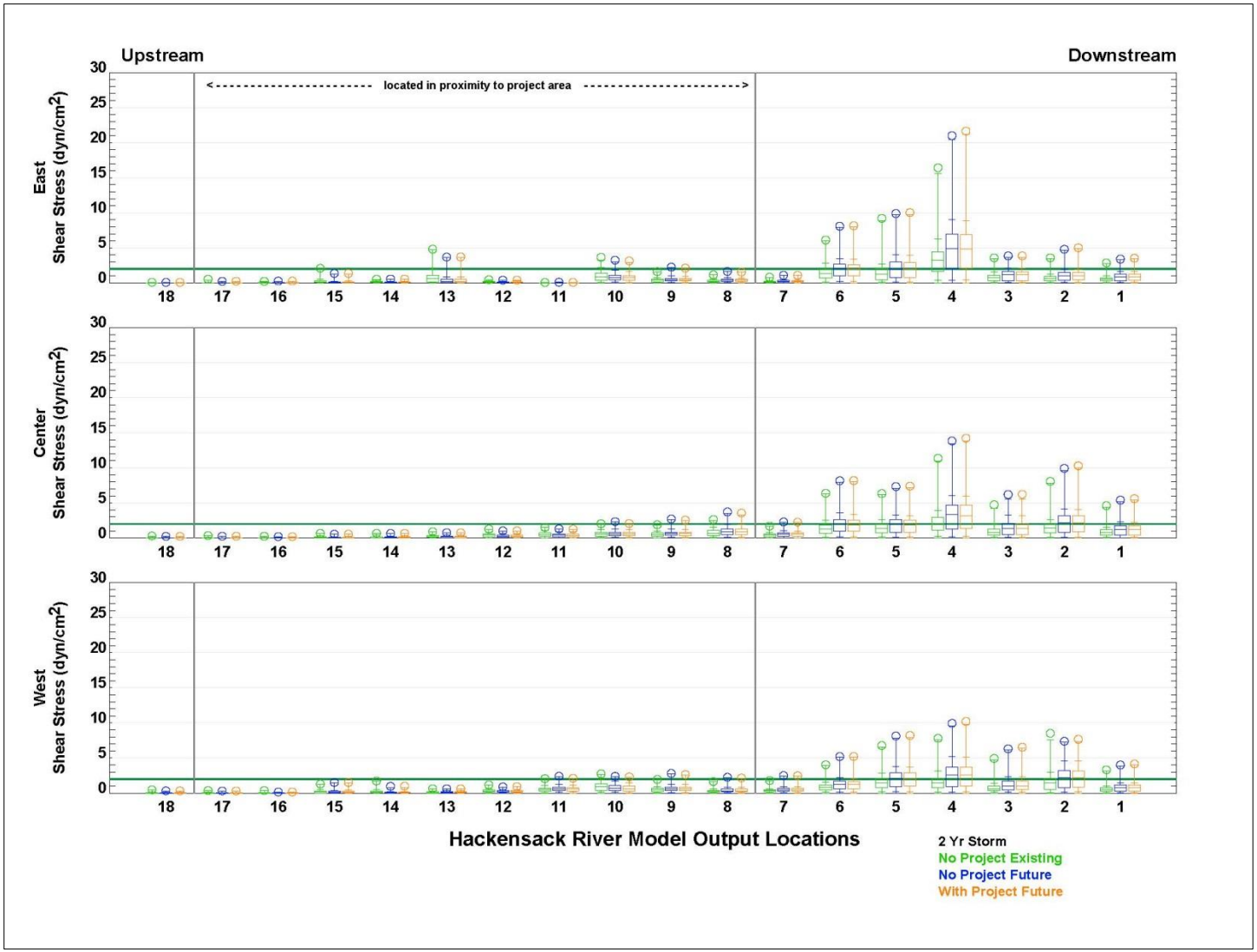


Figure I-25: Alternative 1 Hackensack River MIKE 21 Model Shear Stress for 2-Year Storm

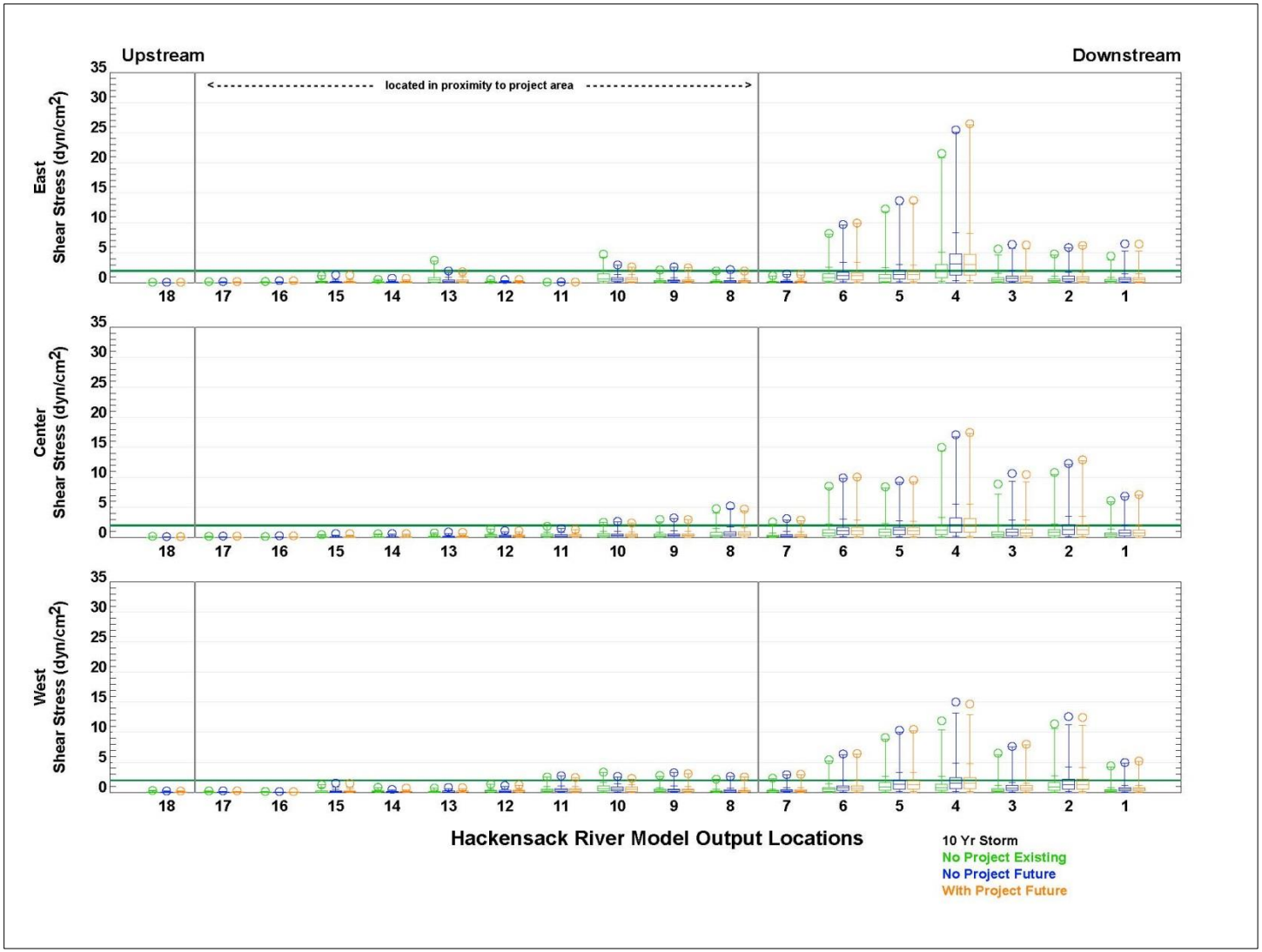


Figure I-26: Alternative 1 Hackensack River MIKE 21 Model Shear Stress for 10-Year Storm

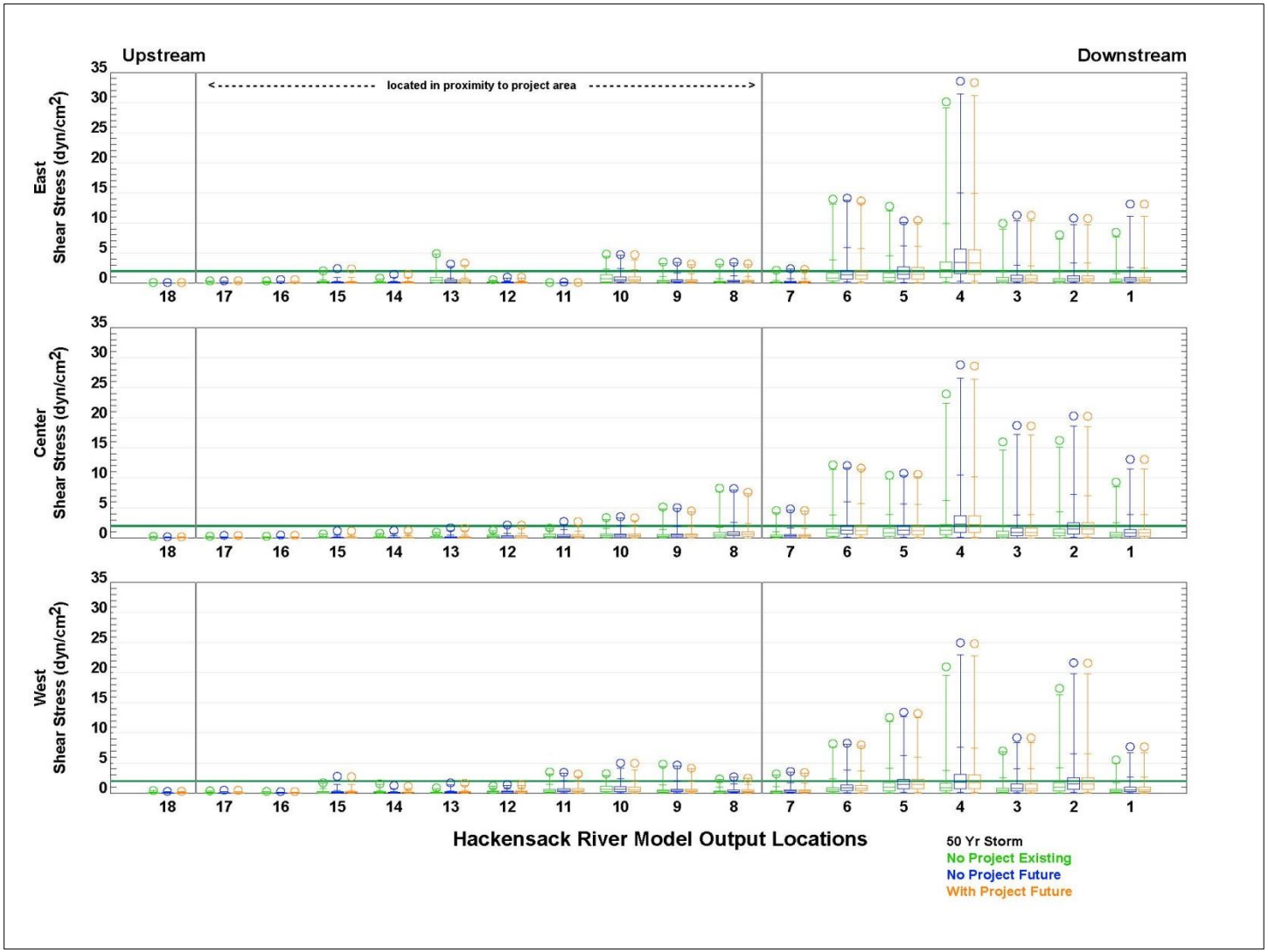


Figure I-27: Alternative 1 Hackensack River MIKE 21 Model Shear Stress for 50-Year Storm

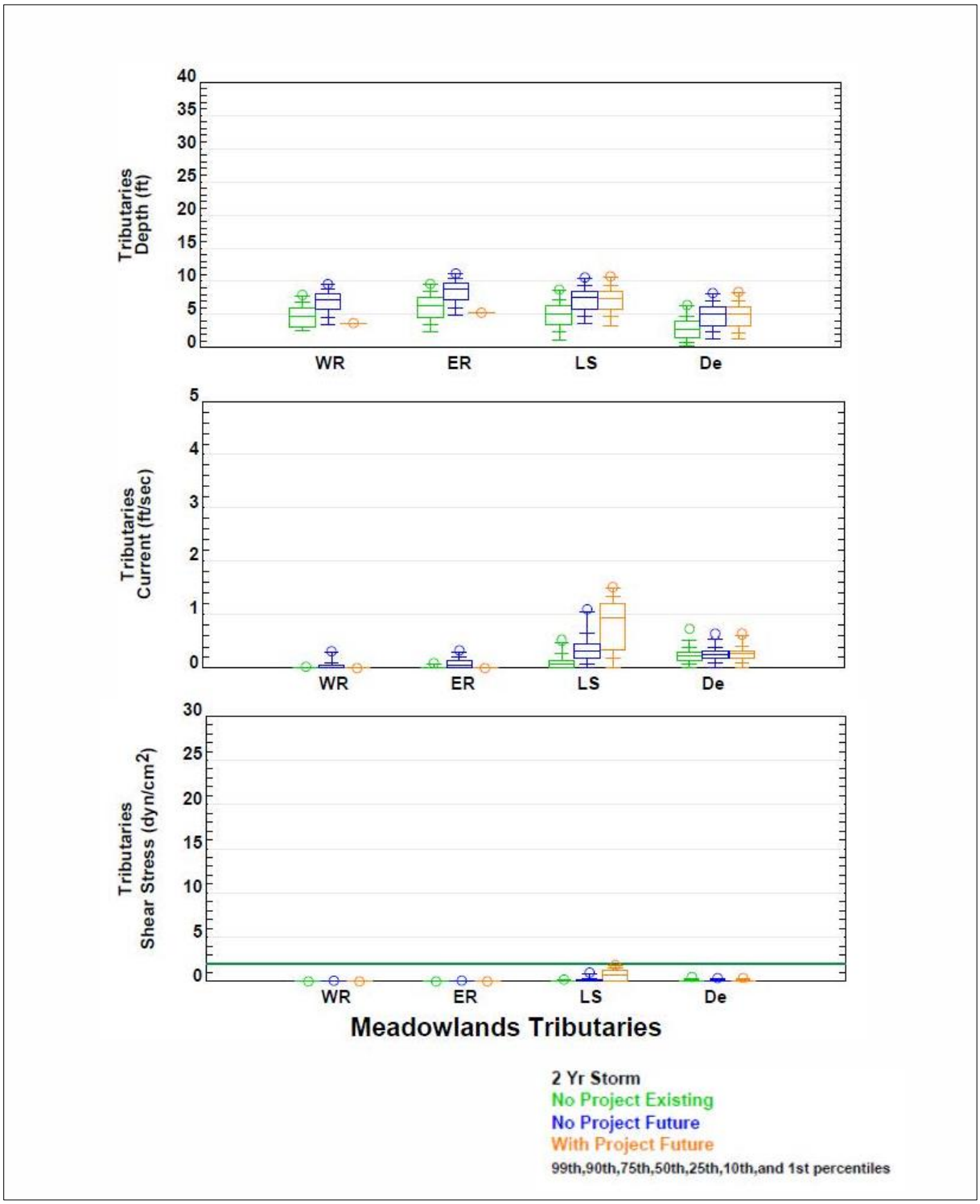


Figure I-28: Alternative 1 Tributary (West Riser, East Riser, Losen Slote, DePeyster) MIKE 21 Model Depth, Depth-Averaged Velocity, Shear Stress for 2-Year Storm

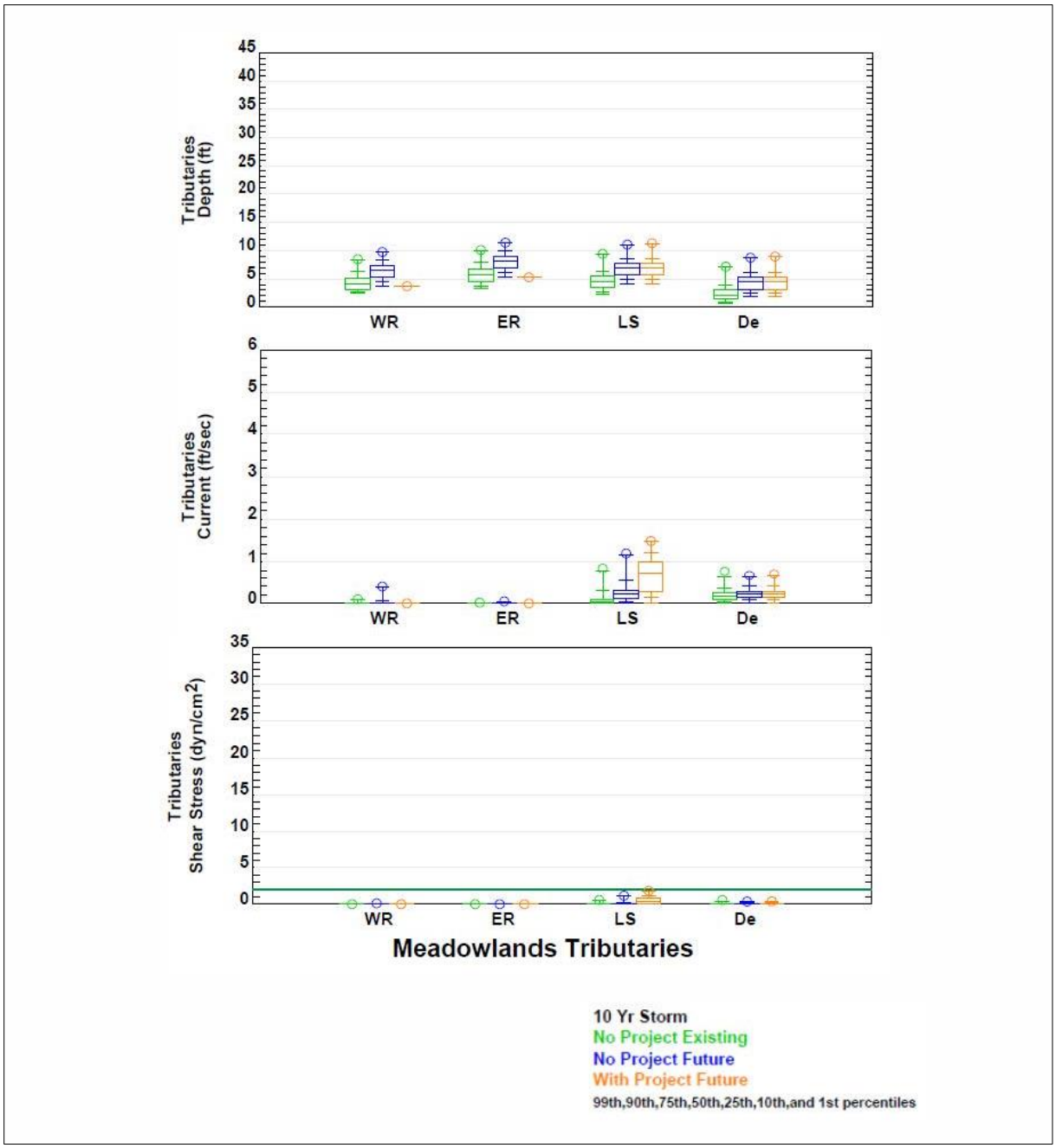


Figure I-29: Alternative 1 Tributary (West Riser, East Riser, Losen Slote, DePeyster) MIKE 21 Model Depth, Depth-Averaged Velocity, Shear Stress for 10-Year Storm

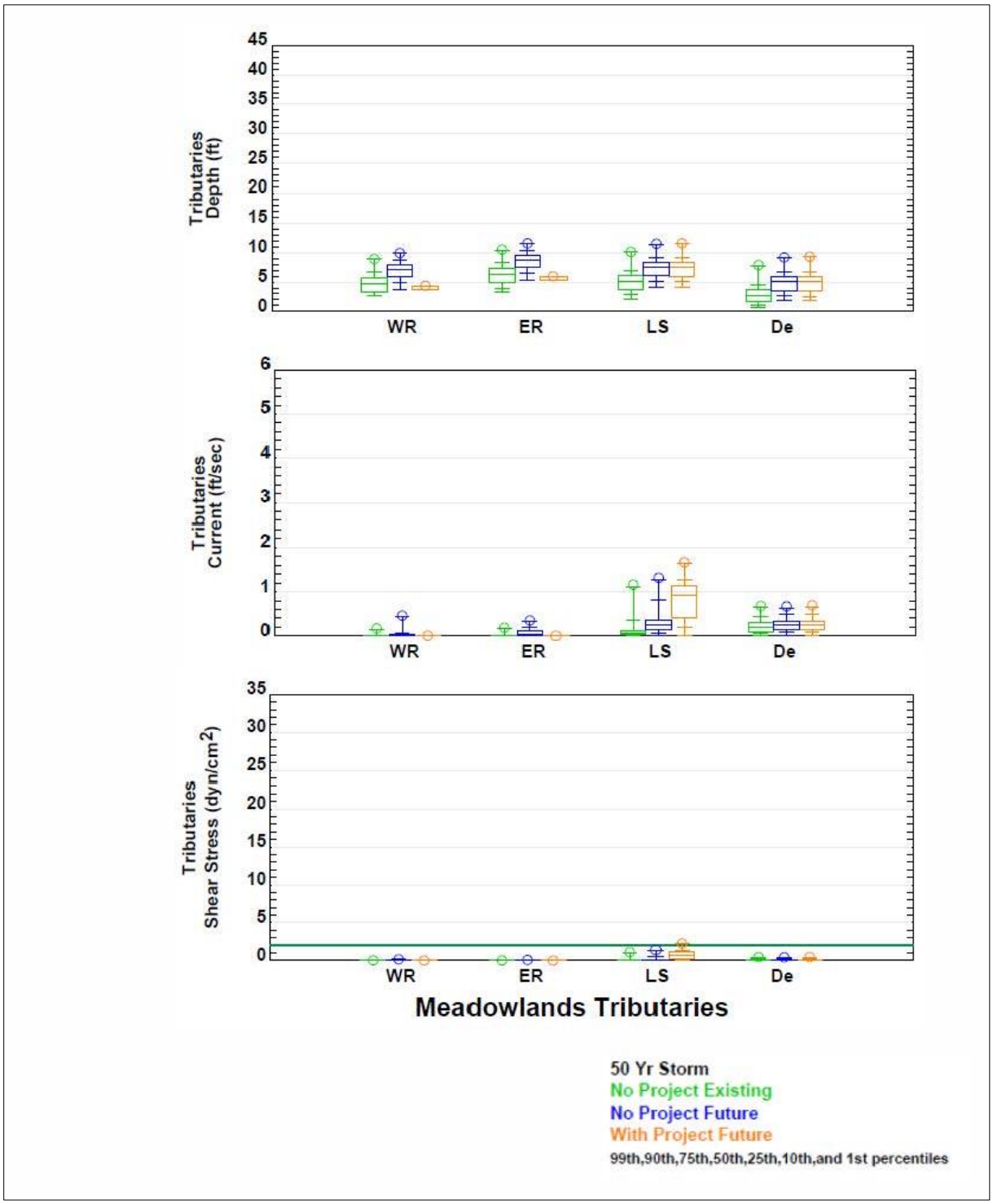


Figure I-30: Alternative 1 Tributary (West Riser, East Riser, Losen Slote, DePeyster) MIKE 21 Model Depth, Depth-Averaged Velocity, Shear Stress for 50-Year Storm

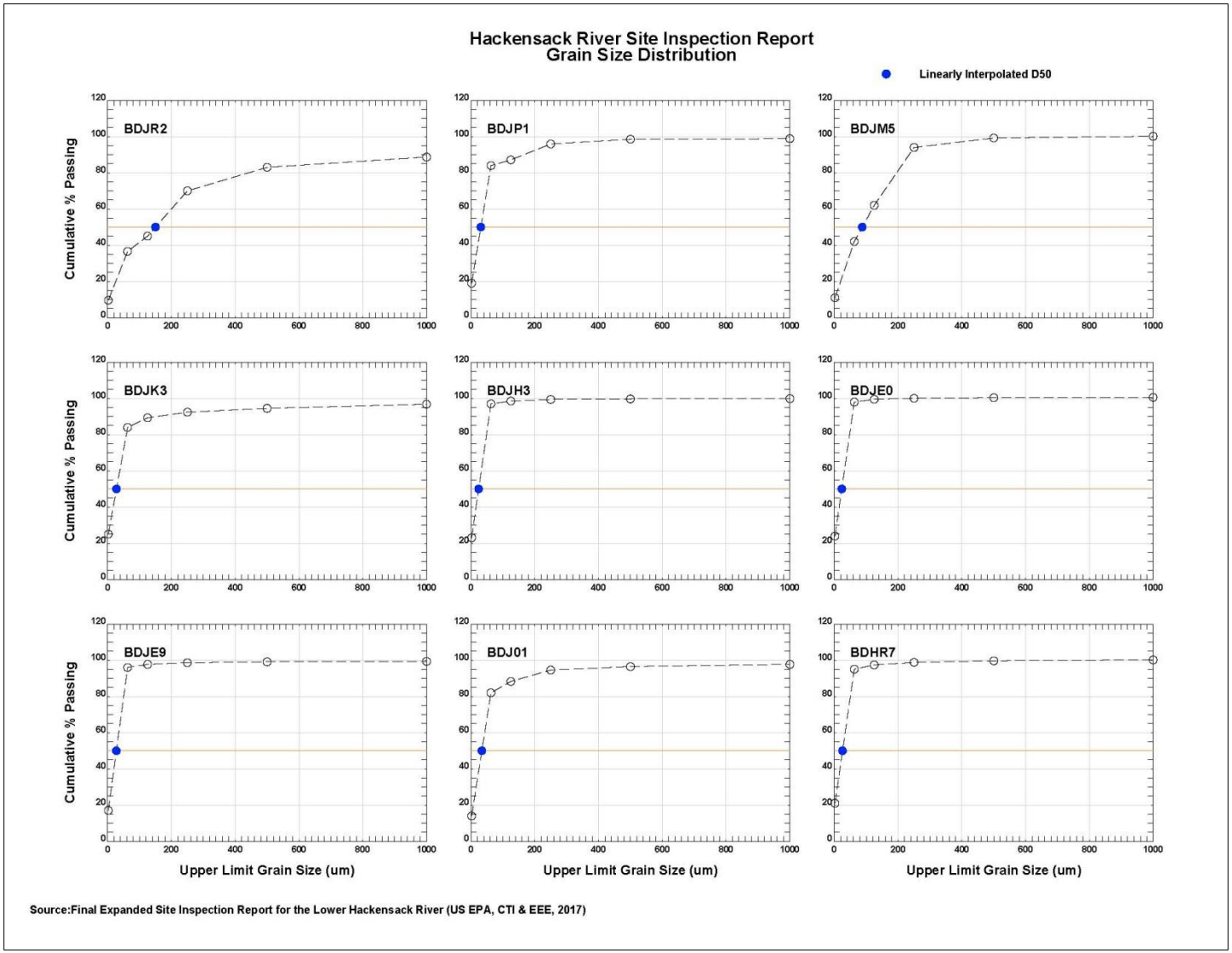


Figure I-31: Grain Size Distributions for Alternative 1 Shear Stress Calculations (Page 1 of 3)

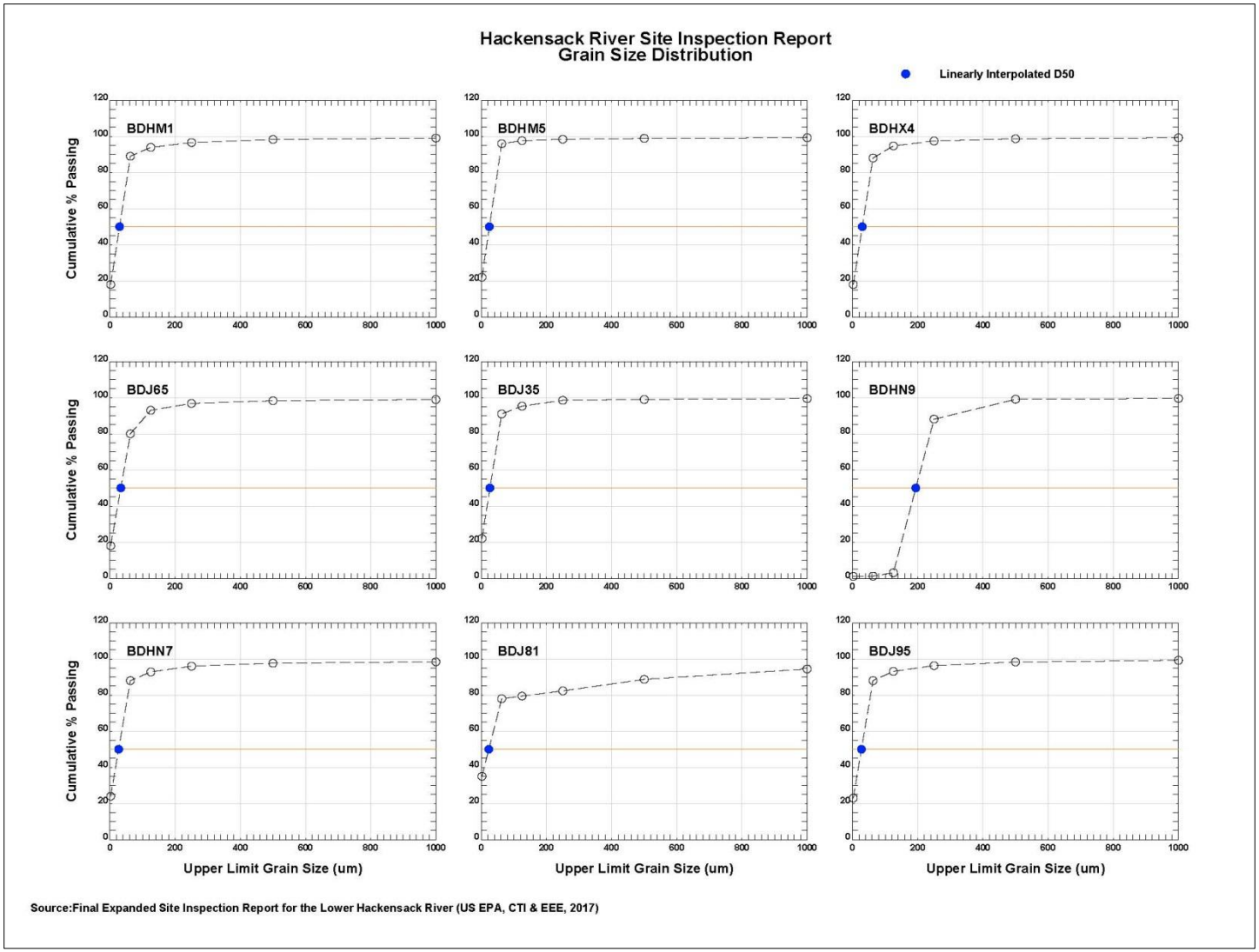


Figure I-32: Grain Size Distributions for Alternative 1 Shear Stress Calculations (Page 2 of 3)

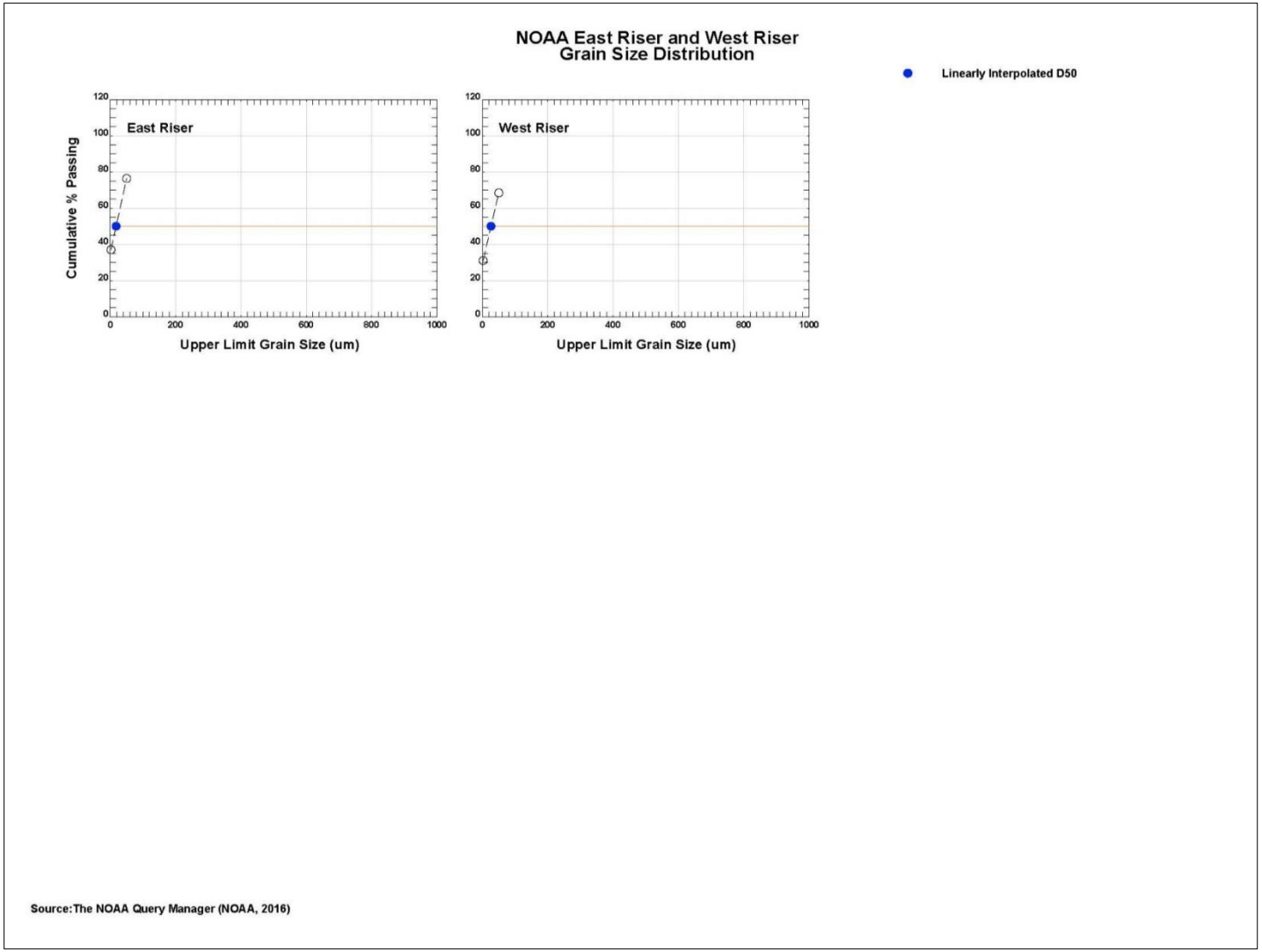


Figure I-33: Grain Size Distributions for Alternative 1 Shear Stress Calculations (Page 3 of 3)

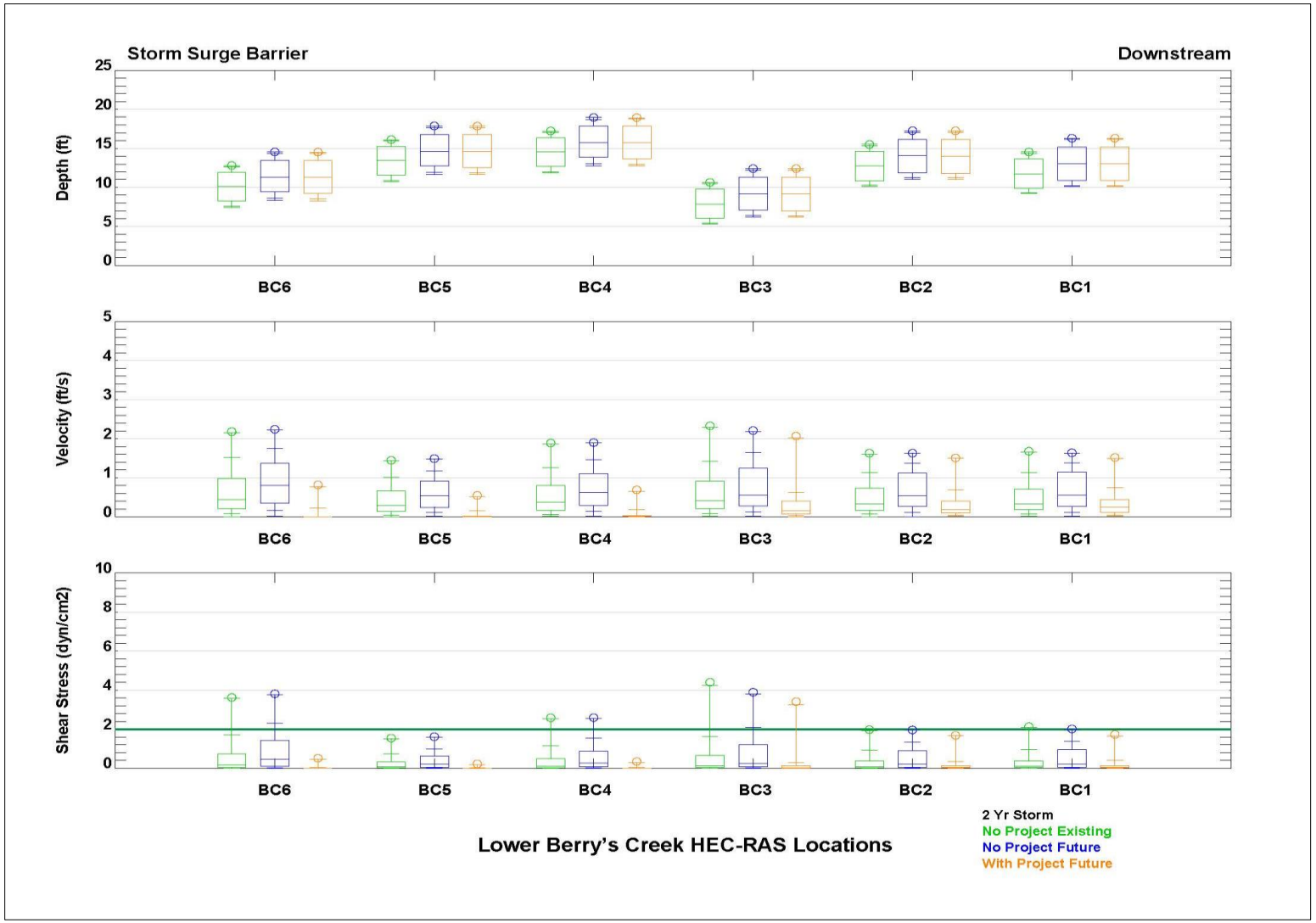


Figure I-34: Alternative 1 Berry's Creek HEC-RAS Model Depth, Depth-Averaged Velocity, Shear Stress for 2-Year Storm

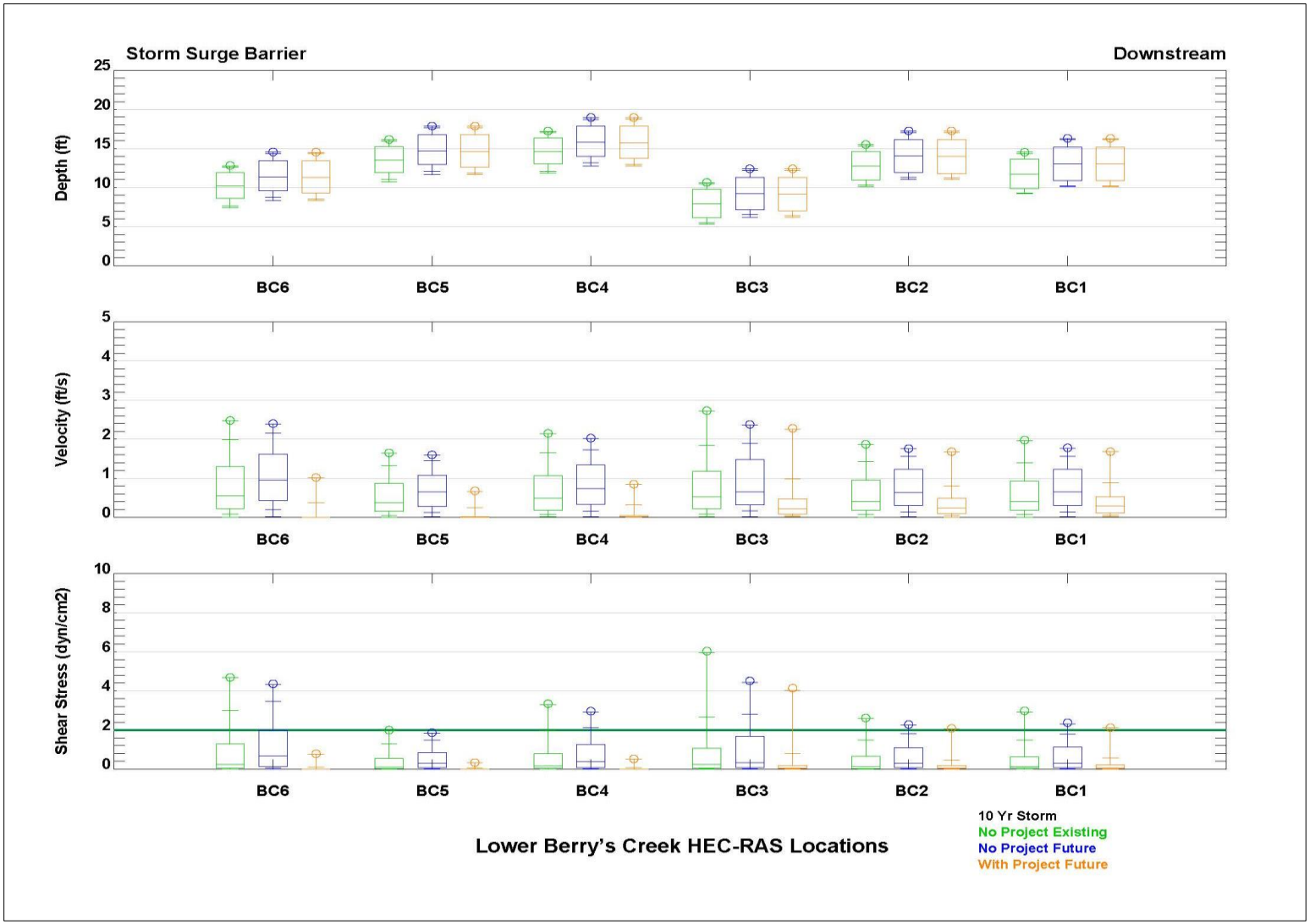


Figure I-35: Alternative 1 Berry's Creek HEC-RAS Model Depth, Depth-Averaged Velocity, Shear Stress for 10-Year Storm

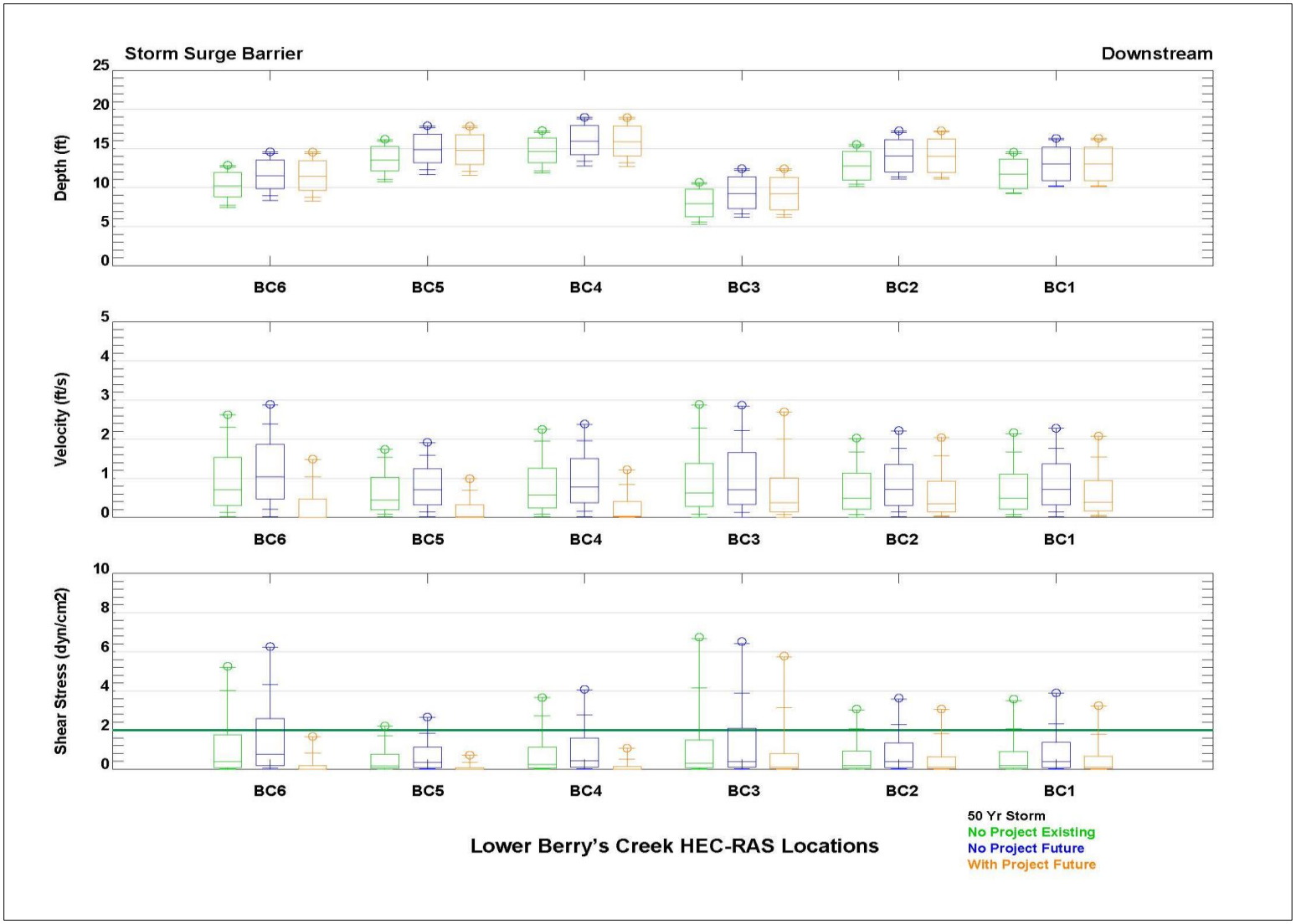


Figure I-36: Alternative 1 Berry's Creek HEC-RAS Model Depth, Depth-Averaged Velocity, Shear Stress for 50-Year Storm

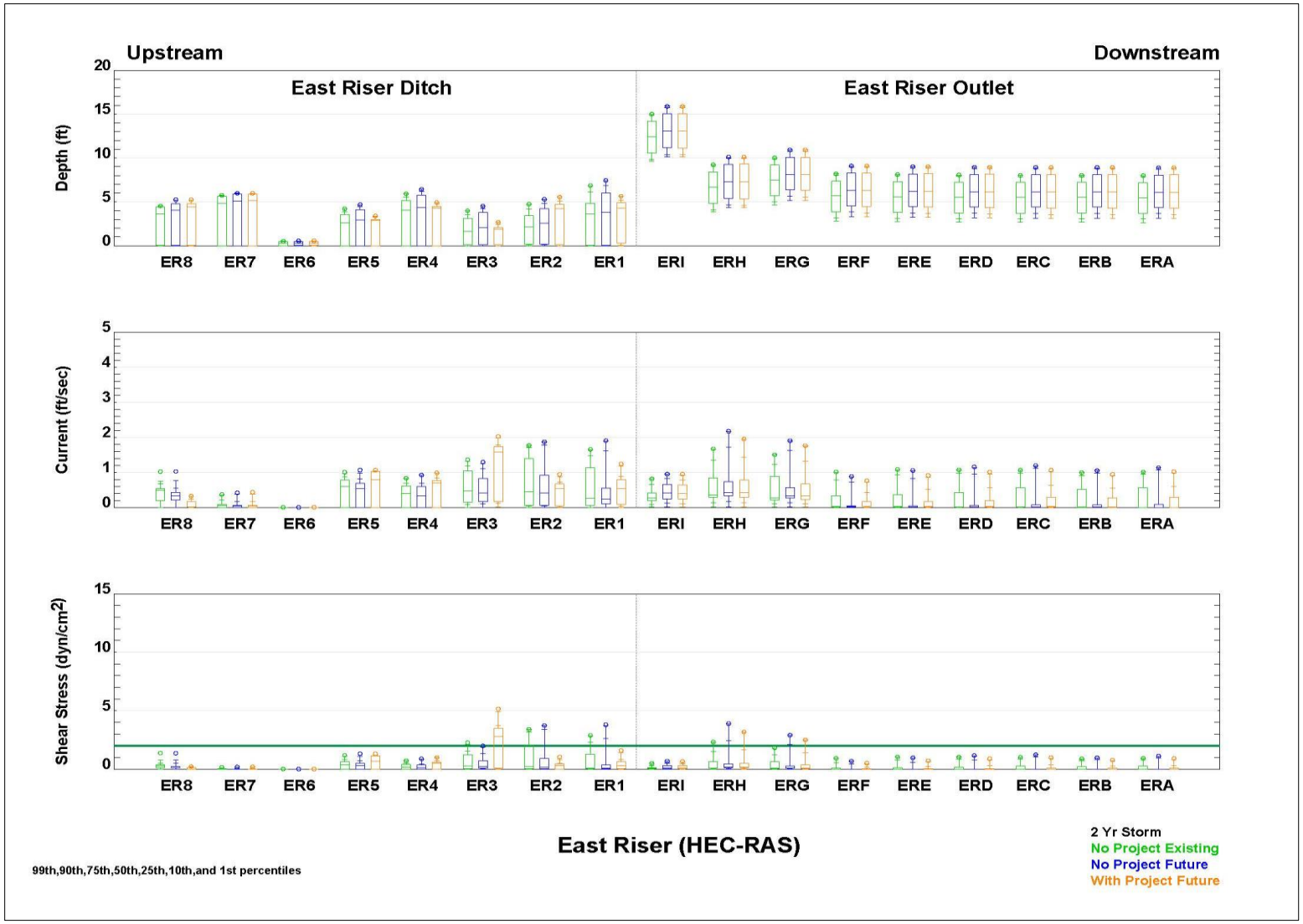


Figure I-37: Alternative 2 East Riser Ditch and Outlet HEC-RAS Model Depth, Depth-Averaged Velocity, Shear Stress for 2-Year Storm

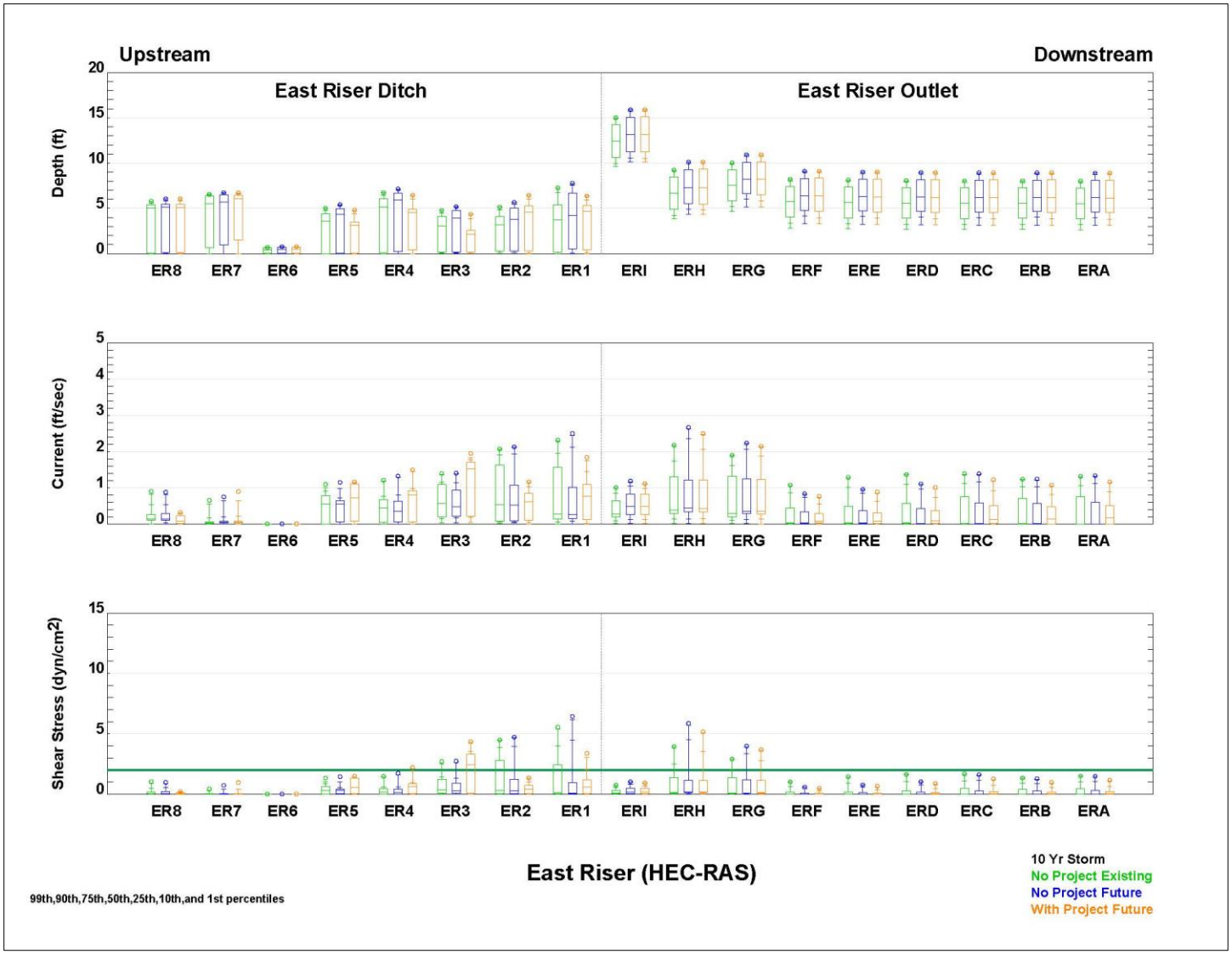


Figure I-38: Alternative 2 East Riser Ditch and Outlet HEC-RAS Model Depth, Depth-Averaged Velocity, Shear Stress for 10-Year Storm

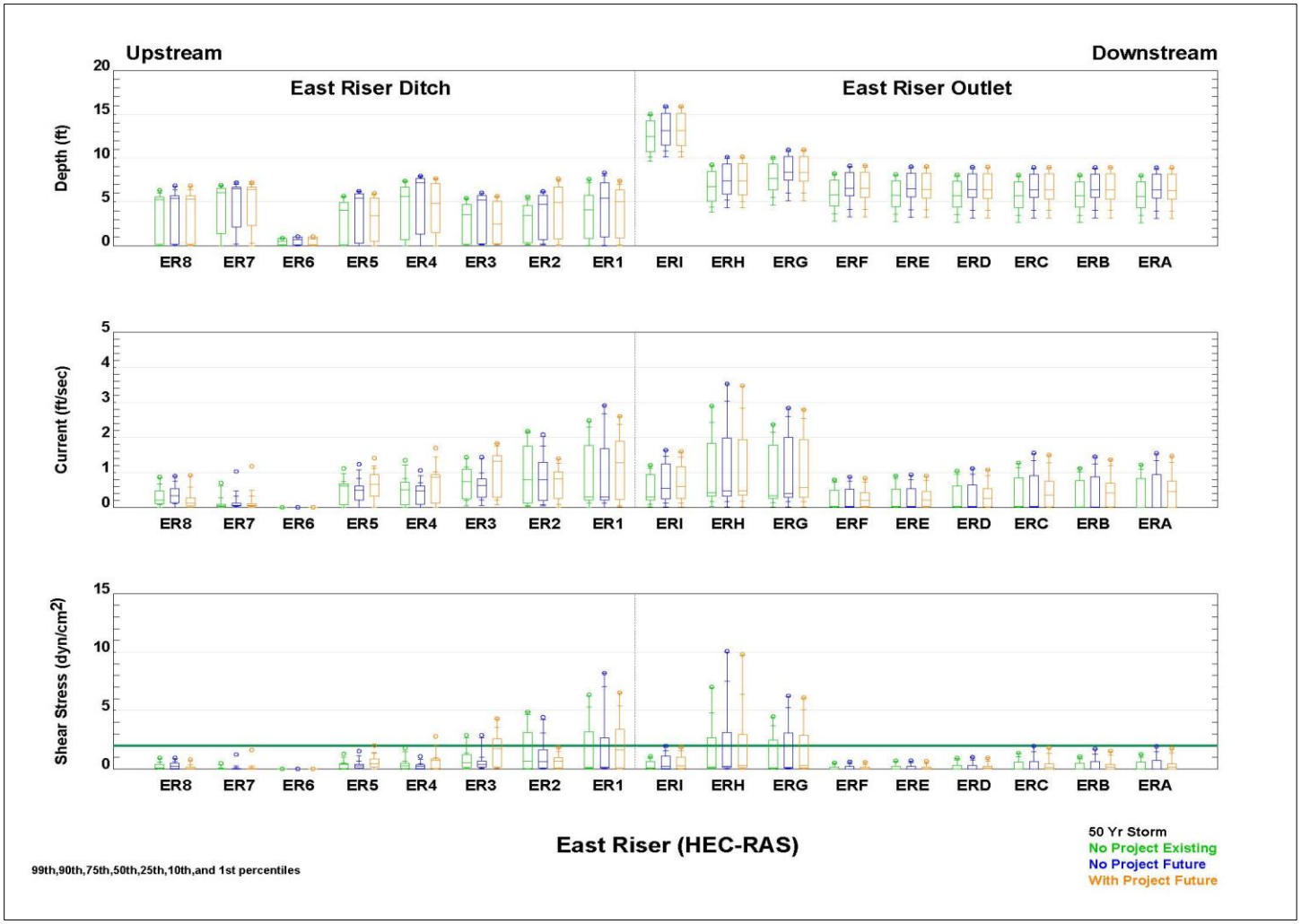


Figure I-39: Alternative 2 East Riser Ditch and Outlet HEC-RAS Model Depth, Depth-Averaged Velocity, Shear Stress for 50-Year Storm

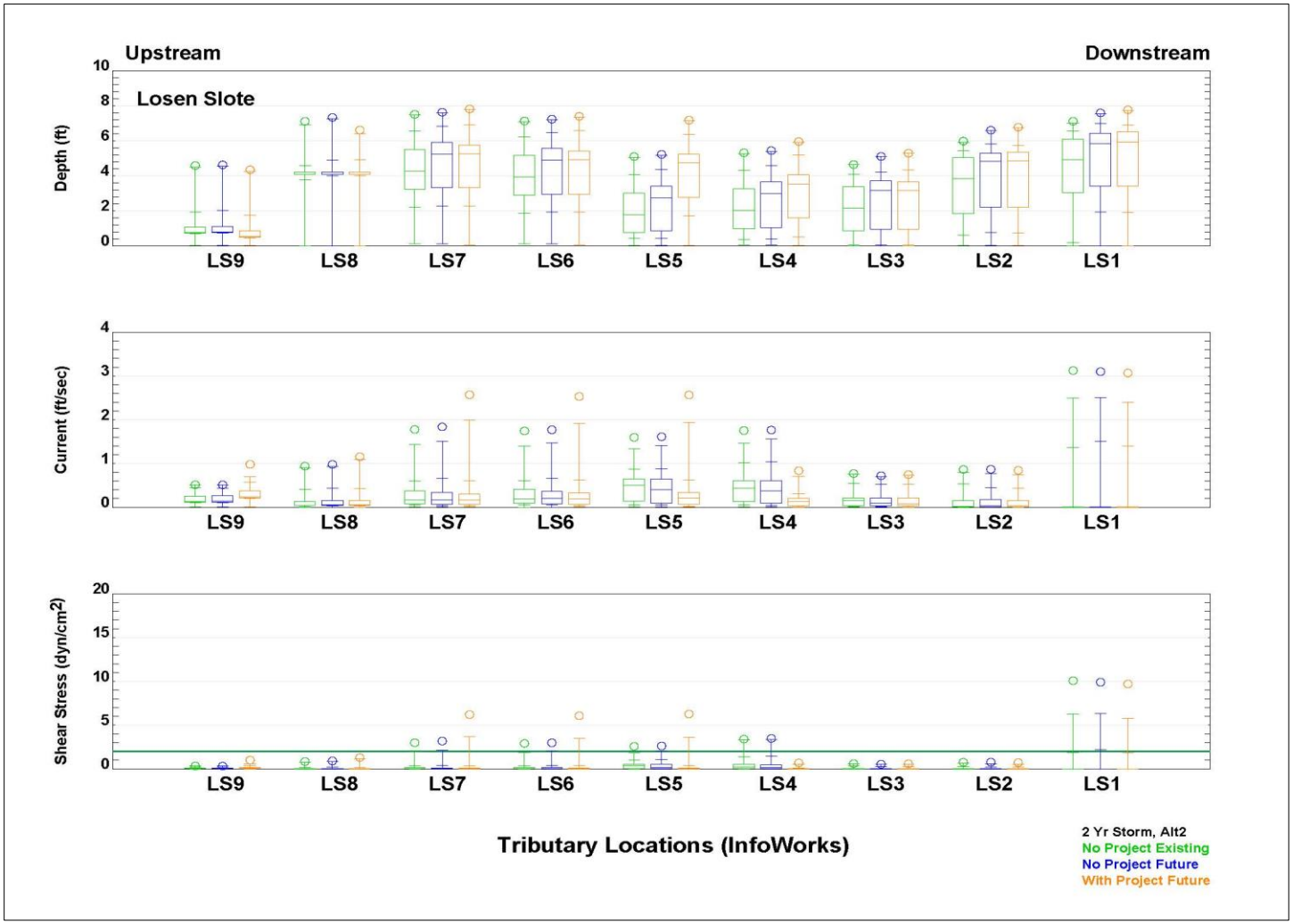


Figure I-40: Alternative 2 Losen Slote InfoWorks Model Depth, Depth-Averaged Velocity, Shear Stress for 2-Year Storm

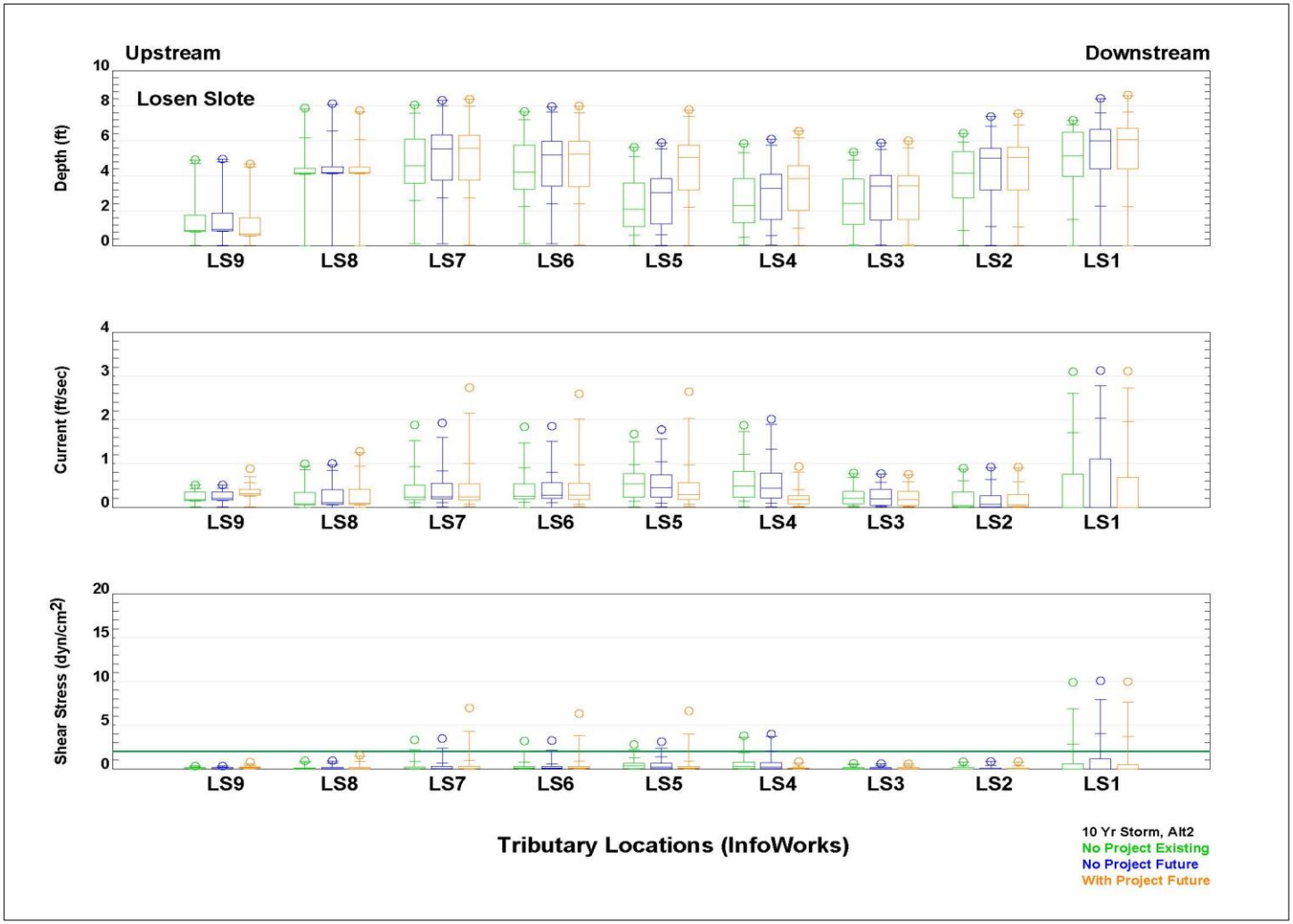


Figure I-41: Alternative 2 Losen Slote InfoWorks Model Depth, Depth-Averaged Velocity, Shear Stress for 10-Year Storm

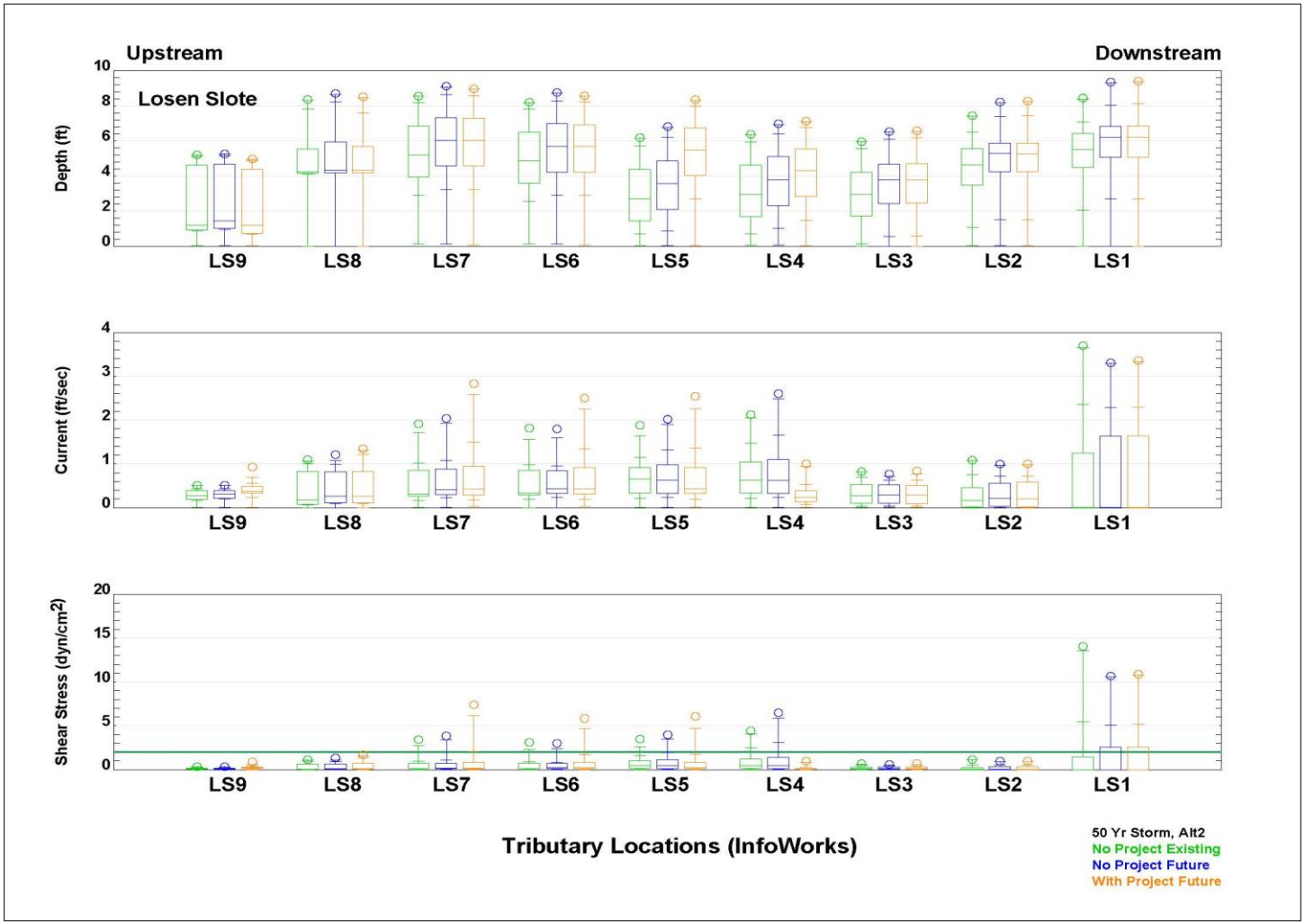


Figure I-42: Alternative 2 Losen Slote InfoWorks Model Depth, Depth-Averaged Velocity, Shear Stress for 50-Year Storm

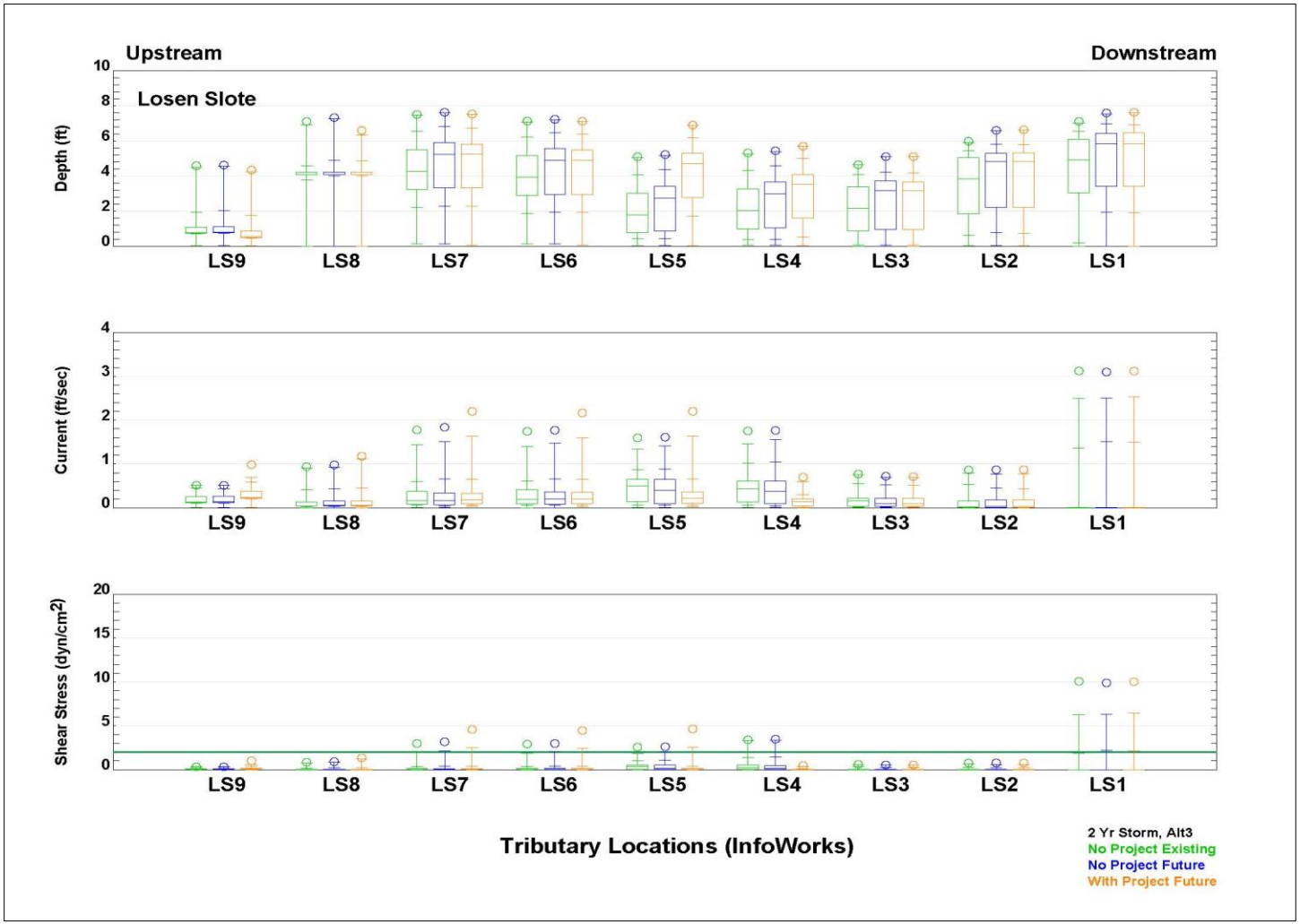


Figure I-43: Alternative 3 Losen Slote InfoWorks Model Depth, Depth-Averaged Velocity, Shear Stress for 2-Year Storm

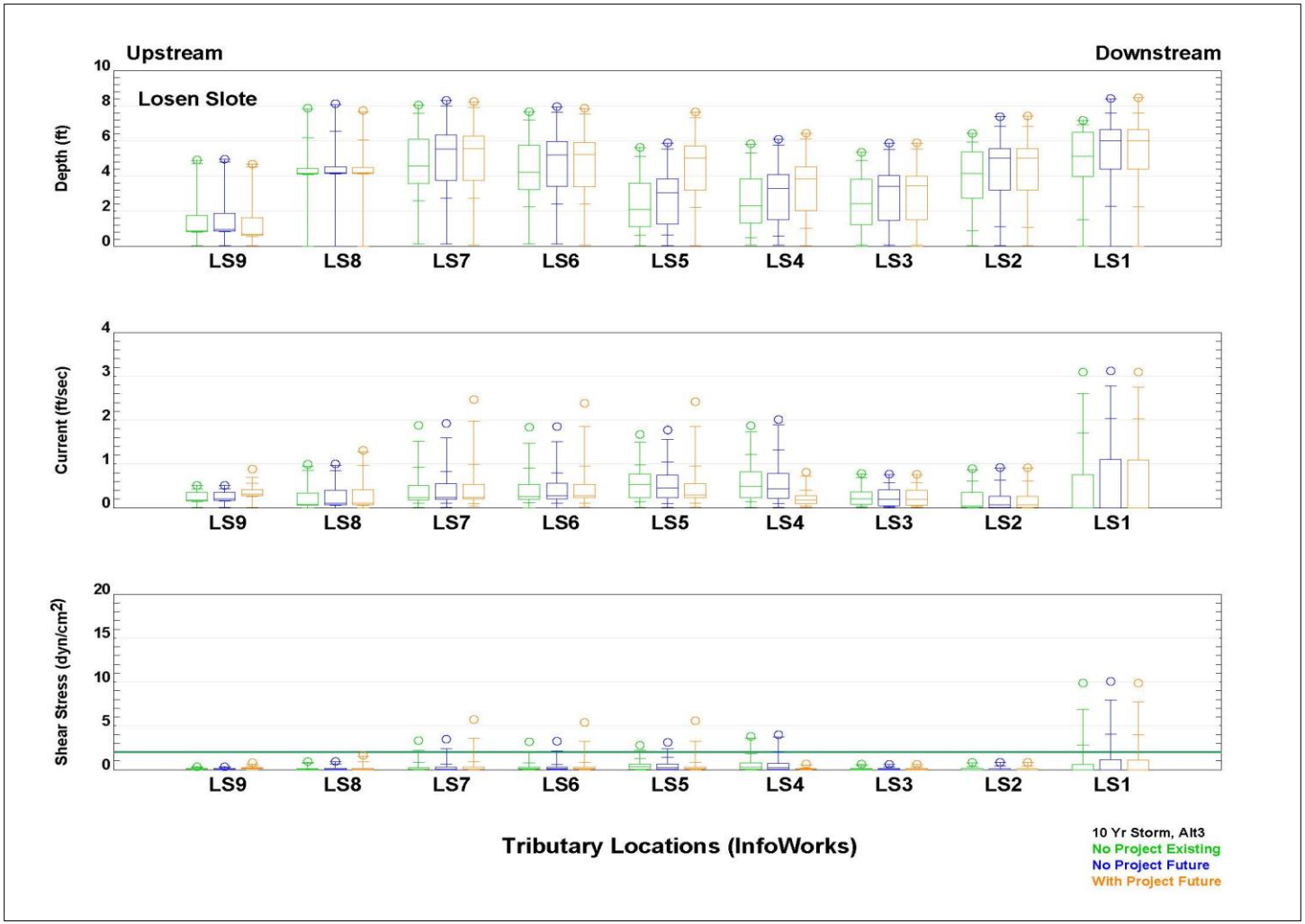


Figure I-44: Alternative 3 Losen Slote InfoWorks Model Depth, Depth-Averaged Velocity, Shear Stress for 10-Year Storm

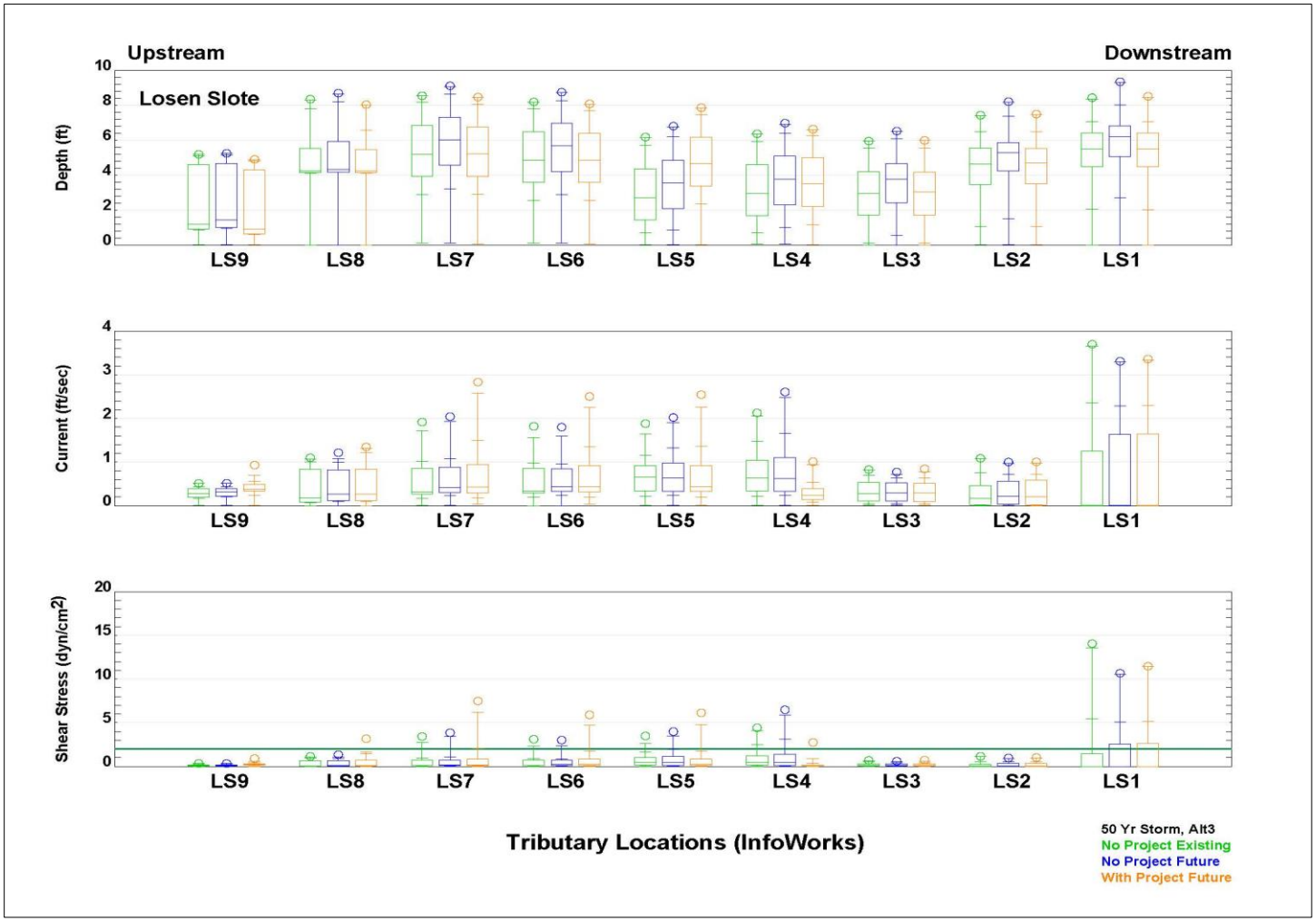


Figure I-45: Alternative 3 Losen Slote InfoWorks Model Depth, Depth-Averaged Velocity, Shear Stress for 50-Year Storm

This Page has been Intentionally Left Blank.

Appendix J: Biological Resources Survey Report

This Page has been Intentionally Left Blank.

Table of Contents

1.0 Existing Information for the Meadowlands District J-1

2.0 Field Survey Methodology J-3

2.1 Habitat Mapping and Evaluation J-3
2.2 Avian (Bird) Surveys J-6
2.3 Mammal Surveys J-9
2.4 Herpetofauna (Reptile and Amphibian) Surveys J-10
2.5 Fish Surveys J-11
2.6 Benthic Invertebrate Surveys J-13

3.0 Biological Field Survey Results J-14

3.1 Habitat Mapping and Evaluation J-14
3.2 Avian Surveys J-15
3.3 Mammal Surveys J-23
3.4 Herpetofauna Surveys J-27
3.5 Fish Surveys J-29
3.6 Benthic Invertebrate Surveys J-31

List of Tables

Table J-1: Descriptions of Avian Survey Locations J-7
Table J-2: Nest Requirements for Raptor Species Recorded within the Project Area J-9
Table J-3: Bat Survey Locations J-10
Table J-4: Dedicated Nocturnal Herpetofauna Survey Dates and Locations J-11
Table J-5: Fish Survey Dates and Locations J-12
Table J-6: Problematic/Invasive Species Observed in the Project Area J-15
Table J-7: Dominant Avian Species - Fall Migration (Sep – Nov) J-17
Table J-8: Dominant Avian Species – Overwintering (Nov-Feb) J-18
Table J-9: Dominant Species Spring Migration (March to mid-June) J-19
Table J-10: Shannon-Weiner Diversity Index for Point Counts J-20
Table J-11: Observed State of New Jersey Protected Species J-21
Table J-12: Mammal Observations – Active Sightings by Location J-24
Table J-13: Passive Sightings by Location J-25
Table J-14: Herpetofauna Species Observed During the 2016 Project Area Field Surveys J-27
Table J-15: Herpetofauna Species Observed During Spring 2017 Project Area Basking Field Survey J-28
Table J-16: Fish Species Identified During Project Area Field Surveys (Summer 2016 – Spring 2017) J-30
Table J-17: Benthic Invertebrate Species Observed in the Project Area During Summer 2016 ..... J-31
Table J-18: Benthic Invertebrate Species Observed in Rock Basket Collections in the Project Area During 2016 ..... J-31

List of Figures

Figure J-1: Grid Pattern for Vegetation Survey in the Project Area J-5
Figure J-2: Raptor Nest Survey Locations Within the Project Area J-8

Attachments

Attachment J-1: Species Lists

Acronyms and Abbreviations

EIS	Environmental Impact Statement
EPW	Evaluation for Planned Wetlands
HMDC	Hackensack Meadowlands Development Commission
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJSEA	New Jersey Sports and Exposition Authority
SVAP	Stream Visual Assessment Protocol

1.0 Existing Information for the Meadowlands District

Over the past 30 years, many studies have inventoried the biological resources present in the Meadowlands District. The New Jersey Sports and Exposition Authority (NJSEA), New Jersey Audubon, and others have conducted a variety of wildlife and vegetation surveys spanning several decades. Several publications have documented these studies and were used to prepare this Environmental Impact Statement (EIS). In a report prepared for the Hackensack Meadowlands Partnership, Kiviat and MacDonald (2002) presented site-specific descriptions of vegetation communities and common wildlife species inhabiting these communities. In the early 2000s, remote sensing was used to classify and map the extent of wetlands in the Meadowlands District as part of the National Wetland Inventory program (Tiner, et al. 2005). Additional surveys and reports documenting the biological resources of the Meadowlands District include a series of assessments repeated at 5-year intervals from 1975 to 1984 by the Hackensack Meadowlands Development Commission (HMDC), now the NJSEA (NJSEA 1975, 1980, 1984). In addition, the NJSEA has prepared a series of species lists for floral and faunal resources documented throughout the Meadowlands District (NJSEA 1987). This section outlines the various studies that have been completed and provides a brief overview of the results that were used to establish the baseline for the affected environment in the Project Area, as discussed in Section 3.14 of the EIS.

Over 330 bird species have been identified in the Meadowlands District (USFWS 2007). Most of these species are migrants on their spring and/or fall migrations that use the Meadowlands District as a stopover area to forage and rest. Approximately 80 species have been documented as summer or permanent residents that breed and/or nest in the Meadowlands District. Upland meadows, patches of woody vegetation that grow primarily on fill, and small remnant forests support a large number of warblers (Parulidae family), vireos (Vireonidae family), kinglets (Regulidae family), and flycatchers (Tyrannidae family) during spring and fall migrations (Kane and Githens 1997). However, limited areas of swamp and upland forest restrict the potential breeding habitat for many sensitive bird species. The Meadowlands District serves as a key stopover point for many migratory birds using the North Atlantic Flyway, and has been designated as an area of special concern under the North American Waterfowl Management Plan (Day, et al. 1999). In addition, the Meadowlands District is an important foraging area for herons (Ardeidae family) that nest in colonies in other areas of the New York/New Jersey Harbor Estuary complex (Day, et al. 1999).

In the Meadowlands District, 22 mammal species have been identified, including four introduced species: house mouse (*Mus musculus*), Norway rat (*Rattus norvegicus*), dog (*Canis familiaris*), and cat (*Felis domesticus*) (USFWS 2007). Most of the reported mammals in the Meadowlands District are common, small- to medium-sized, urban-tolerant species. Mammals common to the Project Area include muskrat (*Ondatra zibethicus*), white-footed mouse (*Peromyscus leucopus*), meadow vole (*Microtus pennsylvanicus*), eastern chipmunk (*Tamias striatus*), eastern gray squirrel (*Sciurus carolinensis*), Virginia opossum (*Didelphis virginiana*), northern raccoon (*Procyon lotor*), and little brown bat (*Myotis lucifugus*) among others (Kiviat and MacDonald 2002, 2004). Less urban-tolerant species include masked shrew (*Sorex cinereus*), eastern mole (*Scalopus aquaticus*), and meadow jumping mouse (*Zapus hudsonicus*) (Kiviat and MacDonald 2002, 2004).

The tidal Hackensack River and its tributaries support a relatively diverse assemblage of fish representing marine, estuarine, freshwater, and coastal migratory species. Characteristic marine and estuarine species include white perch (*Morone Americana*), bluefish (*Pomatomus saltatrix*), Atlantic menhaden (*Brevoortia tyrannus*), gizzard shad (*Dorosoma cepedianum*), Atlantic tomcod (*Microgadus*

tomcod), bay anchovy (*Anchoa mitchilli*), killifish (*Fundulus* spp.), and silversides (*Menidia* spp.). Coastal migratory species include striped bass (*Morone saxatilis*), river herring (*Alosa* spp.), American shad (*Alosa sapidissima*), and American eel (*Anguilla rostrata*) (Anselmini 1974a, 1974b, Ichthyological Associates, Inc. 1979, Bragin, et al. 1989, 2005).

A comprehensive program of fish and benthic invertebrate surveys was conducted throughout the lower Hackensack River during the late 1980s and early 2000s (Bragin, et al. 1989, Bragin, et al. 2005, Bragin, et al. 2009). More than 60,000 fish, representing 36 species, were collected from the Hackensack River and its larger tributaries between 1987 and 1988 using both passive and active gear types. During the 2001 to 2003 re-survey, over 40,000 fish were collected, representing 39 species. The relative abundance of dominant species changed during the 15-year interval between the two studies, including the most abundant species, mummichog (*Fundulus heteroclitus*). Mummichog represented 85 percent of the total collection in the 1987 to 1988 study, but only 40 percent of the total collection in the 2001 to 2003 study; however, it was still the most numerous species collected. The relative abundance of white perch, gizzard shad, and striped bass also increased during the 2001 to 2003 study in comparison to the initial study. However, a few species were more abundant in the 1980s study, including Atlantic tomcod, blueback herring (*Alosa aestivalis*), and pumpkinseed (*Lepomis gibbosus*). These findings suggest an increase in community stability and an overall improvement in water quality (i.e., a probable increase in average dissolved oxygen concentrations) and habitat quality within the Hackensack River over this period.

A comprehensive assessment of benthic invertebrates in the lower Hackensack River was conducted in the late 1980s and again in 2002 (Bragin, et al. 2009). The original survey, conducted in 1987, collected more than 65,000 organisms representing 52 taxa. The benthic community was dominated by gastropods and oligochaetes. The 2002 survey collected more than 215,000 organisms representing 67 taxa. In the 2002 study, the benthic community comprised primarily polychaete worms and amphipods. The results of the 2002 benthic survey were considered indicative of improvements in water and sediment quality over the 15-year interval between the two surveys. However, dominance by only a few generalist taxa in the upper reaches of the river, including the portion of the river contiguous with the Project Area, was still considered indicative of a stressed ecosystem.

Based on previous studies, 18 reptiles have been identified in the Meadowlands District. Quinn (1997) identified four turtle species in the Meadowlands District including diamondback terrapin (*Malaclemys terrapin*), mud turtle (*Kinosternon subrubrum*), snapping turtle (*Chelydra serpentina*), and painted turtle (*Chrysemys picta*). Snapping turtles are common and diamondback terrapins have established a sizeable population in the Meadowlands District (Bragin and Wood n.d.). In addition, one introduced turtle species, the red-eared slider (*Trachemys scripta elegans*), also occurs in the Meadowlands District (Kiviat and MacDonald 2004).

Of the 15 species of snakes occurring in northeastern New Jersey, eight have been reported in the Meadowlands District (Conant and Collins 1991, Kiviat and MacDonald 2002, 2004) and some are reportedly common. These common species include garter snake (*Thamnophis sirtalis*), eastern milk snake (*Lampropeltis triangulum*), and northern brown snake (*Storeria dekayi*) (Kiviat and MacDonald 2002, 2004). Ten of the 26 species of amphibians known to occur in northeastern New Jersey have been reported in the Meadowlands District; however, documentation is limited for six of these species (Conant and Collins 1991, Kiviat and MacDonald 2002, 2004). A New Jersey Turnpike Authority study (1986) recorded only two amphibian species in the Meadowlands District: green frog (*Lithobates clamitans*) and Fowler's toad (*Anaxyrus fowleri*). No salamanders have been reported. In a frog call

survey completed in 2006, Atlantic Coast leopard frog (*Rana sphenocephala utricularia*) was the only species reported (Kiviat 2011).

Butterfly (Lepidoptera) and dragonfly/damselfly (Odonata) surveys conducted in 2006 recorded 25 species of butterfly and 24 dragonfly/damselfly species in the Meadowlands District (Kiviat and Barbour 2007). NJSEA (2015) listed the following species of butterflies and moths as occurring in the Meadowlands District: monarch (*Danaus plexippus*), eastern tiger swallowtail (*Papilio glaucus*), black swallowtail (*Papilio polyxenes*), great spangled fritillary (*Speyeria cybele*), viceroy (*Limenitis archippus*), common buckeye (*Junonia coenia*), cabbage white (*Pieris rapae*), orange sulphur (*Colias eurytheme*), pearl crescent (*Phyciodes tharos*), red admiral (*Vanessa atalanta*), question mark (*Polygonia interrogationis*), painted lady (*Cynthia* spp.), silver-spotted skipper (*Epargyreus clarus*), broad-winged skipper (*Poanes viator*), summer azure (*Celastrina neglecta*), common sootywing (*Pholisora catullus*), wild indigo duskywing (*Erynnis baptisiae*), eastern tailed-blue (*Cupido comyntas*), eight-spotted forester moth (*Alypia octomaculata*), and clear-winged moth (*Hemaris thysbe*).

In addition to the studies that have been conducted throughout the Meadowlands District and the Project Area, site-specific field surveys were conducted in the Project Area for various resources (i.e., plants, birds, mammals, reptiles/amphibians, fish, and benthic invertebrates) beginning in late summer/early fall 2016 to supplement the existing information from past surveys. Data from these field surveys have been incorporated into **Section 3.0** of the EIS and **Section 3.0** of this appendix. The methodology used to complete the surveys as well as additional details and analyses are provided in **Section 2.0** below.

2.0 Field Survey Methodology

Although many of the wetlands and uplands within the Meadowlands District are well studied, there is no record of documented studies for much of the Project Area. Moreover, a portion of the Project Area lies outside of the Meadowlands District and it too has no record of being investigated. The field surveys for this Proposed Project were targeted to primarily investigate areas that lack documented studies. Available records of previous studies were then used to supplement the collected data to provide a thorough representation of the ecological resources in the Project Area.

The following sections describe the methodologies used by the Project team to conduct surveys for various biological resources, including plants, birds, mammals, reptiles/amphibians, fish, and benthic invertebrates within the Project Area. Field surveys began in the late summer/early fall of 2016 and continued through the summer of 2017. A summary of the survey results is presented in **Section 3.0** of this appendix.

2.1 Habitat Mapping and Evaluation

Habitat mapping was completed by first conducting a desktop review of existing spatial information followed by a field mapping program. The review of spatial information included aerial maps, the New Jersey Department of Environmental Protection (NJDEP) Mapped Wetland data, and the United States Geological Survey Land Use/Land Cover information. Spatial data were either confirmed in the field or corrected as necessary. Afterwards, habitat polygons were often mapped at a much higher degree of detail. The communities in each mapped polygon were characterized following the classification scheme outlined in the Ecological Communities of New York State (Edinger, et al. 2014). The Project Area is located within 3 miles of New York State and has similar species and communities to those found in southern New York State and around the New York City area; therefore, this particular habitat

classification scheme is appropriate and preferred for the characterization. Dominant vegetation was then identified for each mapped habitat and detailed in-depth vegetation surveys were completed in select parcels and significant natural areas. A list of observed species is provided in **Attachment J-1**. To supplement the vegetation data, field surveys for wetland functions and stream morphology and hydrology were completed using the Evaluation for Planned Wetlands (EPW) method for wetlands and the Stream Visual Assessment Protocol (SVAP) for streams. The EPW and SVAP methodology and preliminary results are provided in **Appendix L**.

A team of wetland scientists and ecologists completed the field investigations and assessments to support habitat mapping and evaluation, and to quantify the existing conditions in the Project Area. To summarize, the habitat mapping exercise was executed as follows:

- Natural habitats in the Project Area were mapped.
- Select habitat areas were then evaluated in the field. The field team examined the adjacent wetlands, stream channels (if present), and surrounding upland buffers. Field data collection included location of specific features, photographs, and hand-sketches of existing terrestrial and aquatic habitats and vegetative communities. A vegetation survey was completed and habitats were classified in accordance with Edinger, et al. (2014).
- The field team noted conditions and features that support the EPW and SVAP assessments. A description of these conditions and features is described in **Appendix L**.

2.1.1 Vegetation Surveys

A vegetation survey was conducted by botanists during the late summer/early fall of 2016 within a variety of large habitat complexes and selected sites within the Project Area. The selected sites included upper Berry's Creek, Losen Slote Creek, East and West Riser Ditches, Peach Island Creek, Teterboro Woods, and several large open spaces and parks along the main stem of the Hackensack River.

First, basic habitat types were identified based on observed vegetation cover. Meander surveys were then conducted in each habitat, and the dominant vascular plant species were noted. In higher quality habitats, the team documented all observed vascular plant species in addition to the dominant species. Each mapped habitat and its observed plant species were entered into a database and assigned a unique identifier that corresponded with the alpha-numeric vegetation sampling grid. The sampling grid for the vegetation surveys is presented in **Figure J-1**.

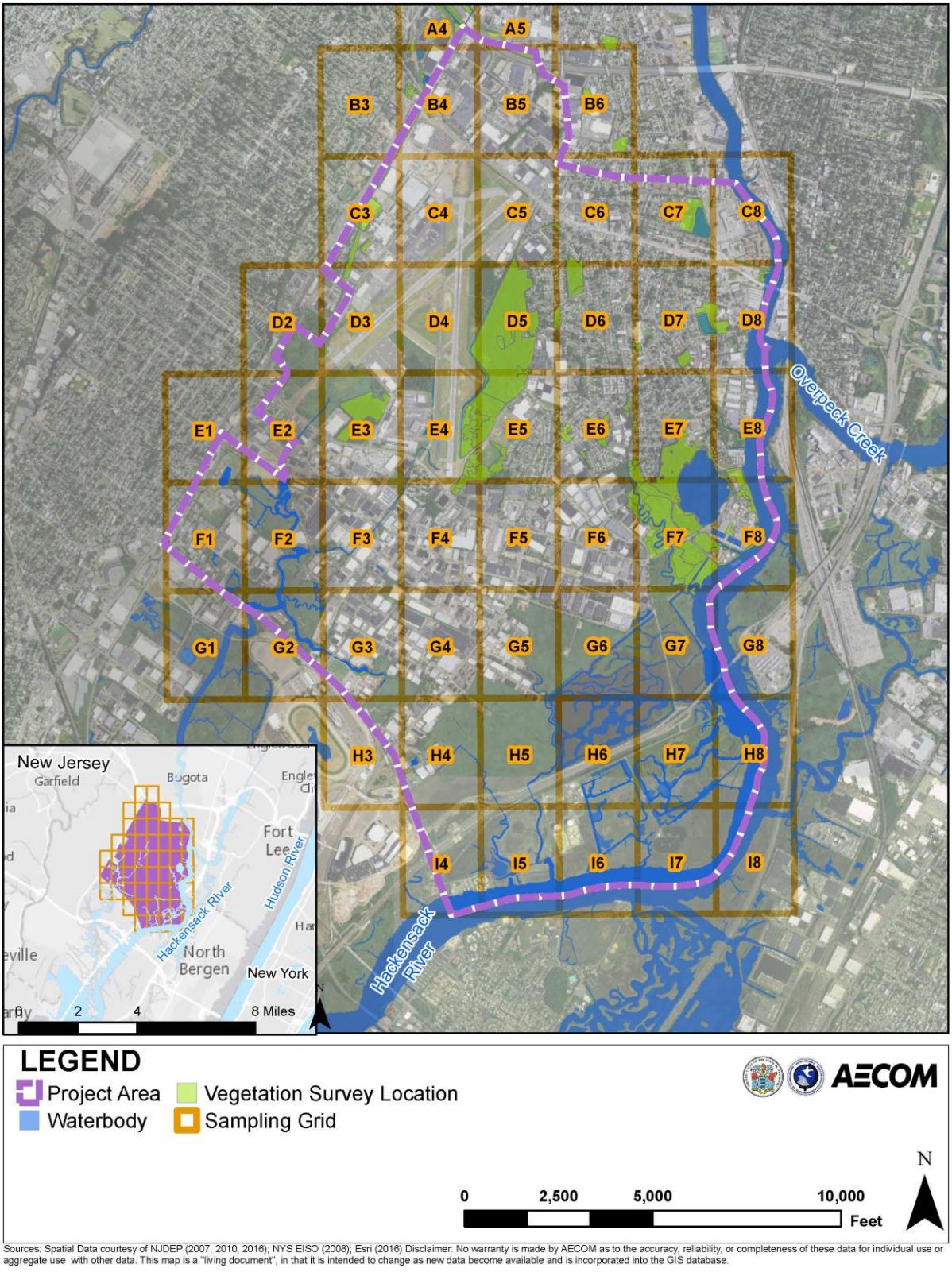


Figure J-1: Grid Pattern for Vegetation Survey in the Project Area

2.2 Avian (Bird) Surveys

Much of the Project Area (approximately 66 percent) is subject to dense commercial and residential development. Undeveloped areas (natural areas) are generally limited to the marshes in the southern portion of the Project Area, within the lower portions of the Berry's Creek and Losen Slote drainages, and the wooded areas within the confines of Teterboro Airport. Despite the majority of the Project Area being developed, the Meadowlands District and the natural areas within the Project Area do provide valuable habitat resources for avifauna. In order to determine site usage and better understand avian presence/absence on the Project Area, a year-long avian survey was conducted. During the migration and overwintering periods, ten locations were surveyed, while during the spring, 12 locations were surveyed. The survey sites cover a wide range of habitat: in wetlands (forested and herbaceous), along rivers and creeks and other waterbodies, and in and among industrially developed areas (known as "structure" habitat). Overall, these sites are in the easternmost and westernmost portions of the Project Area.

To characterize avian populations, the Project team initiated an avian survey program in the Project Area in the late summer/early fall of 2016. The avian surveys were continued in winter 2016-2017 and spring 2017. Avian surveys were conducted according to the following schedule:

- Fall Migration - September to mid-November (weekly)
- Overwintering - Mid-November to March (tri-weekly)
- Spring- March to early June (weekly)
- Summer - (mid-June to early August) (spot check surveys)

Three censusing techniques were used to identify avifauna in the Project Area: point counts, transects, and raptor nest surveys. These techniques are described below.

2.2.1 Point Counts

The team conducted avian surveys from up to 14 specific locations, listed in **Table J-1**, throughout the Project Area. At seven of these locations, point count surveys occurred weekly (AA-1, CM-1, IL-1, HR-1, HR-2, HR-3, and LS-1). At locations LS-2, PC-1, and TE-1, point count surveys occurred seasonally (i.e., locations were surveyed three times during a two-week period during each season). The weekly surveys were conducted near the Build Alternative footprints, while the seasonal surveys were conducted at other points within the Project Area to provide more comprehensive coverage. Ornithologists typically conducted surveys for two hours, beginning shortly before sunrise from a fixed location with clear lines of site. Surveys included recording all observed species, time of sighting, number of individuals, direction and distance from surveyor, whether the sighting was visual or audible, habitat use of the species (e.g. open water, structure, upland, wetlands), and the behavior the bird was displaying (e.g. resting, calling, feeding, swimming, flying). If a bird was flying at high altitude over the location, that particular behavior was recorded as "passive." Often it is difficult to determine the habitat/location of birds that are observed as "passive," therefore, these identifications are analyzed separately in the results section. The sighting distance was estimated in increments of 0 to 250 feet, 251 to 500 feet, 501 to 1,000 feet, 1,001 to 1,500 feet, 1,501 to 2,000 feet, and greater than 2,000 feet. All efforts were made not to count the same bird twice during an observation period.

Table J-1: Descriptions of Avian Survey Locations

Location	Description
AA-1	Amor Avenue, a dense industrial/commercial area adjacent to a small stream/ditch with engineered banks
BC-1	Starke Road, East Riser Ditch at tide gate to Berry's Creek, successional forest and marsh shoreline (west), industrial/commercial development (east)
BC-2	South side of Paterson Plank Road along Berry's Creek, industrial/commercial shoreline (west side), marsh to south and east
CM-1	Commerce Avenue, where a road separates dense commercial/industrial (north side) from large marshes (south side)
CM-2	Commerce Avenue, site located along berm/pipeline road through large tidal marsh
HR-1	Hackensack River, developed shoreline
HR-2	Hackensack River, interface between developed shoreline and open marshes
HR-3	Hackensack River, site adjacent to large marshes
IL-1	Indian Lake, suburban park with ballfields, maintained lawn, and pond
LS-1	Losen Slote Creek, successional shrubland and young riparian/floodplain forests near dense industrial/commercial development
LS-2	Losen Slote Creek, mature forested habitat adjacent to residential neighborhoods
LS-3	Losen Slote Creek, marsh and successional shrubland (south and west), industrial BCUA property (north/northeast)
PC-1	Peach Creek, marshes adjacent to heavy development and large roads
TE-1	Teterboro Airport, dense forested area in the eastern portion of the Teterboro Airport property

2.2.2 Transects

Although point counts were the main method of bird observations, transect surveys were also performed simultaneously with the point count surveys at locations CM-1, CM-2, LS-1 and LS-3. These locations represent large marsh/wooded habitats. In the spring of 2017, transect surveys were performed to identify any "cryptic" species (ones that are not as easily visible) that otherwise would not have been sighted in point count surveys. Observations were made at five minute intervals at fixed locations along the transects. These surveys were only completed in May and June of 2017.

2.2.3 Raptor Nest Survey

Raptors, commonly referred to as "birds of prey," include hawks, owls, eagles, falcons, and vultures. To understand the type and number of raptors within the vicinity of the Build Alternatives, raptor nest surveys were completed in the winter and early spring of 2017. Investigations were conducted on February 16 and April 3, 4, 10, and 13 in 2017. During the investigations, the team walked through the Project Area's anticipated Build Alternative footprints with binoculars and routinely scanned the areas for the presence of raptor nests. Surveys generally occurred within 200 feet of the proposed alignments in natural areas and/or other areas that would be considered suitable raptor nesting sites (**Figure J-2**).

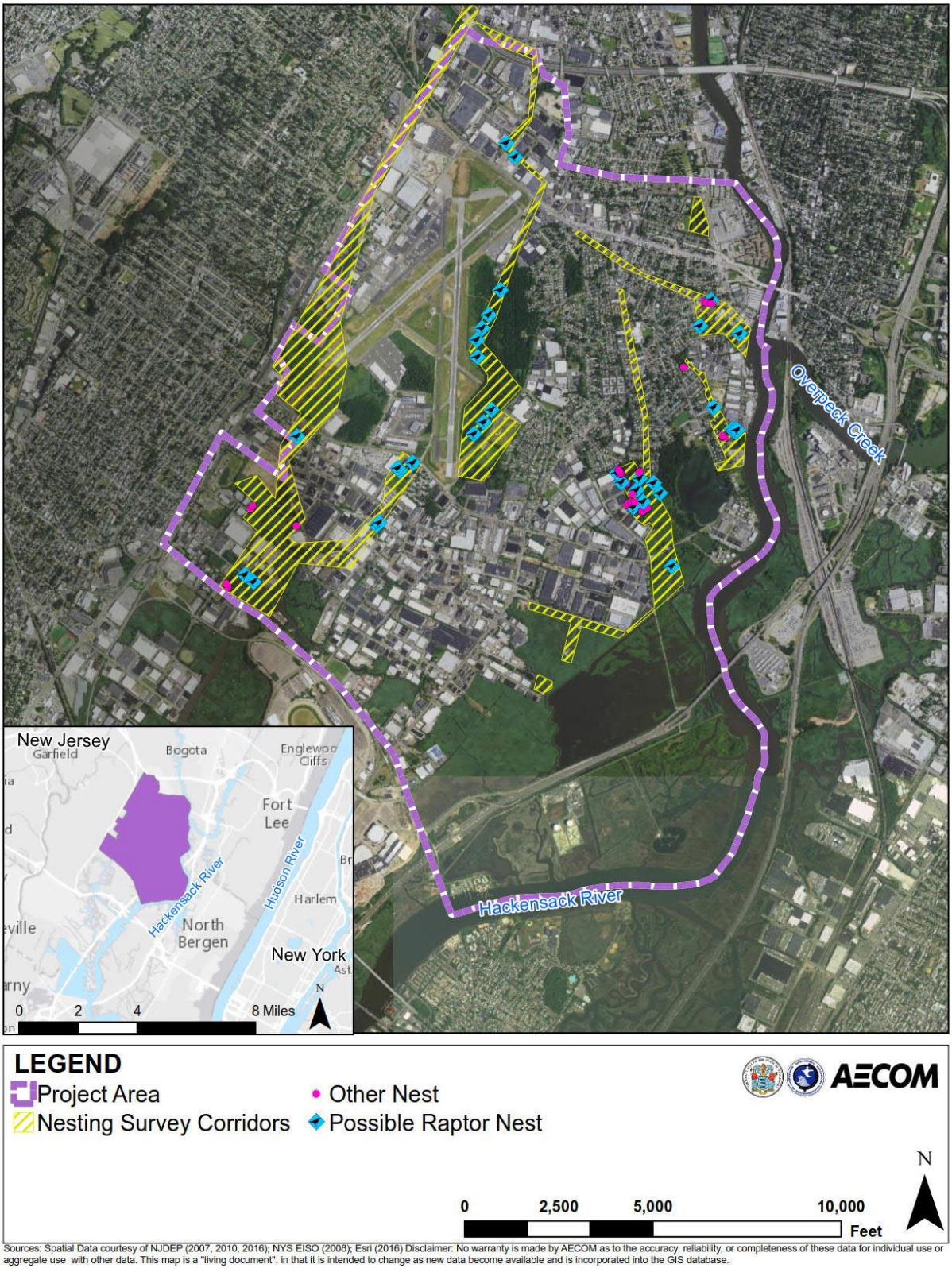


Figure J-2: Raptor Nest Survey Locations Within the Project Area

In general, raptor nests are stick nests located in the major fork of a large tree, but some species can also nest in tree cavities, on the ground, or in/on artificial structures. Typical nest requirements for raptor species recorded within the Project Area are identified in **Table J-2**.

Table J-2: Nest Requirements for Raptor Species Recorded within the Project Area

Species	Nest Substrate	Nest Size	Nest Material
American kestrel	Cavities or artificial structures	9 inches diameter	Scrape
Bald eagle	Super canopy tree	5-6 feet diameter	Sticks weaved with softer material
Black vulture	Ground	N/A	None
Broad-winged hawk	Deciduous and coniferous trees located in the lower third of the canopy	1-2 feet diameter	Sticks for main structure, bark and plant material for nest cup.
Cooper's hawk	Deciduous tree crotch	2 feet diameter	Sticks
Great horned owl	Cavity or tree nest of other species	Highly variable	Sticks
Merlin	Reuse old nests of other species such as crows and hawks	Variable	Variable
Northern harrier	Ground	2 feet diameter	Thick stalk plant material
Osprey	Snag, treetop, cliff or artificial platform	2.5 feet diameter	Sticks
Peregrine falcon	Ledges/cliffs	N/A	Scrape
Red-tailed hawk	Crown of tall trees, cliff ledge, or artificial structure	Up to 6.5 feet diameter	Sticks
Sharp-shinned hawk	Conifers	1-2 feet diameter	Broad flat mass of dead twigs

Source: (The Cornell Lab of Ornithology 2017)

2.3 Mammal Surveys

The Project team conducted mammal surveys within the Project Area by employing the following survey methods and tools:

- **Track Plates.** These devices record the footprints of mammals. Track plates were baited and placed throughout the Project Area during the afternoon, and then were checked the next morning. All prints were identified to the greatest extent practicable. A total of 14 plates were placed at seven locations for six nights in the fall of 2016 and three nights in the winter of 2017.
- **Nocturnal Surveys.** Nocturnal vertebrate fauna surveys were conducted within the Project Area on the nights of September 21, 22, 26, 27, and 28; October 25, 26, and 31; and November 1 in 2016, and February 1-3; April 13 and 20; May 3, 10, 11 and 24; and June 1 in 2017. Prior to these surveys, the Project team examined aerial photographs and selected survey sites based on proximity to natural habitats. During each survey effort, the Project team quietly walked to a selected location to establish a stationary survey position. The scientists then turned off all

illuminating devices and only communicated with low voices. For up to 30 minutes, the scientists passively surveyed their surroundings with night vision optics and recorded all animal species observed, whether flying, arboreal (tree-dwelling), or terrestrial (on the ground). After the passive, stationary observation period was finished, they actively searched the surrounding area by spotlighting to detect the eye shine of vertebrates.

- **Game Cameras**. The Project team deployed game cameras in eight locations throughout the Project Area from mid-September through mid-November 2016. Some camera trap locations were baited with birdseed and mealworms to attract animals. Images were downloaded and reviewed on a weekly basis. In instances where an animal was in the capture zone for an extended period, and consequently was photographed numerous times, the animal was only documented once.
- **Snow Tracking.** Project team scientists searched key locations within the Project Area and identified mammal tracks and other incidental observations after snow fall events on January 9, 2017 and March 16, 2017. Scientists traversed the area and noted the number of sets of tracks and other evidence of mammal occurrences, such as prey remains and scat. The locations surveyed on January 7 included HR-3, AA-1, CM-1, LS-1, CH-1, and NS-1. Locations HR-1, AA-1, CM-2, LS-1, CH-1, NS-1, RA-1, and WS-1 were surveyed on March 16.
- **Ultrasonic Echolocation Recorders.** Bat surveys were performed using Wildlife Acoustics, Inc.'s Song Meter (a device that uses an ultrasonic microphone to record bat echolocations). Song Meters were deployed in a variety of habitats in the Project Area at locations AA-1, CM-1, LS-1, LS-2, PC-1, and TE-1 for over 100 nights in the 2016-2017 survey period. **Table J-3** identifies the survey locations and nights. Following data collection in the field, the echolocations were assigned tentative species identifications automatically by Wildlife Acoustics, Inc.'s Kaleidoscope Pro software[10]. If federally or state-listed bat species were tentatively identified, those recordings would be professionally identified.

Table J-3: Bat Survey Locations

Site	Date Range
AA-1	Sep 22-29 (2016)
CM-1	Apr 9-30 (2017); May 15-Jun 28 (2017)
LS-1	Sep 15-Nov 5 (2016); May 15-Jun 28 (2017)
PC-1	Sep 26 (2016);
RA-1 (Redneck Ave)	Sep 17-23 (2016); May 15- Jul 4 (2017)
TE-1 (Teterboro)	Oct 7-27 (2016); May 3-14 (2017)

2.4 Herpetofauna (Reptile and Amphibian) Surveys

Herpetofauna surveys were conducted through both active and passive techniques. A description of these techniques is provided below.

[10] Wildlife Acoustics, Inc. provides the following disclaimer regarding the automatic species identification feature: "Auto ID is intended for use in analyzing recordings of single bats in free flight, low clutter environments. On average, more than half of such recordings will result in classifications with 80% accuracy. Recordings of roost emergence, multiple bats, captive bats, bats in high-clutter environments or bat social calls are not suitable for Auto ID and results may not be accurate" (Wildlife Acoustics, Inc. 2018). Conditions in the Project Area during data collection were generally conducive to use of the automatic identification feature.

2.4.1 Active Herpetofauna Identification Techniques

2.4.1.1 Basking Surveys

In 2016 and 2017, the Project team scientists conducted meander surveys throughout the Project Area. During the surveys, scientists observed locations of likely heliocentric posturing (areas for species to sun themselves) and areas of refuge (i.e., in Grids B4, C7, D7, E6, and E7). Searches occurred for two days in the late summer (September 15 and September 18, 2016) and on two days in the Spring (May 31 and June 1, 2017). The Project team initially searched underneath rocks and logs in wooded areas. After unsuccessful attempts to locate any herpetofauna, scientists conducted a search in areas containing streams and/or waterbodies. Species were identified using binoculars and recorded.

2.4.2 Dedicated Nocturnal Surveys

In Spring 2017 (mid-April to early June), scientists performed weekly, nighttime searches of wetlands and wooded areas to identify herptetofauna. The surveys lasted for 30 to 40 minutes per site and up to four sites were surveyed per week. The Project team used infrared scopes and spotlights to locate any herpetofauna at each site along waterways, on rocks or logs, and in surrounding forested areas. The Project team also listened for any audible signs of herpetofauna. **Table J-4** identifies the survey nights and locations.

Table J-4: Dedicated Nocturnal Herpetofauna Survey Dates and Locations

Date	Location
April 13	LS1, LS-2, and AA-1
April 20	East Riser Ditch along Riser Road, Redneck Avenue ball fields and woods, and BC-1
May 3	AA-1, LS-1, and Redneck Ave fields and woods
May 10	West Riser Ditch between Route 46 and Malcolm Avenue, HR-1, LS-1, and Commerce Avenue
May 11	CM-1, LS-1, HR-1, and West Riser Ditch between Route 46 and Malcolm Avenue
May 24	CM-1, LS-1, the woods and ballfields along Redneck Avenue and Berry's Creek between Route 46 and Malcolm Avenue
June 1	PC-1, LS-1, and the woods and ballfields along Redneck Avenue

2.4.2.1 Passive Herpetofauna Identification Techniques

Cover boards (2-foot x 2-foot plywood sheets) were placed at seven locations that coincided with mammal track plate locations. The boards were placed flat on the ground with their edges covered with leaves and a thin veneer of loose soil. Cover boards were checked in the spring of 2017 for evidence of herpetofauna.

2.5 Fish Surveys

The Project team conducted fish surveys within the Project Area at nine locations during summer 2016. Surveys also occurred at these sites, plus five additional sampling locations, during fall 2016 and winter and spring of 2017. The five new sites were chosen based on potential Build Alternative footprints that developed after the start of biological surveys. Fish sampling locations were focused in streams

upstream of tide gates, and used both minnow traps (for fish up to 1 inch in girth) and box traps (for fish up to 4 inches in girth). Fish observed in the waterbodies outside the traps were also noted.

During each trap night, the traps were baited with bread products and cat food. The traps were set on the bottom of the waterbody and/or under over-hanging vegetation. The traps were then secured with a rope to a hard structure, such as a guiderail, post, or tree. To prevent turtle mortalities, box traps were set so that they rested on a firm substrate with the openings underwater and the top of the trap above water. The traps were baited in the early afternoon and collected the next morning. **Table J-5** identifies the trap nights and locations.

When the traps were retrieved, the fish were emptied into a 5-gallon bucket or suitably sized container filled with water. Captured fish were identified to species level and measured for length. If more than 50 individuals of one species were captured at an individual location, the first 50 randomly selected fish were measured. The remaining fish (per species) were batch counted. After identification, counting, and measurement, the fish were returned back to the waterbody.

Table J-5: Fish Survey Dates and Locations

Site*	Drainage Feature	Trap Nights 2016-2017				Habitat Description
		Summer	Fall	Winter	Spring	
F1	Moonachie Creek	Sept 21, 22, 23, 26 and 27	Oct 24, 25, 26, and 27	Jan 18 and 19	May 17 and 18	1 to 3 feet deep Weed choked with anthropogenic debris
F2	Losen Slote	Sept 21, 22, 23, 26 and 27	Oct 24, 25, 26, and 27	Jan 18 and 19	May 17 and 18	1 to 4 feet deep Natural vegetated areas on both banks
F3	Losen Slote	Sept 21, 22, 23, 26 and 27	Oct 24, 25, 26, and 27	Jan 18 and 19	May 17 and 18	1 to 3 feet deep Wooded stream corridor
F4	West Riser Ditch	Sept 21, 22, 23, 26 and 27	Oct 24, 25, 26, and 27	Jan 18 and 19	May 17 and 18	1 to 3 feet deep Banks are steep and highly developed with industrial/commercial uses
F5	DePeyster Creek	Sept 21, 22, 23, 26 and 27	Oct 24, 25, 26, and 27	Jan 18 and 19	May 17 and 18	0 to 4 feet deep Surrounded by undeveloped or semi-developed parcels
F6	West Riser Ditch	Sept 26 and 27	NA	Feb 2	May 24 and 25	1 to 4 feet deep Steep banks with non-woody vegetation
F7	East Riser Ditch	Sept 21, 22, 23, 26 and 27	Oct 24, 25, 26, and 27	Jan 18 and 19	May 17 and 18	1 to 3 feet deep Steep, armored banks in fully developed area
F8	Losen Slote	Sept 21, 22, 23, 26 and 27	Oct 24, 25, 26, and 27	Jan 18 and 19	May 17 and 18	0 to 1 foot deep Upstream extent of daylighted channel

Site*	Drainage Feature	Trap Nights 2016-2017				Habitat Description
		Summer	Fall	Winter	Spring	
F9	Moonachie Creek	Sept 21, 22, 23, 26 and 27	Oct 24, 25, 26, and 27	Jan 18 and 19	May 17 and 18	0 to 2 feet deep Generally surrounded by emergent wetlands
F10	East Riser Ditch	NA	NA	Feb 1 and 2	May 17 and 18	1 to 2 feet deep Vegetated corridor with lawn and opportunistic trees
F11	East Riser Ditch	NA	NA	Feb 1 and 2	May 17 and 18	1 to 3 feet deep Vegetated corridor in urbanized area
F12	Losen Slote	NA	NA	Feb 1 and 2	May 17 and 18	Ephemeral ditch with debris Not suitable for year-round fish habitat
F13	Hackensack Tidal Ditch (US Route 46)	NA	NA	Feb 1 and 2	May 17 and 18	0 to 4 feet deep Generally surrounded by semi-developed parcels
F14	Willow Lake	NA	NA	Feb 1 and 2	May 17 and 18	Stormwater retention pond, surrounded by thin wooded corridor and public park Depths exceed 6 feet

* Sampling sites F10 through F14 were added to identify faunal presence in potential Build Alternative footprints that developed after the start of biological surveys.

2.6 Benthic Invertebrate Surveys

The Project team conducted qualitative benthic invertebrate surveys within the Project Area to determine the species composition by employing the following survey methods and tools:

- **Soft sediment sampling**. Using a ponar-style dredge, the Project team collected bottom grab samples of waterbody sediments at five locations (labeled B1 through B5) in the Project Area. At each sample location, scientists collected three samples during one sampling event in the summer and fall of 2016. At each sampling location, the Project team also collected samples during one sampling event in the winter of 2017; however, not all three samples were collected at each location. Following collection, each sample was rinsed with a hose in a sieve bucket lined with 504-micron mesh. Once the sample was reduced by rinsing, a small amount of the sample was placed into a pan containing a shallow layer of water. Each sample was stained with rose bengal vital stain, which colors organisms deep purple, and preserved with alcohol. Each sample was then examined in bright sunlight; any benthic organisms were removed and inventoried.
- **Rock Baskets.** Rock baskets, or “artificial substrate samplers,” were placed on the substrate to mimic a rocky shoreline. The baskets were constructed of 2-inch wire mesh and filled with pieces of rock and concrete. Each basket measured eight inches in diameter and 18 inches tall. Due to the constructed nature of the baskets, these devices allow for the collection and identification of benthic invertebrates and other organisms that use them as habitat. The Project team deployed two baskets at four locations (a total of eight baskets) in the Hackensack River on September 7,

2016. The baskets were retrieved on November 3 and 4, 2016. After retrieving the rock baskets in early November, each basket was immediately placed into a container and rinsed into a 504-micron mesh-bottomed bucket. Post-rinsing, residual contents were transferred to a sample jar and rocks were examined for sessile organisms. Rose bengal vital stain and alcohol were added to the sample jar to highlight and preserve any soft-bodied benthic organisms. Samples were then sorted and organisms identified to the lowest practical taxa.

3.0 Biological Field Survey Results

3.1 Habitat Mapping and Evaluation

Over 400 individual parcels were mapped and characterized based on cover type within the Project Area. The results of the mapping include a total of 18 distinct habitat communities. Vegetation surveys were completed in select vegetated areas (see Error! Reference source not found.). The results of the abitat mapping are provided in Figure 3.14-1 in the EIS.

Wetlands were evaluated for ecosystem functions using the EPW method and streams were evaluated using the SVAP method. The preliminary results for each evaluation method are discussed in Section 4.16 of the EIS and **Appendix L**.

Historically there have been approximately 445 known plants in the Meadowlands District (Kiviat and MacDonald 2002). Today, the United States Fish and Wildlife Service (2005) identifies approximately 275 known plants in the Meadowlands District. During the 2016 to 2017 vegetation surveys, 300 vascular plant species and 4 mosses were observed in the Project Area, which occurs within and outside the Meadowlands District. Common species observed throughout the Project Area include successional species and invasive species, as well as those commonly found in riparian areas. This includes a variety of hardwoods, conifers, shrubs, and herbaceous plants and mosses. A list of the observed species is provided in **Attachment J-1**.

During the surveys, two state-listed endangered species were observed: eastern redbud (*Cercis canadensis*) and floating marshpennywort (*Hydrocotyle ranunculoides*). Two individuals of the eastern redbud were observed; however, due to their position in the landscape, it is believed these individuals were introduced (i.e., planted and/or escaped). Eastern redbuds are now commonly available in nurseries. The floating marshpennywort was observed outside the Project Area within the headwaters of the West Riser Ditch.

Notable during the surveys was the distribution, and sometimes dominance, of invasive plant species. Non-native invasive plant species can be found throughout the State of New Jersey. While the status of “invasive” varies given the circumstances of a species, it is generally applied to species that cause ecological damage and threaten the biodiversity of a particular ecosystem. The NJDEP compiled a report of the 27 “most problematic invasive species” in the state (Snyder and Kaufman 2004). Of these 27 species, 20 were identified in the Project Area. These species are identified in **Table J-6**. Not mentioned in the report was common reed (*Phragmites australis* subsp. *australis*). This is likely because an American subspecies of common reed has been known to occur in NJ; however, the European subspecies (*australis*) was introduced with the arrival of Europeans. Over the centuries, this plant has overtaken many parts of the Meadowlands District due to its rhizomatous growth habit, which allows it to outcompete other plant species and lead to large, monotypic areas of common reed.

Table J-6: Problematic/Invasive Species Observed in the Project Area

Common Name	Scientific Name
Norway maple	*Acer platanoides*
Tree-of-heaven	*Ailanthus altissima*
Garlic-mustard	*Alliaria petiolata*
Amur peppervine (porcelain berry)	*Ampelopsis brevipedunculata*
Oriental bittersweet	*Celastrus orbiculatus*
Spotted knapweed	*Centaurea maculosa*
Canadian thistle	*Cirsium arvense*
Autumn olive	*Elaeagnus umbellata*
Burning bush	*Euonymus alatus*
Japanese honeysuckle	*Lonicera japonica*
Morrow's honeysuckle	*Lonicera morrowii*
Purple loosestrife	*Lythrum salicaria*
Yellow sweet-clover	*Melilotus officinalis*
Japanese stilt grass	*Microstegium vimineum*
Japanese knot weed	*Fallopia japonica*
Asiatic tearthumb (mile-a-minute)	*Persicaria perfoliata*
Curly pondweed	*Potamogeton crispus*
Black locust	*Robinia pseudo-acacia*
Rambler rose (Multiflora rose)	*Rosa multiflora*
Wine raspberry (wineberry)	*Rubus phoenicolasius*

3.2 Avian Surveys

A total of 145 species (54,131 individuals) were observed during the 2016-2017 avian survey. The results of the different censusing techniques are provided below.

3.2.1 Passive Sightings

A total of 9,319 birds, encompassing 43 species, were observed passively flying over the site at high altitude. Four species comprised a majority of these sightings: ring-billed gull (*Larus delawarensis*), 26.8 percent; European starling (*Sturnus vulgaris*), 24.8 percent; Canada goose (*Branta canadensis*), 15.6 percent; and double-crested cormorant (*Phalacrocorax auritus*), 12.4 percent. All other sighted species comprised between 6.0 and <0.1 percent of the total sightings.

The four dominant species identified above were also frequently sighted in the point counts and transect counts. Their numerous sightings are attributable to migratory flocks and individual birds, especially gulls and geese, flying throughout the wetland complex of the Meadowlands District. Passive sightings occurred throughout the year.

3.2.2 Active Sightings

3.2.2.1 Point Counts

Table J-7, **Table J-8**, and **Table J-9** identify the five most frequently observed birds at each site during the point counts in the fall migration, overwintering, and spring nesting season. As depicted in the tables, there is considerable similarity of dominant species across the sites, despite the markedly different habitats present. Review of the data also indicates that although there are seasonal differences in the dominant species, the similarity of species continues across the sites.

Throughout the year, the dominant species include the following: European starling, red-winged blackbird (*Agelaius phoeniceus*), Canada goose, double-crested cormorant, ring-billed gull, mallard (*Anas platyrhynchos*), American robin (*Turdus migratorius*), and blue jay (*Cyanocitta cristata*). There were three species that were in the top five most frequently sited birds in at least 50 percent of all sites over the course of the study: European starling (71.9 percent frequency), ring-billed gull (62.5 percent frequency), and Canada goose (59.4 percent frequency).

Seasonal dominance patterns included the following:

- In the fall migration, the dominant species observed were the following: American robin (TE-1); double-crested cormorant (HR-1); European starling (AA-1, LS-1, LS-2; and PC-1); ring-billed gull (HR-2, and HR-3), mourning dove (CM-1), and rock dove (IL-1).
- In the winter, the dominant species were the following: blue jay (TE-1), Canada goose (CM-1, PC-1), double-crested cormorant (HR-1), European starling (AA-1, LS-2), ring-billed gull (HR-2, HR-3, LS-1), and rock dove (IL-1).
- In the spring, the dominant species were the following: blue jay (TE-1), Canada goose (AA-1, HR-1), common merganser (HR-3), European starling (BC-2, IL-1), northern cardinal (HR-4), red-winged blackbird (CM-1, CM-2, LS-1), and ring-billed gull (BC-1, LS-3).
- Many of these most dominant species at each location also represented the second most dominant species at other locations (e.g., in the fall, mourning dove was second most populous species at LS-1 and LS-2, etc.).

The Shannon-Weiner Diversity Index was applied to each site to identify its diversity per season (**Table J-10**). In the table, the more developed urban sites (AA-1 and IL-1) typically have the lowest H values (i.e., lowest diversity) each season, with sites along the river and the wetland mitigation site (CM-2) having the highest diversity. This is attributed to the significantly better habitat within the marshes along the river and mitigation parcels.

Table J-7: Dominant Avian Species - Fall Migration (Sep – Nov)

AA-1	CM-1	HR-1	HR-2	HR-3	IL-1	LS-1	LS-2	PC-1	TE-1
European Starling 28.1%	Mourning Dove 19.9%	Double-crested Cormorant 16.7%	Ring-billed Gull 21.8%	Ring-billed Gull 13.9%	Rock Dove 16.3%	European Starling 23.9%	European Starling 17.9%	European Starling 25.4%	American Robin 15.6%
Ring-billed Gull 12.3%	European Starling 14.3%	Ring-billed Gull 16.7%	Double-crested Cormorant 12.1%	Double-crested Cormorant 13.5%	Mallard 13.4%	Mourning Dove 16.6%	Mourning Dove 17.9%	House Sparrow 12.4%	Blue Jay 12.6%
House Sparrow 6.91%	American Robin 12.1%	European Starling 8.61%	Mallard 8.87%	Osprey 7.21%	European Starling 10.8%	Ring-billed Gull 7.40%	American Robin 11.6%	Ring-billed Gull 10.5%	Passerine Species 8.89%
Blue Jay 6.65%	Red-winged Blackbird 9.11%	Canada Goose 7.18%	European Starling 6.65%	Song Sparrow 4.81%	Canada Goose 7.49%	Double-crested Cormorant 5.47%	Blue Jay 8.21%	American Robin 7.96%	American Goldfinch 5.93%
American Robin 5.88%	Gray Catbird 4.40%	Herring Gull 4.31%	Canada Goose 5.65%	Great Black-backed Gull 4.81%	Ring-billed Gull 7.49%	American Robin 5.13%	Ring-billed Gull 6.72%	Canada Goose/ Northern Mockingbird 3.48%	European Starling/Red-bellied Woodpecker 5.19%

Table J-8: Dominant Avian Species – Overwintering (Nov-Feb)

AA-1	CM-1	HR-1	HR-2	HR-3	IL-1	LS-1	LS-2	PC-1	TE-1
European Starling 25.1%	Canada Goose 10.9%	Double-crested Cormorant 12.5%	Ring-billed Gull 9.68%	Ring-billed Gull 13.7%	Rock Dove 14.4%	Ring-billed Gull 11.1%	Mourning Dove 10.2%	Canada Goose 19.3%	Blue Jay 30.0%
Ring-billed Gull 17.3%	European Starling 10.9%	Ring-billed Gull 8.48%	Canada Goose 8.60%	Canada Goose 13.7%	Ring-billed Gull 12.8%	Red-winged Blackbird 8.33%	European Starling 14.8%	House Sparrow 19.3%	Fish Crow 7.5%
House Sparrow 7.85%	Ring-billed Gull 8.53%	Canada Goose 8.04%	Common Merganser 7.53%	Double-crested Cormorant 9.16%	European Starling 12.0%	European Starling 6.94%	House Sparrow 9.09%	European Starling 17.5%	Multiple Passerines
Canada Goose 7.33%	Red-winged Blackbird 7.75%	Great Black-backed Gull 6.70%	Mallard 7.53%	Great Black-backed Gull 5.34%	Mallard 8.0%	American Robin 5.56%	Red-winged Blackbird 6.82%	Ring-billed Gull 8.77%	-
Blue Jay 6.81%	Sparrow 6.98%	European Starling 5.36%	Northern Shoveler 7.53%	Common Merganser/ European Starling/ Red-tailed Hawk 4.58%	American Crow/ Canada Goose*/ House Sparrow 7.20%	Mourning Dove 4.86%	American Robin/ Black-capped Chickadee 5.68%	Northern Mockingbird 8.77%	-

Table J-9: Dominant Species Spring Migration (March to mid-June)

AA-1	BC-1	BC-2	CM-1	CM-2	HR-1	HR-3	IL-1	LS-1	LS-3	TE-1
Canada Goose 15.1%	Ring-billed Gull 8.85%	European Starling 10.2%	Red-winged Blackbird 16.0%	Red-winged Blackbird 7.97%	Canada Goose 7.06%	Common Merganser 8.89%	European Starling 12.9%	Red-winged Blackbird 7.60%	Ring-billed Gull 8.77%	Blue Jay 10.5%
European Starling 13.8%	Canada Goose 8.08%	Canada Goose 9.32%	Mourning Dove 6.62%	Mallard 6.64%	Double-crested Cormorant 7.06%	Double-crested Cormorant 6.67%	Canada Goose 10.5%	European Starling 6.98%	European Starling 8.33%	American Robin 7.01%
House Sparrow 13.5%	Red-winged Blackbird 7.31%	Red-winged Blackbird 8.47%	American Robin 5.92%	Canada Goose 4.43%	Ring-billed Gull 5.59%	Green-winged Teal 6.67%	Mallard 10.5%	Northern Cardinal 6.57%	Red-winged Blackbird 7.01%	Mallard 7.01%
Common Grackle 8.01%	American Robin 5.38%	Barn Swallow 7.63%	European Starling 5.57%	American Goldfinch 3.98%	Ruddy Duck 5.00%	Canada Goose 5.56%	House Sparrow 9.36%	American Robin 5.95%	Tree Swallow 6.58%	Red-bellied Woodpecker 7.01%
American Robin/Northern Mockingbird 5.45%	Mallard 5.00%	-	Northern Mockingbird 5.23%	American Robin/Song Sparrow 3.76%	Song Sparrow 5.00%	Multiple Passerines 4.45%	Ring-billed Gull* 9.36%	Song Sparrow 4.51%	Mallard 6.58%	Multiple Passerines 5.26%

Table J-10: Shannon-Weiner Diversity Index for Point Counts

Fall Migration		Overwintering		Spring Migration	
Site	**H**	**Site**	**H**	**Site**	**H**
AA-1	2.82	AA-1	2.60	AA-1	2.89
CM-1	2.87	CM-1	3.14	BC-2	3.18
HR-1	3.05	HR-1	3.29	CM-1	3.54
HR-2	2.93	HR-2	3.04	CM-2	3.89
HR-3	3.33	HR-3	3.10	HR-1	3.63
IL-1	2.98	IL-1	2.84	HR-3	3.38
LS-1	2.97	LS-1	3.31	IL-1	2.88
				LS-1	3.72
				LS-3	3.30
Average	2.99	Average	3.05	Average	3.38
Notes: Locations with insufficient data to provide a meaningful index value were omitted from this table.					

The two sites that exhibited consistently high diversity throughout all three seasons were HR-1 and HR-3. Both of these sites are along the Hackensack River, which would attract several types of birds (passerines, waterfowl, raptors, etc.) because it provides optimal feeding habitat. In addition, site HR-1 is at the intersection of the Hackensack River and a tidal creek and site HR-3 is situated within the Metro Media tract, so the habitat is likely more intact and protected, and thus would attract a greater diversity of avifauna.

After the initial surveys during the migration, overwintering, and spring seasons, summer surveys were conducted. The new summer data yielded no additional species. Out of all sighted birds during this survey period, the three dominant birds were the European starling (approximately 8.86 percent), American robin (approximately 5.69 percent), and common grackle (approximately 5.48 percent).

3.2.2.2 Transects

After comparison of the point count and transect data, the transect data did not yield any additional species. No endangered or rare species were observed nesting as part of the transect surveys. All identified species sighted during the transects are presented in **Attachment 1**.

During the transect surveys, special care was taken to determine if there were any nesting birds. Seven bird species were observed nesting: barn swallow (*Hirundo rustica*), common grackle (*Quiscalus quiscula*), European starling, northern cardinal (*Cardinalis cardinalis*), spotted sandpiper (*Actitis macularius*), tree swallow (*Tachycineta bicolor*), and yellow warbler (*Setophaga petechia*). One individual from each species was observed nesting.

3.2.3 Raptor Nest Survey

A total of 68 nests were observed, of which 37 were identified as potential raptor nests. Potential raptor nests included stick nests greater than approximately eight inches in diameter. No nests were observed as active at the time of survey.

3.2.4 Protected Species

No federally listed bird species have been observed to date. State-listed endangered and threatened species were observed at stations BC-1, BC-2, CM-1, CM-2, HR-1, HR-2, HR-3, IL-1, LS-1, LS-2, and PC-1, all of which are adjacent to or near wetlands and open waters. State-listed endangered and threatened species observed primarily included the American kestrel (*Falco sparverius*), bald eagle (*Haliaeetus leucocephalus*), black-crowned night-heron (*Nycticorax nycticorax*), northern harrier (*Circus cyaneus*), osprey (*Pandion haliaetus*), black skimmer (*Rynchops niger*), and peregrine falcon (*Falco peregrinus*). Other endangered and threatened species observed included pied-billed grebe (*Podilymbus podiceps*) and Savannah sparrow (*Passerculus sandwichensis*).

Special concern species were observed at all 10 stations, but were most frequently observed at HR-1, HR-2, HR-3, and LS-1. They were also commonly observed at CM-1 and IL-1. Special concern species, including the black-throated blue warbler (*Setophaga caerulescens*), great blue heron (*Ardea herodias*), little blue heron (*Egretta caerulea*), spotted sandpiper, sharp-shinned hawk (*Accipiter striatus*), tricolored heron (*Egretta tricolor*), least flycatcher (*Empidonax minimus*), and northern parula (*Setophaga americana*), were primarily observed in wetland habitats. Cooper's hawk (*Accipiter cooperii*) and wood thrush (*Hylocichla mustelina*) were observed in both wetland and upland habitats; black-throated green warbler (*Setophaga virens*), bobolink (*Dolichonyx oryzivorus*), and Canada warbler (*Cardellina canadensis*) were observed in upland habitats; and cliff swallow (*Petrochelidon pyrrhonota*), common tern (*Sterna hirundo*), and snowy egret (*Egretta thula*) were observed in open water. See **Table J-11** for list of birds considered state-listed endangered, threatened, and of special concern.

Table J-11: Observed State of New Jersey Protected Species

Common Name	Status
American Kestrel	Threatened
Bald Eagle	Endangered [B]/Threatened [NB]
Black Skimmer	Endangered
Black-crowned Night-heron	Threatened [B]/Special Concern [NB]
Black-throated Blue Warbler	Special Concern [B]
Black-throated Green Warbler	Special Concern [B]
Bobolink	Threatened [B]/Special Concern [NB]
Canada Warbler	Special Concern [B]
Cliff Swallow	Special Concern [B]
Common Tern	Special Concern [B]
Cooper's Hawk	Special Concern [B]
Great Blue Heron	Special Concern [B]

Common Name	Status
Least Flycatcher	Special Concern [B]
Little Blue Heron	Special Concern
Northern Harrier	Endangered [B]/Special Concern [NB]
Northern Parula	Special Concern [B]
Osprey	Threatened [B]
Peregrine Falcon	Endangered [B]/Special Concern [NB]
Pied-billed Grebe	Endangered [B]/Special Concern [NB]
Savannah Sparrow	Threatened [B]
Sharp-shinned Hawk	Special Concern
Snowy Egret	Special Concern [B]
Spotted Sandpiper	Special Concern [B]
Tricolored Heron	Special Concern
Wood Thrush	Special Concern [B]
B- Breeding population only NB- Non-breeding population only	

3.2.5 Avian Sightings Summary

The large marshes of the Meadowlands District are an important resource for avifauna in northeast New Jersey. The data collected from 2016 – 2017 for this Proposed Project demonstrate that within the Project Area, there are valuable habitat resources utilized by avifauna. This is especially evident in dense wooded tracts and large, contiguous marsh resources in the southern portion of the Project Area that scored highest in EPW evaluations and had high diversity indices. Moreover, many of the observed protected species were observed within these locations too.

Results of the year-long survey indicate that that the marshes of the southern portion of the Project Area and along Berry's Creek and the Hackensack River are important overwintering areas for waterfowl and spring nesting areas for a variety of avifauna. The data also indicate that the portions of these habitats that interface with more urban areas are not favored by protected species, and are typically dominated by disturbance-tolerant species. This also includes the riparian areas associated with small waterbodies that flow through the commercially developed portions of the Project Area. These locations are often dominated by disturbance-tolerant species as well. The birds that were most frequently seen throughout the Project Area and throughout the year were passerines, waterfowl, and seabirds.

Much of the Project Area is dominated by residential and commercial cover types. The data collected and analyzed indicate these areas are dominated by urban-tolerant species (e.g., European starling, house sparrow [*Passer domesticus*], etc.). The data has also indicated that, on occasion, many bird species will use urban locations during migration as temporary stopover habitat; however, the species did not appear to utilize these locations as a nesting or feeding resource.

3.3 Mammal Surveys

Direct observations of mammals by wildlife biologists during nocturnal surveys are considered “active observations.” “Passive observations” of mammals include indirect observations through means such as echolocation microphones, game cameras, snow tracking, and track plates. Survey locations included the following locations:

- AA - Amor Avenue
- CD - Chapman Drive
- CM - Commercial Blvd
- EJ - East Joseph Drive
- KP - Kleber Place
- NS - North Street
- SS - State Street
- LS-2N - Losen Slote Creek Park
- CB-1 - Commerce Blvd
- GP-1 - Gotham Parkway
- SR-1 - Starke Rd at Dell Road
- DR-1 - Behind warehouse on Dell Road
- WBF-1 - Wright Brothers Field
- MD-1 - Woods off Mariani Drive and Redneck Avenue
- RD-1 - Riser Ditch along Riser Road

The results of active mammal observations are provided in **Table J-12**, and the results of passive mammal observations are provided in **Table J-13**. The tables record the seasons when individuals of identified species were observed (R= spring, S=summer, F=fall, W=winter). Bats were the only mammal surveyed in the spring (using echolocation microphones).

Biologists were able to sight 11 total mammal species during the summer and fall of 2016. Six species were observed in the summer, and eight species were observed in the fall. The eastern cottontail (*Sylvilagus floridanus*) was sighted in the most locations (three). The most species-rich location was LS-1N (four species sighted). No individuals were observed at locations GP-1, BC-1, RA-1, or MD-1. Only four species (common muskrat, domestic cat [*Felis catus*], eastern cottontail, and white-tailed deer [*Odocoileus virginianus*]) were observed in more than one location. Only three species (domestic cat, eastern cottontail, and white-tailed deer) were observed in more than one season.

Using passive, indirect methods of surveying, biologists were able to identify 22 mammal species. Other than the common muskrat, domestic dog (*Canis familiaris*), and white-footed mouse, every species was recorded in more than one season. The most speciose locations were C1, C6, and C7, with 20, 16, and 13 species, respectively. The three least speciose locations were C5, C4, and HR-3, with zero, one, and one species, respectively.

Table J-12: Mammal Observations – Active Sightings by Location

Common Name	Scientific Name	LS-1N	LS-2N	CB-1	CM	GP-1	SR-1	DR-1	AA-1N	BC-1	RA-1	MD-1	RD-1	WBF-1
Bat	Unidentified		S		R						R		R	
Common Muskrat	*Ondatra zibethicus*							S	S					
Domestic Cat	*Felis catus*	R			R		F	S	W, R	W		R		
Eastern Cottontail	*Sylvilagus floridanus*	F,R	F	S	R						R			
Groundhog (Woodchuck)	*Marmota monax*	R												
Little Brown Bat	*Myotis lucifugus*													F
Mouse	Unidentified												F	
Norway Rat	*Rattus norvegicus*			F										
Raccoon	*Procyon lotor*	W			R		F			R	R	R		
Red Fox	*Vulpes vulpes*	S			R					W				
Striped Skunk	*Mephitis mephitis*	R												
Virginia Opossum	*Didelphis virginiana*	F			R									
White-tailed Deer	*Odocoileus virginianus*	S,F	S								R			
Total Number of Species		**8**	**3**	**2**	**6**	**0**	**2**	**2**	**1**	**3**	**4**	**2**	**2**	**1**

Notes: F - Fall; W - Winter; R - Spring; S - Summer
AA - Amor Avenue; CM - Commercial Boulevard; LS-1N – Losen Slote Creek; LS-2N - Losen Slote Park; CB-1 - Commerce Blvd; GP-1 - Gotham Parkway; SR-1 - Starke Road @ Dell Road; and DR-1 - Behind warehouse on Dell Road; WBF-1 - Wright Brothers Field; MD-1 - Woods off Mariani Drive and Redneck Avenue; RA-1 – Redneck Avenue; and RD-1 - Riser Ditch along Riser Road

Table J-13: Passive Sightings by Location

Common Name	Scientific Name	LS-1	LS-2	RBP	Tet-1	TW	C6	C7	CD-1	HR-1	HR-3	IL-1	KP-1	NS-1	PC-1	RA-1
Bat	Unidentified	R,S,F		F								S,F				
Big Brown Bat	*Eptesicus fuscus*	S,R,F					R	F				F	R,F			R,S
Common Muskrat	*Ondatra zibethicus*			F				F								
Domestic Cat	*Felis catus*	F,W	F,W	S,F			F,W	W	W	W	W		W	F,W		W
Domestic Dog	*Canis familiaris*	W							W							
Eastern Chipmunk	*Tamias striatus*											S,F				
Eastern Cottontail	*Sylvilagus floridanus*	F,W					F,W		W	W				W		
Eastern Gray Squirrel	*Sciurus carolinensis*		S,F				S	S,F,W				S,F		W	S,F	
Eastern Red Bat	*Lasiurus borealis*	R,F					R						F			R,S,F
Evening Bat	*Nycticeius humeralis*	R,S,F					R						F			R,S
Groundhog (Woodchuck)	*Marmota monax*	F	F	S,F			F	F						W		
Hoary Bat	*Lasiurus cinereus*	R,S,F					R,S	F					R,F			R,S
Little Brown Bat	*Myotis lucifugus*	F					R,S	F				F	F			R,S
Norway Rat	*Rattus norvegicus*							S,F				S,F			S,F	
Raccoon	*Procyon lotor*	F					F		W							
Red Fox	*Vulpes vulpes*	W	F	S,F	S,F		W	F	F,W					W		
Silver-haired Bat	*Lasionycteris noctivagans*	R,S,F					R	F					F			R,S
Striped Skunk	*Mephitis mephitis*	F		S,F			F	W					W			

Common Name	Scientific Name	LS-1	LS-2	RBP	Tet-1	TW	C6	C7	CD-1	HR-1	HR-3	IL-1	KP-1	NS-1	PC-1	RA-1
Tricolored Bat	*Perimyotis subflavus*	F											F			S,F
Unidentifiable	-	F	F,W				F	F,W	F				F,W	F,W		
Virginia Opossum	*Didelphis virginiana*	S,F	F	S,F			F	F	F					F		
White-footed Mouse	*Peromyscus leucopus*	W												W		
White-tailed Deer	*Odocoileus virginianus*	S,F,W							W							
Total Number of Species		**19**	**6**	**7**	**1**	**0**	**15**	**13**	**8**	**2**	**1**	**6**	**10**	**8**	**2**	**8**
Notes: F - Fall; W - Winter; R – Spring; S - Summer																

3.4 Herpetofauna Surveys

A list of the amphibian and reptile species that are known to occur in the Meadowlands District is presented in **Section 3.0** of the EIS. Reptiles observed during the 2016 field surveys and their locations are provided in **Table J-14**. The most abundant species were the red-eared slider and eastern painted turtle (*Chrysemys p. picta*); 11 total individuals were recorded of these species across all locations. One eastern painted turtle was collected during the fish sampling program at Station F2. The location with the highest number of individuals was C7, with nine individuals. The habitat at C7 includes Indian Lake. All other locations had one or two species identified. No amphibians were observed during the 2016 Project Area surveys. No Federal or state-listed endangered, threatened, or special concern species of herpetofauna were observed during the 2016 Project Area surveys.

No herpetofauna were actively observed (visually or audibly) during the spring nocturnal surveys, despite checking the same locations at which several species of frogs were observed in 2006 (i.e., the southern portion of Teterboro Airport and the Redneck Avenue woods).

A basking survey was conducted in the spring of 2017. Eastern painted turtles were observed at CM-1, ERD-1, LS-1, and WRD-01 (**Table J-15**). Red-eared sliders were the most common species observed at IL-1 (52 individuals). Only one red-eared slider was observed at CM-1. There were no other species of reptiles or amphibians observed during the basking surveys. No Federal or state-listed endangered, threatened, or special concern species of herpetofauna were observed during the 2017 Project Area surveys.

Table J-14: Herpetofauna Species Observed During the 2016 Project Area Field Surveys

Common Name	Species Name	A4	B4	C7	D7	E6	E7	*F2	Total
Common snapping turtle	*Chelydra serpentina*		1						1
Eastern garter snake	*Thamnophis s. sirtalis*						1		1
Eastern painted turtle	*Chrysemys p. picta*	1		7	1	1		1	11
Red-eared slider	*Trachemys scripta elegans*		4	2	1	4			11
Unidentified turtle species	N/A		3						3
Total Number of Species		**1**	**2**	**2**	**2**	**2**	**1**	**1**	**4**
Total Number of Individuals		**1**	**8**	**9**	**2**	**5**	**1**	**1**	**27**

*Location of species recorded during 2016 fall Project Area fish survey

Table J-15: Herpetofauna Species Observed During Spring 2017 Project Area Basking Field Survey

Common Name	Species Name	CM-1	ERD-1	ERD-2	IL-1	LS-1	PC-1	WRD-1	WRD-2	WRD-3	WRD-4	Total
Eastern painted turtle	*Chrysemys p. picta*	6	4	0	0	1	0	5	0	0	0	16
Red-eared slider	*Trachemys scripta elegans*	1	0	0	52	0	0	0	0	0	0	53
Total Number of Species		**2**	**1**	**0**	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**2**
Total Number of Individuals		**7**	**4**	**0**	**52**	**1**	**0**	**5**	**0**	**0**	**0**	**69**

3.5 Fish Surveys

Proposed Project-specific surveys were completed in 2016 and 2017 to determine the fish species composition of the Project Area and the Hackensack River. The freshwater bodies in the Project Area are generally small (less than 20 feet-wide), slow-moving, freshwater streams. These waterbodies have been heavily impacted by anthropogenic activities (e.g., straightening, bank-hardening. tide gates, etc.). The species recorded during the 2016 and 2017 surveys, as well as the species recorded during previous surveys done from 1987 to 1988 and 2002 to 2003, are compiled in a list provided in **Attachment 1** of this appendix. There were no Federal or state-listed endangered, threatened, or special concern fish species observed in the Project Area during the surveys.

All recorded fish species are those species with some degree of pollution and disturbance tolerance. Goldfish and mummichog were observed during all four seasons. The three most species-rich areas were F3 (10 species), F1 (8 species), and F2 (7 species). Location F1 is located in a disturbed, weed-choked portion of the Moonachie Creek. Locations F2 and F3 are located in the southern portion of the Losen Slote Creek (upstream of the tide gate). No proximal cause is evident as to why two markedly different habitats were so high in species richness, though all recorded species are pollution- and disturbance-tolerant. The three most ubiquitous species throughout the Project Area were mummichog (85.7 percent occurrence), bluegill (71.4 percent occurrence), and pumpkinseed (64.3 percent occurrence). **Table J-16** identifies the species captured per each location.

Table J-16: Fish Species Identified During Project Area Field Surveys (Summer 2016 – Spring 2017)

Common Name	Scientific Name	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	Median Length (inches)
Atlantic silverside	*Menidia menidia*				S											2.0
Bluegill	*Lepomis macrochirus*	S/F	S/F	S/F	S/F		S	S	S/ F/W	S					W	1.7
Bluegill (hybrid)	NA			S												2.1
Brown bullhead	*Ameiurus nebulosus*		S/ W				/R			S/ W						6.8
Common carp	*Cyprinus carpio*	F	F	S			F	S								7.0
Goldfish	*Carassius auratus*	S/F/ W	R	S/F/ W				W		F/ W					R	6.1
Green sunfish	*Lepomis cyanellus*	F	F	F/R			F	R	F			F,W				2.3
Hybrid sunfish	NA		F	F	F											1.8
Western mosquitofish	*Gambusia affinis*	S/F		F												1.5
Mummichog	*Fundulus heteroclitus*	S/F/ W		S/F/ W	S/F/ W	S/ F/ W	S/F /W	S/F/ W/R	S/F/ W/R	S/ F/ W	F/W /R	F/W /R		F/W/ R	F/W	3.0
Pumpkinseed	*Lepomis gibbosus*	S/F		S/F	F		S/F	S/F/R		F/ R	F	F/R			F/R	2.9
White perch	*Morone americana*				R											16.0
Yellow bullhead	*Ameiurus natalis*	F/W	F/W	F/W					W			W			W	8.0
Notes: F – Fall; W – Winter; R – Spring; S – Summer																

3.6 Benthic Invertebrate Surveys

A list of benthic invertebrate species observed throughout the Meadowlands District in previous and current studies is presented in **Attachment 1** of this appendix. **Table J-17** lists the species identified following bottom grab sampling of waterbody sediments at five locations during the 2016 to 2017 survey in the Project Area. A limited species assemblage was identified in the sampling. This is likely due to the highly disturbed nature of the sampling locations, many of which would have limited water or would go dry in periods with limited hydrology.

Table J-17: Benthic Invertebrate Species Observed in the Project Area During Summer 2016

Common Name	Scientific Name	B1	B2	B3	B4	B5
Annelid worm	Annelida	X				
Barnacle	Cirripedia		X			
Clam	Bivalvia			X		
Eastern oyster	*Crassostrea virginica**		X			
Nematode	Nematoda	X	X	X	X	X
Snail	Gastropoda	X		X		X
Whorled snail	Vertiginidae	X		X		X

Notes: * only shell fragment.
X = Species present.

Rock baskets were also deployed at four locations within the Hackensack River to collect qualitative data on benthic invertebrates. Overall, four different species were identified and 89 total individuals were collected (**Table J-18**). The white fingered mud crab (*Rhithropanopeus harrisii*) was the most dominant species collected at the four sampling locations, with 81 total individuals. All captured species in the rock baskets are common species within the Hackensack River.

Table J-18: Benthic Invertebrate Species Observed in Rock Basket Collections in the Project Area During 2016

Common Name	Scientific Name	HR-B1	HR-B2	HR-B3	HR-B4	Total All Stations
Amphipod	Amphipoda				2	2
Blue mussel	*Mytilus edulis*		2			2
Lined nemertean worm	*Lineus arenicola*				4	4
White fingered mud crab	*Rhithropanopeus harrisii*	10	23	20	28	81
Total Number of Species		**1**	**2**	**1**	**3**	**4**
Total Number of Individuals		**10**	**25**	**20**	**34**	**89**

This Page has been Intentionally Left Blank.

Attachment J-1: Species Lists

This Page has been Intentionally Left Blank.

List of Tables

Table J1-1: Plant Species Identified During the 2016 Biological Field Survey in the Project Area J-37
Table J1-2: Avian Species Sighted in the Project Area J-47
Table J1-3: Passive Sightings at Each Location (All Seasons) J-49
Table J1-4: Count of Individuals (Non-Passive) Observed at Each Location from September to mid-November (Fall Migration) J-51
Table J1-5: Count of Individuals (Non-Passive) Observed at Each Station from mid-November to February (Over Wintering) J-54
Table J1-6: Count of Individuals (Non-Passive) Observed at Each Station from March to mid-June (Spring Nesting Season) J-56
Table J1-7: Bird Observations Along Transect Locations (Spring 2017) J-59
Table J1-8: Amphibian Species and Associated Habitat Identified in or near the Project Area J-61
Table J1-9: Reptile Species and Associated Habitat Identified in or near the Project Area J-62
Table J1-10: Fish Collected in the Project Area J-63
Table J1-11: Benthic Macroinvertebrate Species and Associated Habitat Identified in or near the Project Area J-64
Table J1-12: Invasive Fauna Documented within or in the Vincinty of the Project Area J-67

This Page has been Intentionally Left Blank.

Table J1-1: Plant Species Identified During the 2016 Biological Field Survey in the Project Area

Common Name	Scientific Name	Location
Trees		
American basswood	*Tilia americana*	C3, D6, E7
American elm	*Ulmus americana*	C3, C7, D7, D8, E6, G3
American holly	*Ilex opaca*	E6, E7
American sycamore	*Platanus occidentalis*	C3, F7
Apple	*Malus* sp.	A5, F8
Arborvitae	*Thuja* sp.	C7
Basswood	*Tilia* sp.	B6
Big-tooth aspen	*Populus grandidentata*	A4, F7
Black cherry	*Prunus serotina*	A4, B6, C3, C6, D5, D6, D7, D8, E3, E4, E6, E7, F6, F7, F8
Black locust	*Robinia pseudoacacia*	A4, B6, C7, D5, D7, D8, E3, E5, E6, E7, E8, F6, F7, G3, G7
Black oak	*Quercus velutina*	E7, F7
Black gum	*Nyssa sylvatica*	A4, B6, C6, D5, D6, D7, E3, E4, E5, E7, F7
Black walnut	*Juglans nigra*	E6, F7, G7
Black willow	*Salix nigra*	A4, E4, F7
Boxelder	*Acer negundo*	A4, E4, E8, F4, F7, F8
Callery pear	*Pyrus calleryana*	B6, C7, D8, E6, F8
Common hackberry	*Celtis occidentalis*	B6, E4, E6, E7, F7
Dogwood	*Cornus* sp.	D5
Crack willow	*Salix fragilis*	C6, E5, E6, F7
Eastern cottonwood	*Populus deltoides*	A4, A5, B5, B6, C3, C6, C7, D7, D8, E3, E4, E5, E8, F4, F6, F7, F8, G3, G7
Eastern redbud	*Cercis canadensis*	B6, E6
Eastern red-cedar	*Juniperus virginiana*	E7
Eastern white pine	*Pinus strobus*	B6
European gray willow	*Salix atrocinerea*	B5, E4, E7, F7
Fig	*Ficus carica*	E7
Gray birch	*Betula populifolia*	A4, B4, C3, E4, E5, E7, F6, F7, G3
Gray dogwood	*Cornus racemosa*	C3, E4
Gray poplar	*Populus* x *canescens*	D6

Common Name	Scientific Name	Location
Green ash	*Fraxinus pennsylvanica*	A4, B6, C3, F7, F8, G7
Honeylocust	*Gleditsia triacanthos*	B6, C7, D8, E4, E8
Japanese zelkova	*Zelkova serrata*	C7
London planetree	*Platanus × hispanica*	C7, D8
Marsh primrose-willow	*Ludwigia palustris*	B4, B5, C3, C6, D6, E5, E6, E7, F4, F7, F8
May-apple	*Podophyllum peltatum*	E7
Northern red oak	*Quercus rubra*	E3, E4, E6, E7
Northern white oak	*Quercus alba*	B6, D6, D7, E3, E6, E7
Norway maple	*Acer platanoides*	A4, B6, D5, D7, E6, G3
Ornamental cherry	*Prunus* sp.	B6
Pin oak	*Quercus palustris*	A4, B6, C3, C6, C7, D5, D6, D7, E3, E4, E6, E7, F6, F7, F8, G3, G7
Princesstree	*Paulownia tomentosa*	G3
Quaking aspen	*Populus tremuloides*	E4, F6, F7, G7
Red maple	*Acer rubrum*	A4, B6, C6, C7, D5, D6, E3, E4, E5, E6, E7, F4, F6, F7
River birch	*Betula nigra*	B5, G7
Sassafras	*Sassafras albidum*	D5, E3, E7, F7
Shag-bark hickory	*Carya ovata*	E4
Siberian elm	*Ulmus pumila*	D7
Silky dogwood	*Cornus amomum*	B4, C6, E4, E5, E7, F4, F6, F7
Silver maple	*Acer saccharinum*	A4, C3, C6, D5, D6, D7, E4, E5, E6, E7, F7
Southern catalpa	*Catalpa bignonioides*	A4, B6, C6, D8, E3, E6, E7, F7, G7
Sugar maple	*Acer saccharum*	B6, C7
Swamp white oak	*Quercus bicolor*	B6, D6, E4, E7, F7, G7
Sweetgum	*Liquidambar styraciflua*	B6, C7, D5, D6, D7, E3, E4, E6, E7, F6
Sweet cherry	*Prunus avium*	E7
Sycamore maple	*Acer pseudoplatanus*	A4, C7, D7, E6
Tree-of-heaven	*Ailanthus altissima*	A4, A5, B5, B6, C3, D5, D7, D8, E3, E4, E7, E8, F8, G3, G7
White poplar	*Populus alba*	A4, E8
White willow	*Salix alba*	A4

Common Name	Scientific Name	Location
Willow	*Salix* sp.	B4
Yew	*Taxus baccata/cuspidata/x media*	D5, E6, E7
Shrubs		
Allegheny blackberry	*Rubus allegheniensis*	A4, B6, E3, E4, E5, E7, F4, F6, F7, F8
American black elderberry	*Sambucus nigra*	A4, B5, C3, D6, E3, E4, E7, F4, F7
American water-plantain	*Alisma subcordata*	E5, E6, F7
American witch-hazel	*Hamamelis virginiana*	E7
Amur honeysuckle	*Lonicera maackii*	A4, A5, B4, B5, B6, C6, D7, D8, E6, E8, F7, F8, G3, G7
Arrow-wood	*Viburnum dentatum*	A4, C3, C6, D5, D6, E3, E4, E5, E6, E7, F6, F7
Autumn olive	*Elaeagnus umbellata*	F7
Blackberry	*Rubus* sp.	F8
Blue Ridge blueberry	*Vaccinium pallidum*	E7
Bristly dewberry	*Rubus hispidus*	D5, E3, E4, E7, F6
Burning bush	*Euonymus alatus*	B6, D6, E7
Buttonbush	*Cephalanthus occidentalis*	C3, C6, D6
Clammy azalea	*Rhododendron viscosum*	E7, F7
Coastal sweetpepperbush	*Clethra alnifolia*	D5, D6, E3, E4, E7
Common winterberry	*Ilex verticillata*	D6, E3
Crimsoneyed rosemallow	*Hibiscus moscheutos*	B4, C7, E4, E6, E7, F4, F7, F8, G3
Cutleaf blackberry	*Rubus laciniatus*	F8
Eastern baccharis	*Baccharis halimifolia*	A4, B5, C3, D8, E4, E8, F4, F7, F8, G7
European cranberrybush	*Viburnum opulus*	E7
European privet	*Ligustrum vulgare*	E7
Forsythia	*Forsythia* sp.	A4, B6, D5
Glossy buckthorn	*Frangula alnus*	A4, C3, E4, F6, F7, G7
Greenbrier	*Smilax rotundifolia*	C3, C6, D5, D6, D7, E6, E7
Highbush blueberry	*Vaccinium corymbosum*	D5, E3, E4, E7
Japanese honeysuckle	*Lonicera japonica*	A4, B6, C6, D5, D6, D7, D8, E4, E6, E7, F6, F7, F8
Maple-leaf viburnum	*Viburnum acerifolium*	E3
Morrow's honeysuckle	*Lonicera morrowii*	E4, E5
Northern bayberry	*Morella pensylvanica*	F7

Common Name	Scientific Name	Location
Red chokeberry	*Aronia arbutifolia*	D5, E4, E7
Rose of Sharon	*Hibiscus syriacus*	B6
Smooth sumac	*Rhus glabra*	A4, A5, B4, B5, C3, C6, D8, E4, F6, F7, G3, G7
Staghorn sumac	*Rhus typhina*	A4, F7
Steeplebush	*Spiraea tomentosa*	F7
Swamp doghobble	*Eubotrys racemosus*	E3, E7
White meadowsweet	*Spiraea alba*	F7
White mulberry	*Morus alba*	A4, B4, B5, B6, C6, C7, D5, D7, D8, E4, E5, E6, E7, F7, F8, G3, G7
Wine raspberry	*Rubus phoenicolasius*	E7
Winged sumac	*Rhus copallinum*	E6, E7, F6, F7
Herbs		
Allegheny monkey-flower	*Mimulus ringens*	D5
American burnweed	*Erechtites hieracifolia*	E4 ,E5, E7, F7, G7
American pokeweed	*Phytolacca americana*	A4, B6, C3, D5, D6, E3, E4, E6, E7, F7, F8, G3, G7
American wild mint	*Mentha arvensis*	E5
Anisescented goldenrod	*Solidago odora*	B6
Annual ragweed	*Ambrosia artemisiifolia*	B6, C7, D6, E7
Asiatic dayflower	*Commelina communis*	B6, D5, E4, E6
Atlantic mannagrass	*Glyceria obtusa*	A4
Beggarticks	*Bidens* sp.	C7
Bermudagrass	*Cynodon dactylon*	D7
Bitter dock	*Rumex obtusifolius*	A4, C7, D6
Black medick	*Medicago lupulina*	E7
Black-seed plantain	*Plantago rugelii*	C7, D6, D7
Blunt spikerush	*Eleocharis obtusa*	E5, E6, E7
Bog Yellowcress	*Rorippa palustris* (L.) Besser	E7
Branched centaury	*Centaurium pulchellum*	F7
Bristlegrass	*Setaria* sp.	A5, E5, G3
Bristly lady's thumb	*Persicaria longiseta*	B6, C7, E7
Broad-leaf cat-tail	*Typha latifolia*	A4, B5, C3, C5, D5, D8, E4, E5, E7, F4, F7, G7

Common Name	Scientific Name	Location
Broadleaf enchanter's nightshade	*Circaea lutetiana*	E4
Broom sedge	*Carex scoparia*	E6, F7
Bull thistle	*Cirsium vulgare*	A4, B6, E5, E7, F7, F8, G3, G7
Bulrush	*Schoenoplectus* sp.	E7, E8, F8
Butterfly milkweed	*Asclepias tuberosa*	C3
Canadian horseweed	*Conyza canadensis*	A4, C7, E3, F6, G7
Canadian thistle	*Cirsium arvense*	A4, E4, F4, F7, F8, G7
Common boneset	*Eupatorium perfoliatum*	C3, C6, E4
Common dandelion	*Taraxacum officinale*	A4, B6, D6, E6, E7
Common ladyfern	*Athyrium filix-femina*	E4, E7
Common milkweed	*Asclepias syriaca*	F7
Common motherwort	*Leonurus cardiaca*	A4, F8
Common periwinkle	*Vinca minor*	A4
Common selfheal	*Prunella vulgaris*	E7
Common sheep sorrel	*Rumex acetosella*	B6
Common St. John's-wort	*Hypericum perforatum*	A4, E4, F7
Common threeseed mercury	*Acalypha rhomboidea*	A4, C7, E7
Common threesquare	*Schoenoplectus pungens*	B4, C7, F4, G7
Common wormwood	*Artemisia vulgaris*	A5, B6, C6, C7, D8, E4, E6, E7, F7, F8, G7
Common yarrow	*Achillea millefolium*	F7
Coneflower	*Rudbeckia* sp.	C3
Crabgrass	*Digitaria* sp.	A5, B6, C7, D6, D7
Curly dock	*Rumex crispus*	A4, C7, E6
Curlytop knotweed	*Persicaria lapathifolia*	A4, C7, G7
Cut-leaf water-horehound	*Lycopus americanus*	C7, E6
Deertongue	*Dichanthelium clandestinum*	A4, D6, E7, F7
Devil's beggartick	*Bidens frondosa*	C7, E5, E6, E7, F4
Ditch-stonecrop	*Penthorum sedoides*	D5
Dotted smartweed	*Persicaria punctata*	B4, C3, C6, D6, E3, E4, E5, E6, E7, F4, F7, F8
Duck-potato	*Sagittaria latifolia*	E5, E6
Eastern annual saltmarsh aster	*Symphyotrichum subulatum*	E8, F4, F8

Common Name	Scientific Name	Location
Eastern marsh fern	*Thelypteris palustris*	D5
English plantain	*Plantago lanceolata*	A4, A5, B6, C7, D6, D7, E6, E7, F7, F8
European common reed	*Phragmites australis*	A4, A5, B4, B5, C3, C5, C6, C7, D5, D6, D7, D8, E3, E4, E5, E6, E7, E8, F4, F6, F7, F8, G3, G7
Fall panicgrass	*Panicum dichotomiflorum*	E5
False daisy	*Eclipta prostrata*	A4, C7, E5, E6, F7, G7
False lily-of-the-valley	*Maianthemum canadense*	D5, E3
Field horsetail	*Equisetum arvense*	E4, E7
Flatsedge	*Cyperus* sp.	A4
Flat-top goldentop	*Euthamia graminifolia*	D6, E4, E5, E7, F4, F6, F7, G7
Floating marshpennywort	*Hydrocotyle ranunculoides*	A4, B5
Fringed sedge	*Carex crinita*	F7
Fringed willowherb	*Epilobium ciliatum*	E3, E4
Garden bird's-foot-trefoil	*Lotus corniculatus*	A4, A5, B6, C7, F7, F8
Garlic-mustard	*Alliaria petiolata*	A4, D5, E4, E7, F6, F7, F8, G3
Georgia bulrush	*Scirpus georgianus*	E7
Grass	*Poaceae* sp.	A4, A5, B6, C7, D6, D7, E7, F7, F8
Great mullein	*Verbascum thapsus*	F6, F7
Great plantain	*Plantago major*	B6, E6
Green arrow-arum	*Peltandra virginica*	C7, E6
Green carpetweed	*Mollugo verticillata*	A4, C3
Hairy crabgrass	*Digitaria sanguinalis*	E6
Hay-scented fern	*Dennstaedtia punctilobula*	E3, E4, E5, E7, F7
Hedge false bindweed	*Calystegia sepium*	B6, C7, D7, E7, F8
Indian goosegrass	*Eleusine indica*	B6, E6
Indian-hemp	*Apocynum cannabinum*	A4, B6, C3, C7, D5, D7, E4, E5, E7, F7, F8, G3
Indian-tobacco	*Lobelia inflata*	E3
Japanese bristlegrass	*Setaria faberi*	A4, B6, E6, E7, F7, F8, G7
Japanese hop	*Humulus japonicus*	B6, D6, E4, E6, E7, E8, F7, F8
Japanese knotweed	*Fallopia japonica*	A4, A5, C3, C7, D7, E3, E4, E5, E6, E7, E8, F4, F7, F8, G3, G7
Japanese pachysandra	*Pachysandra terminalis*	E7
Japanese stilt grass	*Microstegium vimineum*	D5, D6, D7, E7, F7

Common Name	Scientific Name	Location
Jesuit's bark	*Iva frutescens*	G7
Jumpseed	*Persicaria virginiana*	F7
King-of-the-meadow	*Thalictrum pubescens*	F7
King's-cureall	*Oenothera biennis*	A4, B6, C7, D6, E6, F7, G3, G7
Knapweed	*Centaurea* sp.	A4, C3, C7
Knotweed	*Polygonum* sp.	B6, C7, D6, D7, F8
Lambsquarters	*Chenopodium album*	A4, C7
Lamp rush	*Juncus effusus*	A4, D6, E3,E4, E7, F7
Large barnyardgrass	*Echinochloa crus-galli*	B5, C5, C6, C7, D6, E5, E6, E7, F4, F7, G7
Lateflowering thoroughwort	*Eupatorium serotinum*	A4, B5, B6, C3, C6, C7, D6, D7, D8, E4, E5, E7, E8, F4, F6, F7, F8, G3, G7
Lesser burdock	*Arctium minus*	A4, E7, F7, F8, G7
Lesser poverty rush	*Juncus tenuis*	A4, B6, C7, E7, F7
Lily	*Lilium* sp.	E7
Little false bluestem	*Schizachyrium scoparium*	F7
Little hogweed	*Portulaca oleracea*	D7, E6, E7, F8
Lovegrass	*Eragrostis* sp.	A5
Marsh bristlegrass	*Setaria parviflora*	B6
Mexican tea	*Dysphania ambrosioides*	E6, E7, F7
Netted chainfern	*Woodwardia areolata*	D6, E4, E5, E7
New York fern	*Thelypteris noveboracensis*	E3, E5, E7
New York ironweed	*Vernonia noveboracensis*	D6, E5, F6, F7
Nightshade	*Solanum ptycanthum*	C7, F7
Northern bracken fern	*Pteridium aquilinum*	D5, E7, F7
Northern long sedge	*Carex folliculata* L.	E7
Oldfield cinquefoil	*Potentilla simplex*	B6
One-flower indian-pipe	*Monotropa uniflora*	D5
Orange day-lily	*Hemerocallis fulva*	E4, E7
Orchard grass	*Dactylis glomerata*	E6
Pale-yellow iris	*Iris pseudacorus*	E8
Panicled-leaf tick-trefoil	*Desmodium paniculatum*	F7
Pennsylvania smartweed	*Persicaria pensylvanica*	C7, D6, D7, F7, G7
Perennial ryegrass	*Lolium perenne*	C7, E6, E7, F7

Common Name	Scientific Name	Location
Pine barren flatsedge	*Cyperus retrorsus*	G7
Pink azalea	*Rhododendron periclymenoides*	D5, E4
Poorman's-pepperwort	*Lepidium virginicum*	A4, B6, C7, E6
Prairie fleabane	*Erigeron strigosus*	E6
Purple loosestrife	*Lythrum salicaria*	A4, A5, B5, C6, C7, D7, E4, E5, E6, E7, E8, F4, F6, F7, F8, G7
Purpleleaf willowherb	*Epilobium coloratum*	D6
Queen Anne's-lace	*Daucus carota*	B6, C7, E7, F7, G7
Red clover	*Trifolium pratense*	C7
Reed canary grass	*Phalaris arundinaceae*	D7, E4
Ricecut grass	*Leersia oryzoides*	C3, E5, E6, E7
Rough cocklebur	*Xanthium strumarium*	D7, F7, G7
Royal fern	*Osmunda regalis*	D5, D6,E3, E4, E7
Salt sandspurry	*Spergularia salina*	F8
Scarlet pimpernel	*Anagallis arvensis*	F7
Seaside goldenrod	*Solidago sempervirens*	A4, C3, E8, F7, F8, G7
Seedbox	*Ludwigia alternifolia*	D5
Sensitive fern	*Onoclea sensibilis*	C7, E4, E6, E7, F4, F6, F7
Sessile-leaf bellwort	*Uvularia sessilifolia*	D6, E4, E7
Shallow sedge	*Carex lurida*	D6, E7
Slender crown grass	*Paspalum setaceum*	D6
Slender yellow woodsorrel	*Oxalis dillenii*	A4
Small-spike false nettle	*Boehmeria cylindrica*	D6, E4, E5, E6, F7
Smartweed	*Persicaria* sp.	B4, C3
Smooth cordgrass	*Spartina alterniflora*	E8, G7
Smooth crabgrass	*Digitaria ischaemum*	E7
Smooth hawksbeard	*Crepis capillaris*	C7
Soft-stem club-rush	*Schoenoplectus tabernaemontani*	E5, F7
Spotted beebalm	*Monarda punctata*	C3
Spotted lady's-thumb	*Persicaria maculosa*	C7, G7
Spotted sandmat	*Chamaesyce maculata*	A5, B6, C7, D6, D7, E6, E7, F7, F8
Spotted touch-me-not	*Impatiens capensis*	D6, D7, E4, E5, E6, F4, F6, F7, G7
Straw-color flatsedge	*Cyperus strigosus*	A4, B4, B5, C3, C6, C7, D6, D7, E3, E6, E7, F4, F7, F8
Sweet sagewort	*Artemisia annua*	A4, F7, F8, G7

Common Name	Scientific Name	Location
Sweet woodreed	*Cinna arundinaceae*	D7, E4, E7, F6, F7
Sweetscent	*Pluchea odorata*	A4, B4, B5, D6, D7, E3, E7, E8, F4, F8, G7
Switchgrass	*Panicum virgatum*	E7, G7
Tall goldenrod	*Solidago altissima*	A4, E4, E5, E7, F4, F6
Tall redtop	*Tridens flavus*	A4, A5, B6, D6
Thyme-leaf speedwell	*Veronica serpyllifolia*	B6
Tidalmarsh amaranth	*Amaranthus cannabinus*	E8
Triangle orache	*Atriplex prostrata*	E8, F8, G7
Trumpetweed	*Eutrochium fistulosum*	E4, F4, F6
Tussock sedge	*Carex stricta*	E7
Virginia chainfern	*Woodwardia virginica*	D5, E7
Virginia water-horehound	*Lycopus virginicus*	F7
Weak Sedge	*Carex debilis* Michx.	E7
White avens	*Geum canadense*	F6, F7
White bedstraw	*Galium mollugo*	A4
White clover	*Trifolium repens*	B6, C7, D6, D7, E6, E7
White grass	*Leersia virginica*	D7, E5, E7
White moth mullein	*Verbascum blattaria*	A4, F7
White snakeroot	*Ageratina altissima*	A4, B6, C3, D5, D7, E4, E6, F6, F7, F8, G3
White sweet-clover	*Melilotus albus*	C7, F7
White vervain	*Verbena urticifolia*	A4, E6, E7, F7, F8, G7
White wood aster	*Eurybia divaricata*	E7
Whorled yellow loosestrife	*Lysimachia quadrifolia*	E3
Wild sarsaparilla	*Aralia nudicaulis*	D5, E4, E7, F7
Woolgrass	*Scirpus cyperinus*	D6
Wrinkle-leaf goldenrod	*Solidago rugosa*	A4, D6, E4, E7, F6, F7, G7
Yellow bristle grass	*Setaria pumila*	B6, C7, E6, F7, G7
Yellow nutsedge	*Cyperus esculentus*	E4, G7
Yellow sweet-clover	*Melilotus officinalis*	C7
Yellowseed false pimpernel	*Lindernia dubia*	C6, F7
Vines		
Amberique-bean	*Strophostyles helvola*	C7, E6

Common Name	Scientific Name	Location
Amur peppervine	*Ampelopsis brevipedunculata*	A4, A5, B4, B5, C3, C6, D5, D6, D8, E3, E4, E5, E6, E7, E8, F4, F6, F7, F8, G3, G7
Asiatic tearthumb	*Persicaria perfoliata*	B6, D5, D6, E5, E6, E7, F4, F6, F7, F8, G7
Chinese wisteria	*Wisteria sinensis*	E6
Cinnamon fern	*Osmunda cinnamomea*	D5, D6, D7, E3, E4, E7
Climbing black-bindweed	*Fallopia scandens*	A4, B5, B6, D5, F4, F6, F7, G3
Climbing hempvine	*Mikania scandens*	B5, D6, D8, E4, E6, F4, F7
Climbing nightshade	*Solanum dulcamara*	A4, B6, D6, E3, E5, E7, F7
Crownvetch	*Securigera varia*	A4, A5, B6, C3, C7, G7
Eastern poison ivy	*Toxicodendron radicans*	A4, A5, B4, C3, C6, C7, D5, D6, D7, D8, E3, E4, E6, E7, F7, G3
English ivy	*Hedera helix*	B6, D7, E6, E7
Fox grape	*Vitis labrusca*	A4, B6, D5, D6, D7, E3, E4, E5, E6, E7, F6, F7, F8
Groundivy	*Glechoma hederacea*	A4, B6, C7, D7, E6, E7, F8
Groundnut	*Apios americana*	F7
Ivyleaf morning-glory	*Ipomoea hederacea*	G7
One-seed burr-cucumber	*Sicyos angulatus*	B6
Oriental bittersweet	*Celastrus orbiculatus*	A4, B5, B6, C3, C6, C7, D8, E4, E6, E7, F7, F8, G3, G7
Rambler rose	*Rosa multiflora*	A4, B6, C6, D5, D7, D8, E6, E7, F6, F7, G3
River-bank grape	*Vitis riparia*	D6
Sawbrier	*Smilax glauca*	C7, D5, D6, E3, E4, E7
Sticky-willy	*Galium aparine*	F8
Summer grape	*Vitis aestivalis*	C3, E7
Sweet autumn virginsbower	*Clematis terniflora*	F8
Trumpet creeper	*Campsis radicans*	B6
Virginia-creeper	*Parthenocissus quinquefolia*	A4, B4, C3, C6, D5, D6, D7, E3, E4, E5, E6, E7, E8, F6, G3, G7
Wild yam	*Dioscorea villosa*	E7
Winter creeper	*Euonymus fortunei*	D5
Mosses		
Slender starburst moss	*Atrichum angustatum*	D5, F7, G7

Common Name	Scientific Name	Location
Oval starburst moss	*Atrichum crispum*	D5, F7
Bordered thyme moss	*Mnium marginatum*	D5, F7
Baby tooth moss	*Plagiomnium cuspidatum*	D5, F7

Table J1-2: Avian Species Identified During the 2016 – 2017 Biological Field Surveys in the Project Area

Common Name	Scientific Name	Common Name	Scientific Name
American Black Duck	*Anas rubripes*	Hooded Merganser	*Lophodytes cucullatus*
American Coot	*Fulica americana*	House Finch	*Haemorhous mexicanus*
American Crow	*Corvus brachyrhynchos*	House Sparrow	*Passer domesticus*
American Goldfinch	*Spinus tristis*	House Wren	*Troglodytes aedon*
American Kestrel	*Falco sparverius*	Killdeer	*Charadrius vociferus*
American Redstart	*Setophaga ruticilla*	Least Flycatcher	*Empidonax minimus*
American Robin	*Turdus migratorius*	Least Sandpiper	*Calidris minutilla*
American Tree Sparrow	*Spizelloides arborea*	Lesser Scaup	*Aythya affinis*
American Woodcock	*Scolopax minor*	Lesser Yellowlegs	*Tringa flavipes*
Bald Eagle	*Haliaeetus leucocephalus*	Little Blue Heron	*Egretta caerulea*
Baltimore Oriole	*Icterus galbula*	Magnolia Warbler	*Setophaga magnolia*
Barn Swallow	*Hirundo rustica*	Mallard	*Anas platyrhynchos*
Belted Kingfisher	*Megaceryle alcyon*	Marsh Wren	*Cistothorus palustris*
Black-crowned night-heron	*Nycticorax nycticorax*	Merlin	*Falco columbarius*
Black Skimmer	*Rynchops niger*	Mourning Dove	*Zenaida macroura*
Black Vulture	*Coragyps atratus*	Mourning Warbler	*Geothlypis philadelphia*
Black-and-white Warbler	*Mniotilta varia*	Mute Swan	*Cygnus olor*
Black-capped Chickadee	*Poecile atricapillus*	Northern Cardinal	*Cardinalis cardinalis*
Blackpoll Warbler	*Setophaga striata*	Northern Flicker	*Colaptes auratus*
Black-throated Blue Warbler	*Setophaga caerulescens*	Northern Harrier	*Circus cyaneus*
Black-throated Green Warbler	*Setophaga virens*	Northern Mockingbird	*Mimus polyglottos*
Blue Jay	*Cyanocitta cristata*	Northern Parula	*Setophaga americana*
Blue-winged Teal	*Anas discors*	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Bobolink	*Dolichonyx oryzivorus*	Northern Shoveler	*Anas clypeata*
Brant	*Branta bernicla*	Northern Waterthrush	*Parkesia noveboracensis*

Common Name	Scientific Name	Common Name	Scientific Name
Brown Creeper	*Certhia americana*	Orchard Oriole	*Icterus spurius*
Brown-headed Cowbird	*Molothrus ater*	Osprey	*Pandion haliaetus*
Bufflehead	*Bucephala albeola*	Ovenbird	*Seiurus aurocapilla*
Canada Goose	*Branta canadensis*	Palm Warbler	*Setophaga palmarum*
Canada Warbler	*Cardellina canadensis*	Peregrine Falcon	*Falco peregrinus*
Canvasback	*Aythya valisineria*	Pied-billed Grebe	*Podilymbus podiceps*
Carolina Wren	*Thryothorus ludovicianus*	Pine Warbler	*Setophaga pinus*
Cedar Waxwing	*Bombycilla cedrorum*	Prairie Warbler	*Setophaga discolor*
Chimney Swift	*Chaetura pelagica*	Purple Finch	*Haemorhous purpureus*
Chipping Sparrow	*Spizella passerina*	Red-bellied Woodpecker	*Melanerpes carolinus*
Cliff Swallow	*Petrochelidon pyrrhonota*	Red-eyed Vireo	*Vireo olivaceus*
Common Grackle	*Quiscalus quiscula*	Red-tailed Hawk	*Buteo jamaicensis*
Common Loon	*Gavia immer*	Red-winged Blackbird	*Agelaius phoeniceus*
Common Merganser	*Mergus merganser*	Ring-billed Gull	*Larus delawarensis*
Common Raven	*Corvus corax*	Ring-necked Duck	*Aythya collaris*
Common Tern	*Sterna hirundo*	Rock Dove	*Columba livia*
Common Yellowthroat	*Geothlypis trichas*	Ruby-crowned Kinglet	*Regulus calendula*
Cooper's Hawk	*Accipiter cooperii*	Ruby-throated Hummingbird	*Archilochus colubris*
Dark-eyed Junco	*Junco hyemalis*	Ruddy Duck	*Oxyura jamaicensis*
Double-crested Cormorant	*Phalacrocorax auritus*	Rusty Blackbird	*Euphagus carolinus*
Downy Woodpecker	*Picoides pubescens*	Savannah Sparrow	*Passerculus sandwichensis*
Dunlin	*Calidris alpina*	Scarlet Tanager	*Piranga olivacea*
Eastern Kingbird	*Tyrannus tyrannus*	Semipalmated Plover	*Charadrius semipalmatus*
Eastern Phoebe	*Sayornis phoebe*	Sharp-shinned Hawk	*Accipiter striatus*
Eastern Towhee	*Pipilo erythrophthalmus*	Snow Goose	*Chen caerulescens*
Eastern Wood-pewee	*Contopus virens*	Snowy Egret	*Egretta thula*
European Starling	*Sturnus vulgaris*	Solitary Sandpiper	*Tringa solitaria*
Field Sparrow	*Spizella pusilla*	Song Sparrow	*Melospiza melodia*
Fish Crow	*Corvus ossifragus*	Spotted Sandpiper	*Actitis macularius*
Forster's Tern	*Sterna forsteri*	Swainson's Thrush	*Catharus ustulatus*
Fox Sparrow	*Passerella iliaca*	Swamp Sparrow	*Melospiza georgiana*
Gadwall	*Anas strepera*	Tree Swallow	*Tachycineta bicolor*

Common Name	Scientific Name	Common Name	Scientific Name
Golden-crowned Kinglet	*Regulus satrapa*	Tricolored Heron	*Egretta tricolor*
Gray Catbird	*Dumetella carolinensis*	Tufted Titmouse	*Baeolophus bicolor*
Great Black-backed Gull	*Larus marinus*	Warbling Vireo	*Vireo gilvus*
Great Blue Heron	*Ardea herodias*	White-breasted Nuthatch	*Sitta carolinensis*
Great Cormorant	*Phalacrocorax carbo*	White-crowned Sparrow	*Zonotrichia leucophrys*
Great Crested Flycatcher	*Myiarchus crinitus*	White-throated Sparrow	*Zonotrichia albicollis*
Great Egret	*Ardea alba*	Willow Flycatcher	*Empidonax traillii*
Great Horned Owl	*Bubo virginianus*	Wilson's Snipe	*Gallinago delicata*
Greater Yellowlegs	*Tringa melanoleuca*	Wood Duck	*Aix sponsa*
Green Heron	*Butorides virescens*	Wood Thrush	*Hylocichla mustelina*
Green-Winged Teal	*Anas crecca*	Yellow Warbler	*Setophaga petechia*
Hairy Woodpecker	*Picoides villosus*	Yellow-bellied Sapsucker	*Sphyrapicus varius*
Hermit Thrush	*Catharus guttatus*	Yellow-rumped Warbler	*Setophaga coronata*
Herring Gull	*Larus argentatus*	-	-

Table J1-3: Passive Avian Sightings at Each Location (All Seasons)

Common Name	AA-1	BC-1	BC-2	CM-1	CM-2	HR-1	HR-2	HR-3	IL-1	LS-1	LS-2	LS-3	PC-1	TE-1
American Black Duck										5				
American Crow	24			2		33	3		15	3	3	1	1	
American Goldfinch			1							2				
American Robin				6				3	3	2				94
Bald Eagle						2				1				
Barn Swallow				1										
Black Skimmer			1											
Blackbird	4			4					4	4		16		
Black-crowned Night-Heron					1									
Canada Goose	137	3		550	90	12	30	246	42	168			168	5
Canvasback								2						
Cedar Waxwing										8				
Chimney Swift										4				
Common Grackle	2		30	4	23				2	29				
Common Merganser						1								
Crow	2	1	2	2	9	1			3	5	1	1	31	
Double-crested Cormorant	5	22	1	196	66	200	213	273	67	86		13	5	14
Dove									28					
Duck (Unidentified)				23		33	2		16	1				

Common Name	AA-1	BC-1	BC-2	CM-1	CM-2	HR-1	HR-2	HR-3	IL-1	LS-1	LS-2	LS-3	PC-1	TE-1
European Starling	390		3	819	2	100			248	931		2	377	
Fish Crow	3		1			1		2	2	3			4	
Goose	2													
Great Black-backed Gull	2			15	4	2		3		6			4	
Great Blue Heron				1	2					2		3		
Great Egret		2	6	4	12		1			15		14		
Gull	52			116	1	23	15		41	10	8		1	
Hawk (Unidentified)	1													
Herring Gull	7	1		12	16	11	3	3	2	9		1	2	
House Sparrow	12			3										
Killdeer										1				
Least Sandpiper										1				
Mallard	6		2	5	19	16			12	19	3	13	5	
Marsh Wren					2									
Mourning Dove	2			10	1	3			1	33		2	4	
Mute Swan										1				
Northern Cardinal										1				
Northern Harrier				3										
Northern Mockingbird				2										
Northern Shoveler					3									
Northern Waterthrush				5										
Osprey			1	1		1				4				
Passerine	1								1					
Red-tailed Hawk									1	1		1		
Red-winged Blackbird				323	10			54	106	67				
Ring-billed Gull	272	11	80	274	21	241	171	383	297	184	28	27	578	5
Rock Dove	23		11	1		10			143	4			13	1
Ruddy Duck						4								
Sharp-shinned Hawk													1	
Snow Goose	18													
Snowy Egret			1		8			3		7				
Sparrow	3					10			1				4	
Swallow						3								
Swamp Sparrow									1					
Tree Swallow										4				
Wood Duck						1								
Unidentified										3		2		
Grand Total	**968**	**40**	**140**	**2,382**	**290**	**708**	**438**	**972**	**1,036**	**1,624**	**43**	**96**	**1,198**	**119**

Source: Species observed during RBDM Biological Field Surveys.

Table J1-4: Count of Individuals Observed (Non-Passive) at Each Location from September to mid-November (Fall Migration)

Common Name	AA-1	CM-1	HR-1	HR-2	HR-3	IL-1	LS-1	LS-2	PC-1	TE-1
American Black Duck					1		1			
American Coot				3						
American Crow	10	2	2	3	3	9	5	3	3	2
American Goldfinch	5	9	4	1	3	2	34	10	2	8
American Kestrel		2					2			
American Redstart		2								
American Robin	23	80	3	3		8	45	31	16	21
American Tree Sparrow	1									
American Woodcock		2								
Bald Eagle				2	1		1			
Barn Swallow					3					
Belted Kingfisher			3				1			
Black-capped Chickadee	3	5				1	5	7		4
Black Vulture		1								
Blackbird		1		3			2			
Blackpoll Warbler			1							
Black-throated Green Warbler						1				
Blue Jay	26	3	2	1	2	9	36	22	6	17
Blue-winged Teal				1						
Brown Creeper						1				1
Brown-headed Cowbird						2	1			
Bufflehead			2							
Canada Goose	13	23	15	14	4	23	10	1	7	
Carolina Wren				1			3	6		1
Cedar Waxwing					1		1			
Chickadee								2		
Chimney Swift	1	1			3	2	2	2	2	3
Chipping Sparrow	1		1							
Common Grackle	7		1			2	2	2	1	1
Common Loon				1						
Common Yellowthroat		12		1			9	1		1
Cooper's Hawk	1					3	4			3
Cormorant							13			
Crow					1	3	4		2	1
Dark-eyed Junco	3	1			1	2	3	6	1	1
Domestic Duck						2				
Domestic Goose						10				

Common Name	AA-1	CM-1	HR-1	HR-2	HR-3	IL-1	LS-1	LS-2	PC-1	TE-1
Double-crested Cormorant	3	12	35	30	28	7	48	5		
Dove	5			2		5	4			
Downy Woodpecker	5	7			1	2			3	1
Duck				2			3			
Eastern Kingbird		1					1		1	
Eastern Phoebe		2				1		1		2
Eastern Towhee							1			
Eastern Wood-pewee										1
European Starling	110	94	18	17	8	33	210	48	51	7
Field Sparrow	1								1	
Fish Crow	1	2	1	1				1	2	
Flycatcher		1							2	
Fox Sparrow							1			
Golden-crowned Kinglet										2
Gray Catbird	12	29	4	5	1	2	30	5	5	6
Great Black-backed Gull		1	4	2	10		3			
Great Blue Heron	2		3	11	3		12		1	
Great Egret				4	4	2	4		1	
Great Horned Owl								1		
Greater Yellowlegs					2					
Green Heron						1				
Green-winged Teal				2						
Gull	7	7	1	3			3			
Hairy Woodpecker	1									
Hawk	1				1	1	1	4	1	
Hermit Thrush										4
Herring Gull	2	7	9	12	9	1	29	2	2	
Hooded Merganser				1						
House Finch	2	1	1			1	1		1	1
House Sparrow	27		7	2	1	21	1		25	
Killdeer			1		4	1			1	
Kinglet						1				
Lesser Yellowlegs			1		1					
Little Blue Heron			1							
Mallard	3		8	22	8	41	6	3		
Marsh Wren		3	1				1			
Merlin					1		1			
Mourning Dove	10	131	7	1	2	12	146	48	4	6
Mute Swan					1					

Common Name	AA-1	CM-1	HR-1	HR-2	HR-3	IL-1	LS-1	LS-2	PC-1	TE-1
Northern Cardinal	5	13			1	1	6	4	2	1
Northern Flicker	2	3				1	5	4		6
Northern Harrier		12	1	1	3					
Northern Mockingbird	17	23	4	1	3	1	20	9	7	2
Northern Parula							1			
Northern Waterthrush	1						1			
Nuthatch										1
Osprey			3	1	15		6		3	
Ovenbird	1								1	
Palm Warbler							1			
Passerine	1	8	2	1			3			12
Peregrine Falcon					2	1				
Pied-billed Grebe					2					
Pine Warbler		2								
Prairie Warbler			1							
Purple Finch	2									
Red-bellied Woodpecker							1			7
Red-tailed Hawk	1		1	1	3	1	4			
Red-winged Blackbird		60		11	4	1	19	2	3	
Ring-billed Gull	48	26	35	54	29	23	65	18	21	1
Rock Dove	5	1	3	13	2	50	2		6	
Ruby-crowned Kinglet		1	2		1		3	1		
Ruddy Duck			6	7	1					
Sandpiper					4					
Savannah Sparrow					3		2			
Sharp-shinned Hawk	1						5	3		
Snowy Egret		1	2	1	5		1			
Song Sparrow	10	21	6	1	10	1	12	8	3	
Sparrow	6	9	3	1		6	4	1	5	1
Spotted Sandpiper			2	3						
Swallow					2				4	
Swamp Sparrow	1	20			5		18	1		
Tree Swallow					2					
Tufted Titmouse							1	3		2
Unidentified									1	1
Unidentified Songbird		1								
Warbler	3	3	1			5	2			1
Water Thrush									1	
White-breasted Nuthatch		1	1					1		2

Common Name	AA-1	CM-1	HR-1	HR-2	HR-3	IL-1	LS-1	LS-2	PC-1	TE-1
White-crowned Sparrow					1		1		3	
White-throated Sparrow		1					3	2		1
Wood Duck				1						
Woodpecker										1
Wren							1			
Yellow Warbler		1					1			
Yellow-bellied Sapsucker		1								
Yellow-rumped Warbler	1	9			2	4				2
Grand Total	**391**	**659**	**209**	**248**	**208**	**307**	**878**	**268**	**201**	**135**

Source: Species observed during RBDM Biological Field Surveys.

Table J1-5: Count of Individuals (Non-Passive) Observed at Each Station from mid-November to February (Over Wintering)

Common Name	AA-1	CM-1	HR-1	HR-2	HR-3	IL-1	LS-1	LS-2	PC-1	TE-1
American Black Duck				2	4		1			
American Coot				4						
American Crow	9	3	6		1	9	1	2		1
American Goldfinch	2	6	3		1		3	3		
American Kestrel							1	1		
American Robin	1	5					8	5	1	2
American Tree Sparrow	1	2	4	1	3		2			
Bald Eagle		1	12	4	3		1	2		
Belted Kingfisher			3	1			1			
Blackbird		2			1			1	1	2
Black-capped Chickadee	2	3	2			1	6	5		1
Black-crowned Nightheron				2	1					
Blue Jay	13		6			5	6	4	3	12
Brown-headed Cowbird							1			
Bufflehead			4	2	2	1				
Canada Goose	14	14	18	8	18	9	3	1	11	2
Canvasback					1					
Carolina Wren		1					3			
Common Grackle	2						6			2
Common Merganser			8	7	6					
Common Raven		1					1			
Cooper's Hawk			2	2		1	1			1
Crow			2		1		2			
Dabbling Duck		1			1	1				
Dark-eyed Junco		1	6			2	5	4		
Domestic Duck						2				

Common Name	AA-1	CM-1	HR-1	HR-2	HR-3	IL-1	LS-1	LS-2	PC-1	TE-1
Double-crested Cormorant			28	3	12	2				
Dove	1									1
Downy Woodpecker	4	5	2		1	1	4	1	1	
Duck			1		4			1		
European Starling	48	14	12	2	6	15	10	9	10	1
Fish Crow			1	1	2	2	2	1		3
Fox Sparrow							5			
Gadwall			1							
Golden-crowned Kinglet						1				
Gray Catbird			1							
Great Black-backed Gull	1	1	15	2	7	1				
Great Blue Heron		1	2	4	1		2	1		
Great Cormorant			2		1					
Green-winged Teal			1	3	1					
Gull	6	4	1			1		1		
Herring Gull	2	2	3	1	1	1	3	1	2	
Hooded Merganser			3							
House Finch		1				1				
House Sparrow	15		5			9		8	11	
Lesser Scaup					1					
Mallard	2	1	11	7	5	10	3	1	2	
Mourning Dove	3	7	4		1	3	7	13		
Northern Cardinal	1	2			1	1	6	1	2	
Northern Flicker		3	1					2		2
Northern Harrier		1			5					
Northern Mockingbird	9	4	4		2		1		5	
Northern Shoveler				7		2				
Peregrine Falcon			1			2	1			
Pied-billed Grebe					1					
Raptor	1					2				
Red-bellied Woodpecker							4	3		2
Red-tailed Hawk	2	2	1	6	6	5	4	1		2
Red-winged Blackbird	6	10	2	4	2		12	6		
Ring-billed Gull	33	11	19	9	18	16	16	3	5	1
Ring-necked Duck				1						
Rock Dove	6	1	4	3	1	18				
Ruby-crowned Kinglet		1					1			
Ruddy Duck	1		11	6	3				1	
Sharp-shinned Hawk								1		
Song Sparrow	3	5	8	1	4		3		2	

Common Name	AA-1	CM-1	HR-1	HR-2	HR-3	IL-1	LS-1	LS-2	PC-1	TE-1
Sparrow		9	1							
Swamp Sparrow	2	3			1					
Tufted Titmouse							1	2		2
Unidentified Songbird					1	1				1
White-breasted Nuthatch	1		1					3		2
White-throated Sparrow		1	2				6			
Yellow-rumped Warbler							1	1		
Grand Total	**191**	**129**	**224**	**93**	**131**	**125**	**144**	**88**	**57**	**40**

Source: Species observed during RBDM Biological Field Surveys.

Table J1-6: Count of Individuals (Non-Passive) Observed at Each Station from March to mid-June (Spring Nesting Season)

Common Name	AA-1	BC-1	BC-2	CM-1	CM-2	HR-1	HR-3/4	IL-1	LS-1	LS-3	TE-1
American Black Duck				1	6		5				
American Crow	2	6		2	1	3		14	6	4	
American Goldfinch		7		7	18	4	2		18	1	2
American Redstart								1			
American Robin	17	14	4	17	17	14	1	7	29	13	4
American Tree Sparrow	1			1	1		4		6		
American Woodcock				1							
Bald Eagle				2	2	5	1				
Baltimore Oriole	2	2	2	2	1	1			5		
Barn Swallow		5	9	2	9	5			4	10	
Belted Kingfisher									1		
Black Crowned Night-heron								1			
Black Skimmer		3			2	1					
Black-and-white Warbler		1				1			2		
Blackbird	6			2		3			3	1	
Black-capped Chickadee	1			4			1		3		
Blackpoll Warbler			1	1							
Black-throated Blue Warbler									1		
Blue Jay	7	1		1		4	1	7	15	4	6
Blue-winged Teal					1						
Bobolink									1		
Brant										1	
Brown Creeper									1		
Brown-headed Cowbird	1	4	1	1	1	2	1		11		
Canada Goose	47	21	11	12	20	24	6	18	17	7	
Canada Warbler											1
Carolina Wren		5			1	2					2

Common Name	AA-1	BC-1	BC-2	CM-1	CM-2	HR-1	HR-3/4	IL-1	LS-1	LS-3	TE-1
Cedar Waxwing	1	4	2			1			5		3
Chimney Swift		1		2	2			1	2	7	1
Chipping Sparrow				1					3		
Cliff Swallow						1					
Common Grackle	25	6	3	6	6	14		3	11	10	1
Common Merganser					5	6	8				
Common Raven	1	1		1		1					
Common Tern						1					
Common Yellowthroat	6	2	2	7	6	2			16	2	1
Cooper's Hawk								2			
Crow		2	1					2	2	1	
Dark-eyed Junco	1			1				1	5		
Double-crested Cormorant		6	3	1	12	24	6	7	3	15	
Downy Woodpecker	3	1		4	1				1		
Duck				1	5						
Dunlin				2							
Eastern Kingbird								2			
Eastern Phoebe				1	1		1		3		
Eastern Towhee							1				1
Eastern Woodpewee											1
Egret					1						
European Starling	43	9	12	16	6	13	4	22	34	19	
Field Sparrow									4		
Fish Crow	2	2	2		2	3	1	1	2	1	
Flycatcher				1	1						
Forster's Tern					1						
Fox Sparrow				1					4		
Gadwall					4	2					
Golden-crowned Kinglet							1		2		
Gray Catbird	5	7	4	3	9	7			10	4	3
Great Black-backed Gull	1	1		3	8	12	2			3	
Great Blue Heron		1		3	14	2		1	10	2	
Great Cormorant						2					
Great Crested Flycatcher											3
Great Egret	1	1	2	1	9	3		1	3	6	
Greater Yellowlegs		1		1	12		1		1		
Green-winged Teal		4			10	4	6				
Gull						1			1		
Herring Gull	1	5		3	7	6		1	1	1	
Hooded Merganser					2	1					

Common Name	AA-1	BC-1	BC-2	CM-1	CM-2	HR-1	HR-3/4	IL-1	LS-1	LS-3	TE-1
House Finch		4	1	2					1	3	
House Sparrow	42	3	6	1	2	12	3	16	1		
House Wren					1	1					
Killdeer	4	3			7	1	1	1	3	7	
Least Flycatcher									1		
Least Sandpiper		1		1	5	3				2	
Lesser Scaup					1		1				
Lesser Yellowlegs					2						
Magnolia Warbler						1					
Mallard	3	13	6	12	30	17	2	18	15	15	4
Marsh Wren			2	3	14				2		
Merlin							3				
Mourning Dove	11	11	2	19	3	9	1	1	21	6	
Mourning Warbler											1
Northern Cardinal	11	10	2	9	8	6	3	1	32	5	3
Northern Flicker		4		4	4	3		1	6	1	3
Northern Harrier				5	5		3		1		
Northern Mockingbird	17	9	5	15	6	7	3	4	8	2	1
Northern Parula									1		
Northern Rough-winged Swallow		1	2	5	6	3			2		
Northern Shoveler					3	1					
Northern Waterthrush					2						
Orchard Oriole									2		
Osprey		2		1	6	4	1		1	2	
Palm Warbler				2	1				2		
Peregrine Falcon					4	2				1	
Pied-billed Grebe							1				
Pine Grosbeak					1						
Prairie Warbler		1	1								
Red-bellied Woodpecker								1	1		4
Red-eyed Vireo											2
Red-legged Kittiwake				1							
Red-tailed Hawk				1	1	1	1		2		1
Red-winged Blackbird	11	19	10	46	36	11	5	3	37	16	
Ring-billed Gull	13	23	2	4	8	19	3	16	10	20	
Ring-necked Duck					1						
Rock Dove	4	1	7	3		7		12		1	
Ruby-crowned Kinglet									1		
Ruby-throated Hummingbird									1		

Common Name	AA-1	BC-1	BC-2	CM-1	CM-2	HR-1	HR-3/4	IL-1	LS-1	LS-3	TE-1
Ruddy Duck			1		2	17		3		3	
Rusty Blackbird									2		
Sandpiper						2	1		1		
Scarlet Tanager		1							1		
Semipalmated Plover					1						
Snow Goose				1							
Snowy Egret		2			9	5	1		1		
Solitary Sandpiper					1						
Song Sparrow	10	2	4	9	17	17	4		22	7	
Sparrow	2				1				1		
Spotted Sandpiper		2		2	8	2					
Swainson's Thrush											2
Swamp Sparrow		1		7	7		1		2	1	
Tree Swallow	4	7	3	6	13	10	1	1	11	15	
Tricolored Heron										1	
Tufted Titmouse							2		2		2
Unidentified Seabird					1				1		
Unidentified Shorebird					1						
Unidentified Songbird		2			3					1	
Warbling Vireo				1					2		
White-crowned Sparrow					1				1		
White-throated Sparrow	4	4		2	1			1	21		
Willow Flycatcher			3		7				2	1	
Wilson's Snipe				2							
Wood Duck				1	3	1			2		
Wood Thrush											2
Woodpecker	1			1							
Wren		1									
Yellow Warbler	1	8	2	5	14	2			14	5	2
Yellow-rumped Warbler		2		1	2				3	1	
Grand Total	**312**	**260**	**118**	**287**	**452**	**339**	**94**	**171**	**486**	**228**	**56**

Source: Species observed during RBDM Biological Field Surveys.

Table J1-7: Bird Observations Along Transect Locations (Spring 2017)

Common Name	CM-1	CM-2	LS-1	LS-3
American Goldfinch	8		1	7
American Robin	7		3	7
Bald Eagle		1		
Baltimore Oriole			1	1
Barn Swallow	1	3		5

Common Name	CM-1	CM-2	LS-1	LS-3
Brown-headed Cowbird	2		3	3
Canada Goose		2	3	
Cedar Waxwing	1		5	
Chimney Swift	1			2
Common Grackle	2	4	2	2
Common Yellowthroat	6	3	2	5
Crow				1
Double-crested Cormorant	2			4
Eastern Phoebe				1
European Starling	4	1	2	7
Gray Catbird	4		4	9
Great Egret				1
Hawk				1
Herring Gull		1		1
House Wren	1		1	
Killdeer	1			5
Least Sandpiper		1		
Little Blue Heron				1
Mallard		3		4
Marsh Wren	2	11		4
Mourning Dove	8	1	2	2
Northern Cardinal	1	1	2	6
Northern Mockingbird	7			4
Northern Rough-winged Swallow		2		
Osprey		1		
Red-wing Blackbird	20	6	2	28
Ring-billed Gull				1
Snowy Egret		2		
Song Sparrow	3	3	3	5
Spotted Sandpiper	1	2		1
Swallow	1			1
Swamp Sparrow	7	2		1
Tree Swallow	7	4	2	8
Warbling Vireo	2		5	1
Willow Flycatcher	1	2	4	3
Yellow Warbler	3	5	5	10
Grand Total	**103**	**61**	**52**	**142**

Source: Species observed during RBDM Biological Field Surveys.

Table J1-8: Amphibian Species and Associated Habitat Identified in or near the Project Area

Common Name	Scientific Name	Salt Marsh	Forest	Scrub/Shrub	Freshwater Wetlands	Upland/ Other	Open Water
American bullfrog	*Lithobates catesbeianus*	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]
American toad	*Anaxyrus americanus*	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]
Fowler's toad[2]	*Anaxyrus fowleri*	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]
Gray treefrog	*Hyla versicolor*	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]
Green frog	*Lithobates clamitans melanota*	C[3]	C[3]	C[3]	B, C	C[3]	C[3]
Jefferson salamander[1]	*Ambystoma jeffersonianum*	D	D	D	D	D	D
Marbled salamander[1]	*Ambystoma opacum*	D	D	D	D	D	D
Chorus frog[1]	*Pseudacris* sp.	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]
Northern cricket frog[1]	*Acris c. crepitans*	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]
Northern spring peeper[1]	*Pseudacris crucifer*	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]	B[3], C[3]
Northern spring salamander[1]	*Gyrinophilus porphyriticus porphyriticus*	D	D	D	D	D	D
Pickerel frog	*Lithobates palustris*	C[3]	C[3]	C[3]	B, C[3]	C[3]	C[3]
Atlantic Coast leopard frog	*Lithobates sphenocephala*	B, C[3]	C[3]	C[3]	B, C[3]	C[3]	B, C[3], E

Notes:
No amphibians were observed during RBDM Biological Field Surveys
1 Species observed in the Meadowlands, exact location is unknown.
2 Rare historical occurrences.
3 Specific habitats are undetermined because documentation is lacking. Species may have been reported based solely on field guide range maps, misidentifications, or occurrences near but outside the Meadowlands.
A. Marsh Resources, Inc. 2015-2016 Avian Surveys, Carlstadt, New Jersey.
B. Kiviat and MacDonald 2002
C. Kiviat and MacDonald 2004
D. USFWS 2007 - Specific habitats are not indicated.
E. Kiviat 2011

Table J1-9: Reptile Species and Associated Habitat Identified in or near the Project Area

Common Name	Scientific Name	Salt Marsh	Forest	Scrub/ Shrub	Freshwater Wetlands	Upland/ Other	Open Water
Common five-lined skink	*Plestiodon fasciatus*	B[2]	B[2]	B[2]	B[2]	B[2]	B[2]
Eastern/woodland box turtle[1]	*Terrapene carolina*	D[3]	D[3]	D[3]	D[3]	D[3]	D[3]
Eastern garter snake	*Thamnophis s. sirtalis*	B	B	B	B, E, F	B, F	B
Eastern hognose snake	*Heterodon p. platirhinos*	B[2]	B[2]	B[2]	B[2]	B[2]	B[2]
Eastern milk snake[1]	*Lampropeltis t. triangulum*				E	B, C	
Eastern mud turtle	*Kinosternon subrubrum*	B					B
Eastern musk turtle	*Sternotherus odoratus*	B[2]	B[2]	B[2]	B[2]	B[2]	B[2]
Eastern painted turtle	*Chrysemys p. picta*	B	F	F	F	E, F	B, F
Eastern/common ribbon snake	*Thamnophis sauritis*	B[2]	B[2]	B[2]	B[2]	B[2]	B[2]
Northern black racer	*Coluber c. constrictor*	B[2]	B[2]	B[2]	B[2]	B[2]	B[2]
Northern brown snake[1]	*Storeria d. dekayi*					B, C	
Northern diamondback terrapin	*Malaclemys t. terrapin*	B, D				B, C, D	B, C, D
Northern water snake	*Nerodia s. sipedon*	B, C			B, C, E	C	B
Red-eared slider	*Trachemys scripta elegans*		F	F	C, D, F	C, D, F	C, F
Smooth green snake	*Opheodrys vernalis*	B[2]	B[2]	B[2]	B[2]	B[2]	B[2]
Snapping turtle	*Chelydra serpentina*	B			B, E, F	A, F	F
Spotted turtle[1]	*Clemmys guttata*	B[2], D[3]	B[2], D[3]	B[2], D[3]	B[2], D[3]	B[2], D[3]	B[2], D[3]
Wood turtle[1]	*Glyptemys insculpta*	B[2], D[3]	B[2], D[3]	B[2], D[3]	B[2], D[3]	B[2], D[3]	B[2], D[3]

Notes:
1 Species observed in nearby Meadowlands stations outside the Project Area.
2 Specific habitats are undetermined because documentation is lacking. Species may have been reported based solely on field guide range maps, misidentifications, or occurrences near but outside the Meadowlands.
3 Specific habitats are undetermined because the distribution and biology is poorly known in the Meadowlands.
A. Marsh Resources, Inc. 2015-2016 Avian Surveys, Carlstadt, New Jersey.
B. Kiviat and MacDonald 2002
C. Kiviat and MacDonald 2004
D. USFWS 2007
E. NJTA 1986
F. Species observed during RBDM Biological Field Surveys.

Table J1-10: Fish Collected in the Project Area

Common Name	Scientific Name	Tidal River	Saltwater Tidal Creek
Alewife	*Alosa pseudoharengus*	A	A
Alligator gar[1]	*Atractosteus spatula*		A, B
American eel	*Anguilla rostrata*	A	A
American shad	*Alosa sapidissima*	A	A
Atlantic menhaden	*Brevoortia tyrannus*	A[2]	A
Atlantic silverside	*Menidia menidia*	A[2]	A, B
Atlantic tomcod	*Microgadus tomcod*	A[3]	A
Bay anchovy	*Anchoa mitchilli*	A	A
Black crappie	*Pomoxis nigromaculatus*	A	A
Blueback herring	*Alosa aestivalis*	A	A
Bluefish	*Pomatomus saltatrix*	A	A
Bluegill	*Lepomis macrochirus*	A[2]	A
Brown bullhead	*Ameiurus nebulosus*	A	A, B
Common carp	*Cyprinus carpio*	A	A, B
Western mosquitofish	*Gambusia affinis*	A	B
Gizzard shad	*Dorosoma cepedianum*	A	A
Goldfish	*Carassius auratus*	A[2]	B
Green sunfish	*Lepomis cyanellus*	A[3]	B
Golden shiner	*Notemigonus crysoleucas*	A[3]	A
Inland silverside	*Menidia beryllina*	A	A
Largemouth bass	*Micropterus salmoides*	A[2]	
Mummichog	*Fundulus heteroclitus*	A	A, B
Pumpkinseed	*Lepomis gibbosus*	A	A, B
Spot	*Leistomus xanthurus*	A	A
Striped bass	*Morone saxatilis*	A	A
Striped killifish	*Fundulus majalis*	A	A
Striped mullet	*Mugil cephalus*	A[2]	
Threespine stickleback	*Gasterosteus aculeatus*	A[2]	A
Weakfish	*Cynoscion regalis*	A	A
White perch	*Morone Americana*	A	A
White catfish	*Ameiurus catus*	A[3]	
Yellow bullhead	*Ameiurus natalis*	A	A, B
Yellow perch	*Perca flavescens*	A[3]	

Notes:
[1] Suspected aquarium release.
[2] Unique to 2002 to 2003 survey (Bragin, et al. 2005).
[3] Unique to 1987 to 1988 survey (Bragin, et al. 2005).

A. Bragin et al., 2005
B. Species observed during RBDM Biological Field Surveys

Table J1-11: Benthic Macroinvertebrate Species and Associated Habitat Identified in or near the Project Area

Taxonomic Group	Scientific Name	Tidal River	Saltwater Tidal Creek
Amphipods	*Ameroculodes* sp.	B	B
	Ampelisca abdita	B	B
	Apocorophium lacustre	A, B	A, B
	Corophium lacustre	A	
	Corophium sp.		A
	Gammarus daiberi	B	B
	Gammarus tigrinus	A	B
	Gammarus mucronatus	A	B
	Incisocalliope aestuarius	B	B
	Leptocheirus plumulosus	B	B
	Melita dentate	A	A
	Melita nitida	A, B	A, B
	Monocorophium insidiosum	B	
	Monoculodes edwardsi	A	A
	Mucrogammarus mucronatus	B	B
Annelids	Annelida		C
Anthozoa	Actinaria	A	
Barnacles	*Balanus improvisus*	A, B	A, B
	Cirripedia		C
Bivalves	*Congeria leucophaeta*	A	A
	Crassostrea virginica	B	B, C
	Geukensia demissa	A	
	Macoma balthica	A, B	A, B
	Macoma mitchelli	B	B
	Mulinia lateralis	A, B	B
	Mya arenaria	A, B	B
	Mytilus edulis	C	
	Mytilopsis leucophaeata	B	B
	Rangia cuneata	B	B

Taxonomic Group	Scientific Name	Tidal River	Saltwater Tidal Creek
	Bivalvia		C
Caridean shrimp	*Crangon septemspinosa*	A, B	B
	Palaemonetes pugio	A, B	A, B
Cnidaria/ Coelenterates	*Diadumene leucolena*	B	
	Edwardsiidae	B	B
Copepoda	Harpacticoida	A	
Cumaceans	*Leucon americanus*	A, B	
	Oxyurostylis smithi	B	
Echinodermata	Holothuroidea	A	
Flatworms	*Euplana gracilis*	B	B
	Stylochus ellipticus	B	
Gastropods	*Alderia modesta*		B
	Doridella obscura	B	B
	Elysia chlorotica		B
	Epitonium rupicola	B	
	Haminoea solitaria	B	
	Littoridinops tenuipes	B	B
	Eupleura caudata	A	
	Hydrobia totteni	A	A
	Melampus bidentatus		A
	Vertiginidae		C
	Gastropoda		C
Insect larvae	*Chaoborus* sp.	A, B	
	Chironomidae	A, B	A, B
	Coleoptera	A	A
	Tabanidae	A	A
Isopods	*Cyathura polita*	A, B	A, B
	Edotea triloba	A, B	A, B
	Synidotea laevidorsalis	B	
Nemertea	Nemertea	A	
	Lineus arenicola	C	
Nematodes	Nematoda	A	C
Oligochaete worms	Oligochaeta	A, B	A, B

Taxonomic Group	Scientific Name	Tidal River	Saltwater Tidal Creek
Opossum shrimp	*Neomysis* sp.	A, B	B
Polychaete worms	*Boccardiella ligerica*	A, B	A, B
	Capitella capitata	B	
	Eteone foliosa	B	
	Eteone heteropoda	A, B	B
	Eteone longa	A	
	Eteone sp.	A	
	Glycera sp.	B	
	Glycera dibranchiate	A	
	Haploscoloplos sp.	A	
	Heteromastus filiformis	A, B	B
	Hobsonia florida	B	B
	Hypaniola florida	A	A
	Laeonereis culveri	A, B	A, B
	Leitoscoloplos fragilis	A	
	Leitoscoloplos robustus	A, B	B
	Manayunkia aestuarina	A, B	A, B
	Marenzelleria viridis	A, B	B
	Mediomastus ambiseta	B	
	Microphthalmus sczelkowii	B	
	Neanthes succinea	A, B	B
	Nereis diversicolor	A	
	Nereis succinea	A	
	Nephtys picta	B	
	Pectinaria gouldii	A, B	B
	Podarkeopsis levifuscina	B	
	Polydora cornuta	B	B
	Polydora ligni	A	
	Polydora socialis	A	A
	Polydora sp.	A	
	Sabellaria vulgaris	B	
	Spio setosa	B	
	Spionidae sp.	A	
	Streblospio benedicti	A, B	A, B
	Tharyx sp.	B	

Taxonomic Group	Scientific Name	Tidal River	Saltwater Tidal Creek
Ribbon worms	*Amphiporus bioculatus*	B	
	Carinoma tremaphorus	B	B
Sea spiders	*Anoplodactylus petiolatus*	B	
Sea squirts	*Molgula manhattensis*	B	B
True crabs	*Callinectes sapidus*	A, B	B
	Rhithropanopeus harrisii	A, B, C	A, B
Water mites	Hydrachnidia	A	

Notes: A: Bragin *et al.* 2009 (1987-1988 surveys)
B: Bragin *et al.* 2009 (2001-2002 surveys)
C: Species observed during RBDM Biological Field Surveys.

Table J1-12: Invasive Fauna Documented within or in the Vicinity of the Project Area

Common Name	Scientific Name
Birds	
Mute swan	*Cygnus olor*
Crustaceans	
Chinese mitten crab	*Eriocheir sinensis*
Asian shore crab	*Hemigrapsus sanguineus*
Fish	
Grass carp	*Ctenopharyngodon idella*
Bighead carp	*Hypophthalmichthys nobilis*
Green sunfish	*Lepomis cyanellus*
Warmouth	*Lepomis gulosus*
Insects	
Emerald ash borer	*Agrilus planipennis*
Asian longhorned beetle	*Anoplophora glabripennis*
Asian gypsy moth	*Lymantria dispar asiatica*
Viburnum leaf beetle	*Pyrrhalta viburni*
Larger pine shoot beetle	*Tomicus piniperda*
Granulate ambrosia beetle	*Xylosandrus crassiusculus*
Mollusks	
Chinese mystery snail	*Cipangopaludina chinensis malleata*
Quagga mussel	*Dreissena bugensis*
Zebra mussel	*Dreissena polymorpha*

Source: (NJISST 2014)

This Page has been Intentionally Left Blank.

Appendix K: Geology and Soils

This Page has been Intentionally Left Blank.

Table of Contents

1.0 Descriptions of Soil Types in Project Area.....K-1
1.1 Udorthents K-1
1.1.1 Udorthents, organic substratum (UdoB) K-1
1.1.2 Udorthents, organic substratum-Urban Complex (UdouB) K-1
1.1.3 Udorthents, wet substratum (UdwB) K-1
1.1.4 Udorthents, refuse substratum K-1
1.2 Urban Land (UR) K-2
1.3 Sulfaquents-Sulfihemists (Westbrook, Ipswich, Sandy hook soils, TrkAv) K-2
1.4 Accessory soils (DuuB, Duuc, PrnAt, RkrB, and RkrC) K-2

Acronyms and Abbreviations

EIS	Environmental Impact Statement
NRCS	Natural Resources Conservation Service

This Page has been Intentionally Left Blank.

1.0 Descriptions of Soil Types in Project Area

1.1 Udorthents

Udorthents are estuarine deposits and dredge and fill soils found on lowlands. These soils support buildings, roadways, recreational facilities, and various other structures. This soil covers approximately 35 percent of the Project Area (USACE 1995). Udorthents are categorized into substrata based on slope, surface layer texture, and content. These substrata are described below.

1.1.1 Udorthents, organic substratum (UdoB)

This unit is composed of fill material consisting of clean stones, boulders, rubble, and dredged soils; fill is up to 3 feet in depth in some areas. Slopes range from 0 to 8 percent. Though the original soils are unidentifiable, they likely were deep, poorly drained organic and mineral soils that experienced extended periods of ponding due to daily tidal flooding. Several other soil units, such as the poorly drained Sulfaquents and Sulfihemists, and Udorthents with refuse substratum and wet substratum, were mapped in small areas within the unit (Goodman 1995). The Udorthents, organic substratum is mainly found along river or creek banks and drainage areas prone to frequent tidal flooding. The areas where this unit is mapped in the Project Area are either set aside for future development or support railroads and unpaved roads (USACE 1995).

1.1.2 Udorthents, organic substratum-Urban Complex (UdouB)

This unit is an amalgamation of Udorthents, organic substratum (50 percent), Urban Land (35 percent), and additional units (15 percent). Areas of the Udorthents, organic substratum consist of stones, boulders, rubble, and soil particles. Urban Land has a surface layer that has been paved and developed with residential and or commercial buildings. Additional soils within this complex include loamy Udorthents, drainageways, areas of ponded water, and poorly drained Sulfaquents and Sulfihemists. Slopes range from 0 to 8 percent (Goodman 1995). The mixture of Udorthents, organic substratum and Urban Land is mainly found toward the southern portion of the Project Area. This soil unit is commonly used for roadways and residential and commercial areas (USACE 1995).

1.1.3 Udorthents, wet substratum (UdwB)

This unit is composed of fill material consisting of clean stones, boulders, rubble, and silty and sandy soils dredged from nearby streams or rivers; fill is up to 3 feet in depth in some areas. The slope ranges from 0 to 8 percent. Though unidentifiable, the original soils likely were deep, somewhat to very poorly drained, and prone to extended periods of ponding due to daily tidal flooding. Loamy Udorthents and Urban Land are mapped in small areas within this soil map unit (Goodman 1995). Udorthents, wet substratum occur in drainageways, upland stream terraces, areas of marine deposits, and floodplains. This unit is mostly mapped in the central to northern portion of the Project Area. This soil map unit is used for recreational facilities such as baseball fields, playgrounds, and parks or land set aside for future community development (USACE 1995).

1.1.4 Udorthents, refuse substratum

This unit is composed of fill material containing various kinds of refuse, solid waste, and rubble. In certain areas, soil material has been added to the fill, which can extend to depths of 3 feet or more. The slope ranges from 0 to 8 percent. Though unidentifiable, the original soils likely were deep, slightly to very poorly drained, and prone to extended periods of ponding due to daily tidal flooding. Poorly drained Sulfaquents and Sulfihemists, and Udorthents, with organic or wet substratum, have been mapped in

small areas within this soil unit (Goodman 1995). The Udorthents, refuse substratum is mainly used for refuse disposal. Several historic landfills are located in the Project Area; refer to **Section 3.20.3.2** of the Environmental Impact Statement (EIS) for information on the landfill locations. The majority of land is under vegetative cover (USACE 1995).

1.2 Urban Land (UR)

This NRCS soil map unit consists of areas made up of fill material consisting of clean stones, boulders, rubble, and soil and non-soil particles covered by high-density residential, commercial, and industrial buildings, paved roads, and other structures. Slopes range from 1 to 8 percent. Udorthents, with either a loamy or wet substratum, have been mapped in small areas within the unit (Goodman 1995). This map unit covers approximately 40 percent of the Project Area.

1.3 Sulfaquents-Sulfihemists (Westbrook, Ipswich, Sandy hook soils, TrkAv)

This Natural Resources Conservation Service (NRCS) soil map unit is composed of very poorly drained, hydric soils. Sulfaquents and Sulfihemists soils consist of meadowmat, peat, decayed vegetation, and organic silt and sand with slopes ranging from 0 to 2 percent. Due to its very flat topography, the soils experience daily tidal flooding and constant saturation. Along with Sulfaquents and Sulfihemists, Udorthents with organic or refuse substratum are mapped in small areas of this map unit (Goodman 1995).

Sulfihemists are highly organic soils (i.e., containing a predominance of undecomposed plant or woody fiber) ranging from 16 inches to more than 51 inches in thickness. The organic material is made up of decayed marine organisms, wetland plants, and roots. The surface layer, typically the upper 12 inches, is highly decomposed and has a black, reddish brown, or dark brown hue. Below the surface layer, the organic material is less decomposed with lenses of highly decomposed organic material. The underlying layer of mineral material is composed of stratified layers of clay, silt, and sand with a soil texture ranging from very coarse to fine (Goodman 1995).

Sulfaquents are hydric mineral soils. The surface layer in some areas is made of highly decomposed, black or very dark brown organic material, less than 16 inches thick. Other areas have a surface layer of black or very dark brown silt or fine sandy loam with an organic matter content of less than 20 percent ranging from 4 to 12 inches in thickness. The underlying layer is similar to that of the Sulfihemists (Kiviat and MacDonald 2002).

Sulfihemists have a very high permeability (ability of a substance to allow liquid and gases to pass through) due to their high organic material content, while Sulfaquents have variable permeability due to their high mineral material content compared to organic material. They are both either neutral or slightly acidic when moist but can be very strongly acidic when dried (Kiviat and MacDonald 2002). Both soils are found in tidal marshes. Tidal marsh covers approximately 25 percent of the Project Area. Tidal marsh areas are scattered throughout the Project Area, but are mostly concentrated in the areas along the Hackensack River. The daily tidal flooding and regional topography renders the marshland areas impractical for urban development or farming (Goodman 1995).

1.4 Accessory soils (DuuB, Duuc, PrnAt, RkrB, and RkrC)

The NRCS soil map units making up the accessory soils account for less than 1 percent of the Project Area. The Dunellen-Urban land complex unit (DuuB and DuuC) consists of surface area covered by buildings, roads, and pavements underlain by natural and disturbed soils. The Riverhead-sandy loam

unit (RkrB, and RkrC) consists of sandy loam and gravelly sandy loam derived from the glaciofluvial deposits from the most recent ice age. The Preakness silt loam unit (PrnAt) consists of silty loam, fine sandy loam, and gravelly sandy loam derived from sandstones, conglomerates, basalt, and gneiss (Goodman 1995).

This Page has been Intentionally Left Blank.

Appendix L: Wetlands and Waters of the US

This Page has been Intentionally Left Blank.

Table of Contents

1.0 Introduction L-1

2.0 Methodology L-3

2.1 Desktop Studies L-3
2.2 Evaluation for Planned Wetlands Process L-3
2.3 Stream Visualization Assessment Protocol L-4
2.4 Field Data Collection of Wetlands and WOUS in the Project Area L-5
2.5 Refinement of Wetlands Mapping in Footprints of the Build Alternatives L-7

3.0 Results L-8

3.1 Desktop Studies L-8
3.2 Wetland Descriptions in the Project Area Based on Field Data Collection L-11
3.3 Results of EPW L-21
3.4 Waters of the US in the Project Area and SVAP Results L-23
3.4.1 West Riser Ditch L-26
3.4.2 East Riser Ditch L-27
3.4.3 Berry's Creek L-28
3.4.4 Moonachie Creek L-28
3.4.5 Peach Island Creek L-29
3.4.6 Losen Slote L-29
3.5 Results of Refinement of Wetlands Mapping in the Footprints of the Three Alternatives L-30

4.0 References L-39

List of Tables

Table L-1: EPW Functions and Definitions L-3
Table L-2: NJDEP Wetlands Acreage in the Project Area L-8
Table L-3: FCI Values of Investigated Wetlands L-22
Table L-4: SVAP Scores of Sampled Locations L-25
Table L-5: Anticipated Alternative 1 Wetland and WOUS Impacts L-30
Table L-6: Anticipated Alternative 2 Wetland and WOUS Impacts L-31
Table L-7: Anticipated Alternative 3 Wetland and WOUS Impacts L-31

List of Figures

Figure L-1: RBDM Project Area....L-2
Figure L-2: Wetland Habitats Sampling Grid Pattern....L-6
Figure L-3: USFWS NWI Mapped Wetlands in the Project Area....L-9
Figure L-4: NJDEP Mapped Wetlands and Open Waters in the Project Area....L-10
Figure L-5: EPW Observation Locations....L-12
Figure L-6: SVAP Observation Locations and Results....L-24
Figure L-7: Anticipated Alternative 1 Wetland and WOUS Impacts (Sheet 1)....L-33
Figure L-8: Anticipated Alternative 1 Wetland and WOUS Impacts (Sheet 2)....L-34
Figure L-9: Anticipated Alternative 1 Wetland and WOUS Impacts (Sheet 3)....L-35
Figure L-10: Anticipated Alternative 2 Wetland and WOUS Impacts (Sheet 1)....L-36
Figure L-11: Anticipated Alternative 2 Wetland and WOUS Impacts (Sheet 2)....L-37

Attachments

Attachment L-1: Photographic Log
Attachment L-2: HUD Eight-Step Process for Compliance with Executive Order 11988 (*Floodplain Management*) and Executive Order 11990 (*Protection of Wetlands*) as Provided by 24 CFR Part 55

Acronyms and Abbreviations

BCUA	Bergen County Utilities Authority
CFR	Code of Federal Regulations
EIS	Environmental Impact Statement
EPW	Evaluation of Planned Wetlands
FCI	Functional Capacity Indicators
FCU	Functional Capacity Units
FP	Fish, Non-tidal Pond/Lake
FS	Fish, Non-tidal
FT	Fish, Tidal
GIS	Geographic Information System
HUD	US Department of Housing and Urban Development
HUC14	14 Digit Hydrologic Unit Code
I-80	Interstate 80
JD	Jurisdictional Determination
LOI	Letter of Interpretation
NJAC	New Jersey Administrative Code
NJDCA	New Jersey Department of Community Affairs
NJDEP	New Jersey Department of Environmental Protection
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
RBDM	Rebuild by Design Meadowlands
SB	Shoreline Bank Erosion Control
SS	Sediment Stabilization
SVAP	Stream Visual Assessment Protocol
SWQC	Surface Water Quality Criteria
UH	Uniqueness/Heritage
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
WAA	Wetland Assessment Area
WOUS	Waters of the United States
WQ	Water Quality

This Page has been Intentionally Left Blank.

1.0 Introduction

This document is an appendix to the Environmental Impact Statement (EIS) prepared for the Rebuild by Design Meadowlands (RBDM) Flood Protection Project and provides detailed information on the wetlands and waterbodies, collectively Waters of the United States (WOUS), within the Project Area. This section presents the methodologies employed during the desktop and field analyses and provides the results that were used to establish the baseline for the affected environment in the Project Area, as discussed in **Section 3.16** of the EIS.

The total Project Area is 5,405 acres and includes the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack. The Project Area has the following approximate boundaries: the Hackensack River to the east; Paterson Plank Road (State Route 120) and the southern boundary of the Borough of Carlstadt to the south; State Route 17 to the west; and Interstate 80 (I-80) and the northern boundary of the Borough of Little Ferry to the north. Much of the Project Area is within the New Jersey Meadowlands District, a regional planning area. **Figure L-1** provides an aerial view of the Project Area and identifies surface waters therein.

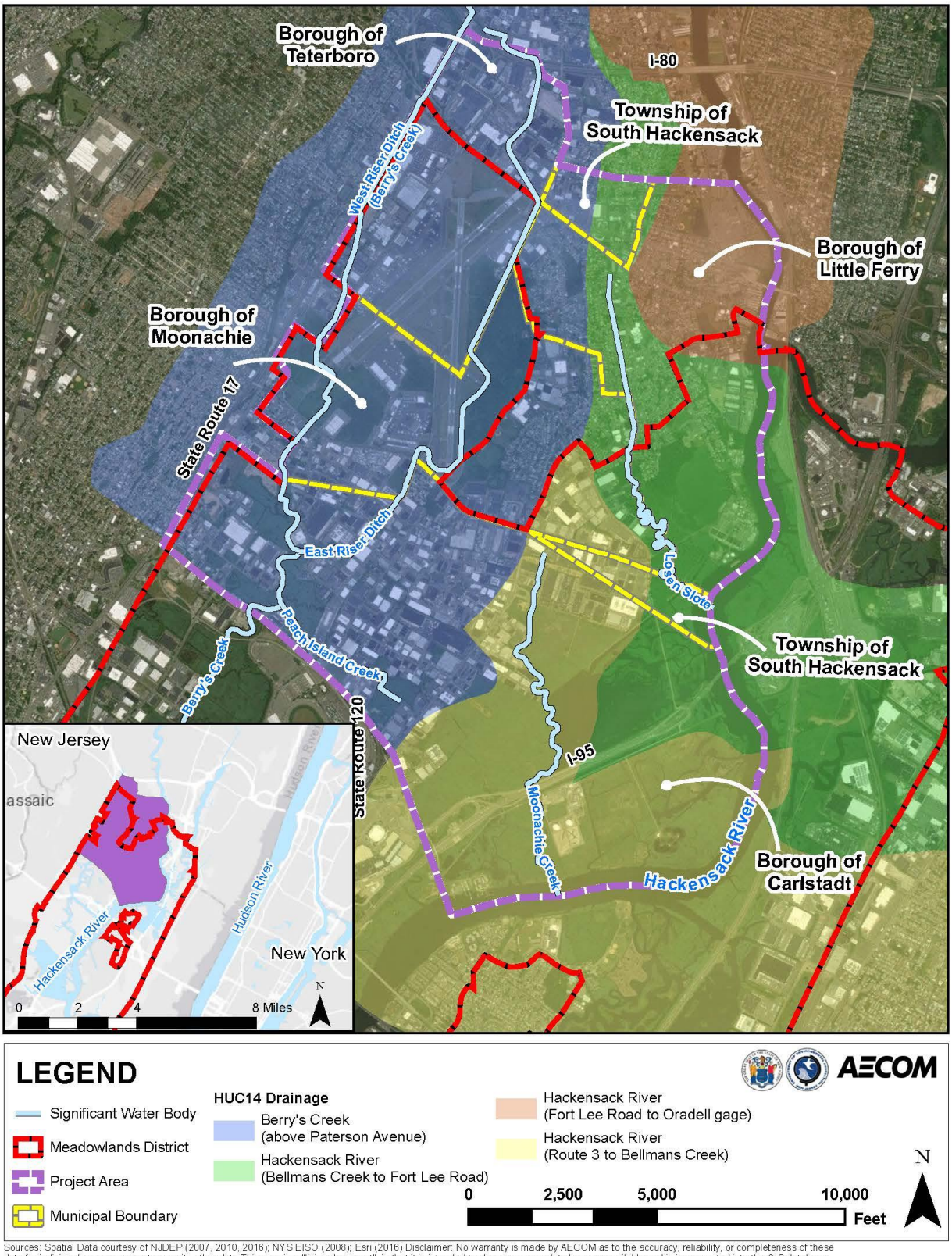


Figure L-1: RBDM Project Area

2.0 Methodology

2.1 Desktop Studies

A review of available data sources was first conducted to identify the approximate location and extent of wetlands and waterbodies in the Project Area. The data sources reviewed included the New Jersey Department of Environmental Protection (NJDEP) geographic information system (GIS) wetland mapping data (NJDEP 2015) along with the United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping data (USFWS 2018).

2.2 Evaluation for Planned Wetlands Process

The Evaluation for Planned Wetlands (EPW) protocol was applied to characterize the existing functions of wetlands within the Project Area. The EPW handbook (Bartoldus, et. al., 1994) describes EPW as "…a rapid-assessment procedure used to determine whether a planned wetland has been adequately designed to achieve defined wetland function goals. The EPW [protocol] allows the designer and decision maker to identify characteristics which are important to each function and determine how and if the planning goals are attainable." Details on the EPW protocol, described below, were taken from this handbook.

The Wetland Assessment Area (WAA) represents a designated wetland area to which the planned wetland would be compared. The EPW protocol evaluates each identified site within the WAA on six major wetland functions. The functions used in the EPW are defined in **Table L-1**. For this project, either the tidal fish or non-tidal fish was used, depending on the hydrologic regime of the habitat.

Table L-1: EPW Functions and Definitions

Function	Definition
Shoreline Bank Erosion Control (SB)	Capacity to provide erosion control and to dissipate erosive forces at the shoreline bank
Sediment Stabilization (SS)	Capacity to stabilize and retain previously deposited sediments
Water Quality (WQ)	Capacity to retain and process dissolved or particulate materials to the benefit of downstream surface water quality
Wildlife (WL)	Degree to which a wetland functions as habitat for wildlife as described by habitat complexity
Fish Tidal fish (FT) Non-tidal Stream/River (FS) Non-tidal Pond/Lake (FP)	Degree to which a wetland habitat meets the food/cover, reproductive, and water quality requirements of fish
Uniqueness/Heritage (UH)	Presence of characteristics that distinguish a wetland as unique, rare, or valuable

The EPW uses a unitless element score to represent the functional capacity of the physical, chemical, or biological characteristics of the wetland or landscape. The element score ranges from 0.0 to 1.0, where 0.0 represents unsuitable conditions and 1.0 represents the optimal condition. A low score

indicates that there is low potential for functional capacity of that wetland or landscape characteristic and a high score implies a greater potential to increase the wetland or landscape's functional capacity. The element scores for each EPW function were used to calculate a Functional Capacity Indicator (FCI).

The FCI is a dimensionless number ranging from 0.0 to 1.0 that describes a wetland's relative capacity to perform a function, where 0.0 indicates no functional capacity and 1.0 indicates optimal function capacity. The FCI is then multiplied by the WAA to derive the Functional Capacity Units (FCUs) of the area. The FCIs represent the "quality" of functional capacity per unit area, whereas the FCUs represent the "quantity" of functional capacity.

EPW data was collected within the Project Area to obtain information on general habitat quality; it is considered preliminary. During the permitting phase of the Proposed Project, the EPW findings for impacted wetlands would be refined. Further, FCUs would be calculated during the permitting phase of the Proposed Project.

2.3 Stream Visualization Assessment Protocol

The Stream Visual Assessment Protocol (SVAP) (NRCS 1998) was utilized to assess hydrologic and morphologic stream conditions for non-tidal waterways that were not addressed within the scope of the EPW. SVAP is a qualitative field reconnaissance technique that assesses channel and floodplain conditions, riparian areas, water quality, and aquatic habitat. The protocol was developed as an assessment for existing physical conditions within a project site, and it may not detect factors affecting the habitat from the watershed or stream areas outside of the project limits.

In accordance with the SVAP guidelines, up to 15 assessment elements were recorded (as applicable). The assessment elements assessed during the field effort included:

- Channel condition;
- Hydrologic alteration;
- Riparian zone condition;
- Bank stability;
- Water appearance;
- Nutrient enhancement;
- Barriers to fish movement;
- In-stream fish cover;
- Pools;
- Insect/invertebrate habitat;
- Canopy cover; and
- Macroinvertebrates observed.

Each element was scored from 1 to 10, where 1 indicates the feature was most degraded or in an unstable condition and 10 indicates that the feature was in the most natural or stable condition. The overall assessment score was created by adding up the scored value for each element and dividing that by the number of categories assessed. This numerical score can be used as a general determination of the overall quality of the stream condition. Overall assessment scores of 6.0 or less are considered 'poor,' scores between 6.1 and 7.4 are considered 'fair,' scores between 7.5 and 8.9 are considered 'good,' and scores greater than or equal to 9.0 are considered excellent.

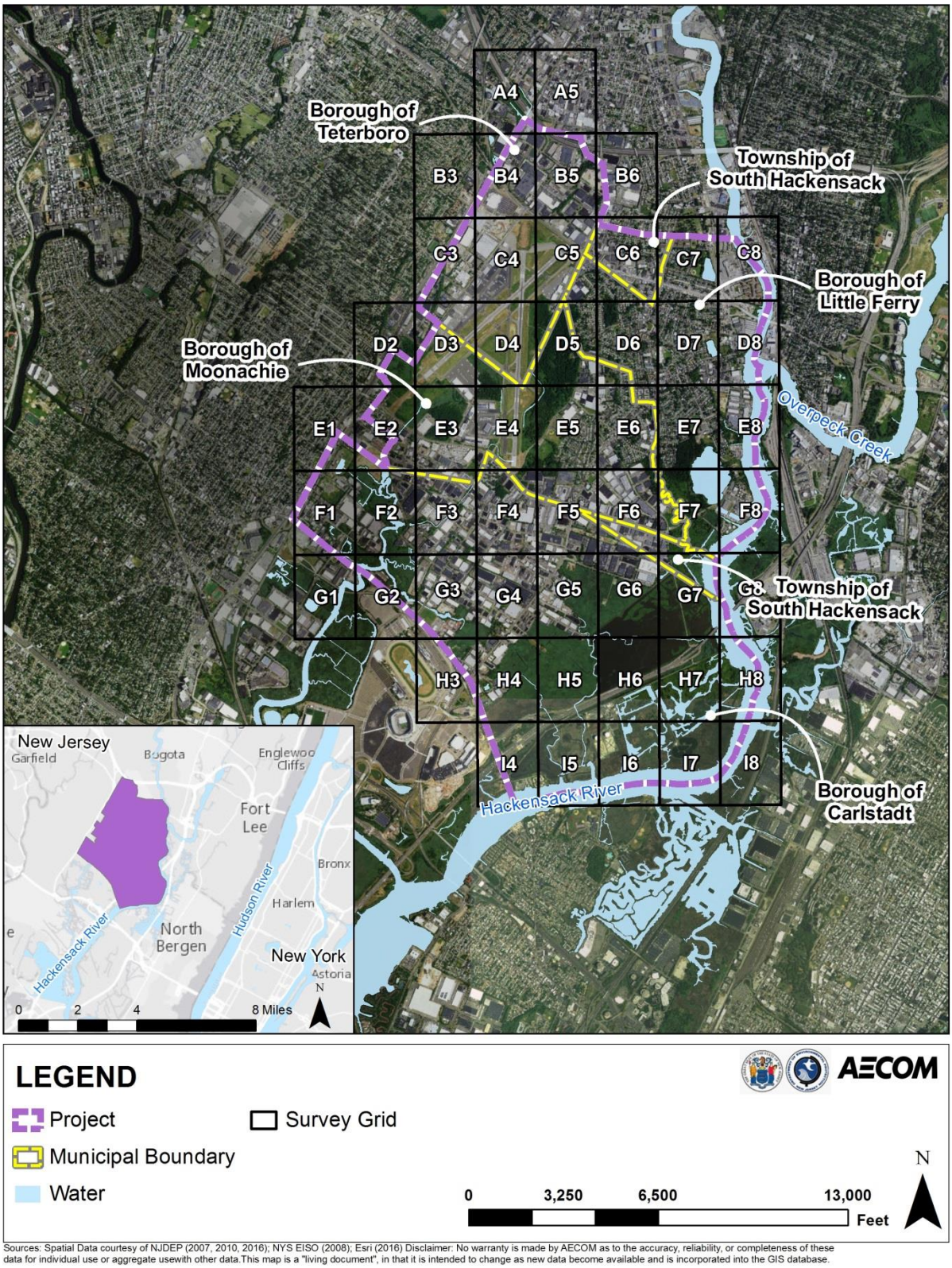
2.4 Field Data Collection of Wetlands and WOUS in the Project Area

As part of the data collection process for the Proposed Project's biological resources impact analysis (see Section 4.14 of the DEIS and Appendix J), natural habitats, including wetlands and WOUS, in the Project Area were mapped using aerial imagery and similar data. Select habitat areas were then evaluated in the field to quantify the existing conditions in the Project Area. In addition to vegetation surveys, assessments of wetland and stream characteristics were conducted in accordance with the EPW and SVAP protocols, as appropriate. The field team examined the habitats for associated wetlands, stream channels (if present), and upland buffers. Field data collection was conducted initially from September 2016 through the spring of 2017 and subsequently updated in February 2018; it included photographs, hand-sketches of existing terrestrial and aquatic habitats and vegetative communities, and locations of specific features.

Dominant vegetation was identified for each mapped habitat and detailed vegetation surveys were completed in select parcels and significant natural areas. Each mapped wetland habitat was defined by an alpha-numeric code based on its location in a sampling grid (see **Figure L-2**).

The information gathered during the field investigations was used to qualitatively rank ecological value (low, moderate, high) based on general observations and professional judgement, as well as measure functional values based on the EPW calculations. The determinations were considered baseline conditions for describing the existing environment within the Project Area and will be applied in the future to identify appropriate restoration recommendations during the permitting phase of the Proposed Project. The field teams noted the following conditions and features to support the EPW and SVAP assessments:

- Stream channel/bank and riparian buffer/upland conditions
- Dominant vegetation in each habitat/vegetative community
- Anticipated fauna usage within each habitat
- Outfalls and other conveyances of hydrology
- Human-induced and natural/wildlife impacts
- Evidence of flooding and water level fluctuations



Sources: Spatial Data courtesy of NJDEP (2007, 2010, 2016); NYS EISO (2008); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate usewith other data.This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Figure L-2: Wetland Habitats Sampling Grid Pattern

2.5 Refinement of Wetlands Mapping in Footprints of the Build Alternatives

In order to assess potential wetland and WOUS impacts associated with the three Build Alternatives of the Proposed Project, the Project team further evaluated the approximate location and type of wetlands and streams within the footprints of each Build Alternative. This desktop review and field investigation did not include a formal jurisdictional wetlands delineation, but rather provided a refinement of the wetlands and streams depicted on available mapping resources based on field reconnaissance. The investigation was conducted in the following three steps:

Step 1: Identification of Areas to be Investigated in the Field
The first step consisted of a desktop review using available data sources to identify areas to be further investigated in the field for possible mapping refinement. The data sources reviewed included NJDEP freshwater wetlands (FWW) mapping (NJDEP 2015), USFWS NWI mapping (USFWS 2018), and recent aerial photography, such as Google Earth, Bing, and NJDEP GIS. Public access was taken into account in identifying areas to be investigated in the field. The results of the desktop review identified several general areas to be investigated in the field; field maps of these areas were prepared utilizing recent aerial photography and topographic data.

Step 2: Field Investigation
The field investigation of the potential wetland areas identified during the desktop review was conducted by Project biologists on February 8, 2018. The potential wetland areas were visually investigated and the approximate wetland boundaries sketched on field maps based on the topography, persistent vegetation, and visual evidence of wetland hydrology. The general classification of wetlands (based on the Cowardin system[11]) and dominant vegetation were noted. The areas were also photo-documented.

Step 3: Refinement of Wetlands Mapping
The approximate wetland boundaries within the footprints of the alternatives, and extending 150 feet from the footprints, were then drawn in ArcGIS. The best available source was used to draw the approximate wetland boundaries; best available sources ranged from surveyed wetland boundaries that were field delineated by AECOM for other projects in the vicinity of the Build Alternative footprints to recent aerial photography for areas that could not be accessed in the field. The wetland polygons were given an attribute in ArcGIS to identify what data source was utilized. The hierarchy of best available sources for the wetland boundaries, as used for this project, were as follows:

1. Field delineated wetland boundary available - NJDEP Letter of Interpretation (LOI) or United States Army Corps of Engineers (USACE) Jurisdictional Determination (JD) **issued** (e.g., near Losen Slote in Borough of Little Ferry [NAN-2014-00081-WCA])
2. NJDEP FWW or NWI wetland boundary, adjusted based on field observations and topography
3. Field observation of wetland that was not shown on NJDEP FWW or NWI mapping
4. NJDEP FWW or NWI wetland boundary, adjusted based on aerial photo interpretation and topography
5. NJDEP FWW or NWI wetland boundary, not adjusted.

Consistent with the Cowardin system (Cowardin et. al. 1979), the wetlands were classified as freshwater emergent, freshwater scrub-shrub, freshwater forested, or tidal emergent. The top of bank of streams and waterbodies were also drawn in ArcGIS using available topography. Streams and waterbodies were classified as tidal open water or non-tidal open water. The results of the field mapping refinement are provided in **Section 3.5**.

[11] Devised by Lewis M. Cowardin et al. in 1979 for the USFWS, it is a comprehensive system that is hierarchical and includes several layers of detail for classifying wetlands.

3.0 Results

3.1 Desktop Studies

Wetland types in the Project Area are illustrated in the USFWS NWI Map (**Figure L-3**) and the NJDEP Wetlands and Open Waters map (**Figure L-4**). Estuarine emergent wetlands comprise the majority of the wetlands of the Project Area, occupying approximately 840.4 acres. These wetlands are now the most common and widely distributed wetland type within the Meadowlands District (Tiner et. al., 2005) due to the gradual reduction in freshwater flow of the Hackensack River since the construction of the Oradell and other dams. Conversely, palustrine (freshwater) wetlands, now restricted almost entirely to the upper Berry's Creek sub-basin, occupy 367.4 acres within the Meadowlands District. The remaining wetland/WOUS acreage in the Project Area (approximately 615.5 acres) consists of either open water or substantially disturbed or modified wetlands. A summary of the wetlands by type in the Project Area is presented in **Table L-2**. Total wetland acreages within the overall Project Area were calculated from NJDEP wetlands mapping data (NJDEP 2015). Detailed descriptions of the types of wetlands in the Project Area based on the desktop studies are presented in Section 3.16.3.3 of the EIS.

Table L-2: NJDEP Wetlands Acreage in the Project Area

NWI Classification	NJDEP Classification	Total Acres in Project Area
Estuarine Intertidal Emergent	Saline Marsh (High Marsh)	46.7
	Saline Marsh (Low Marsh)	288.3
	Phragmites Dominate Coastal Wetlands	505.4
Freshwater Forested	Deciduous Wooded Wetlands	193.0
Freshwater Scrub/Shrub	Deciduous Scrub/Shrub Wetlands	65.6
Freshwater Emergent	Herbaceous Wetlands	35.6
	Phragmites Dominate Interior Wetlands	73.2
Modified	Managed Wetlands in Maintained Lawn Greenspace	20.4
	Disturbed Wetlands (Modified)	17.6
	Disturbed Tidal Wetlands	92.7
Estuarine Deepwater	Open Water	484.8
Riverine		
Lake		
	Totals	**1,823.3**

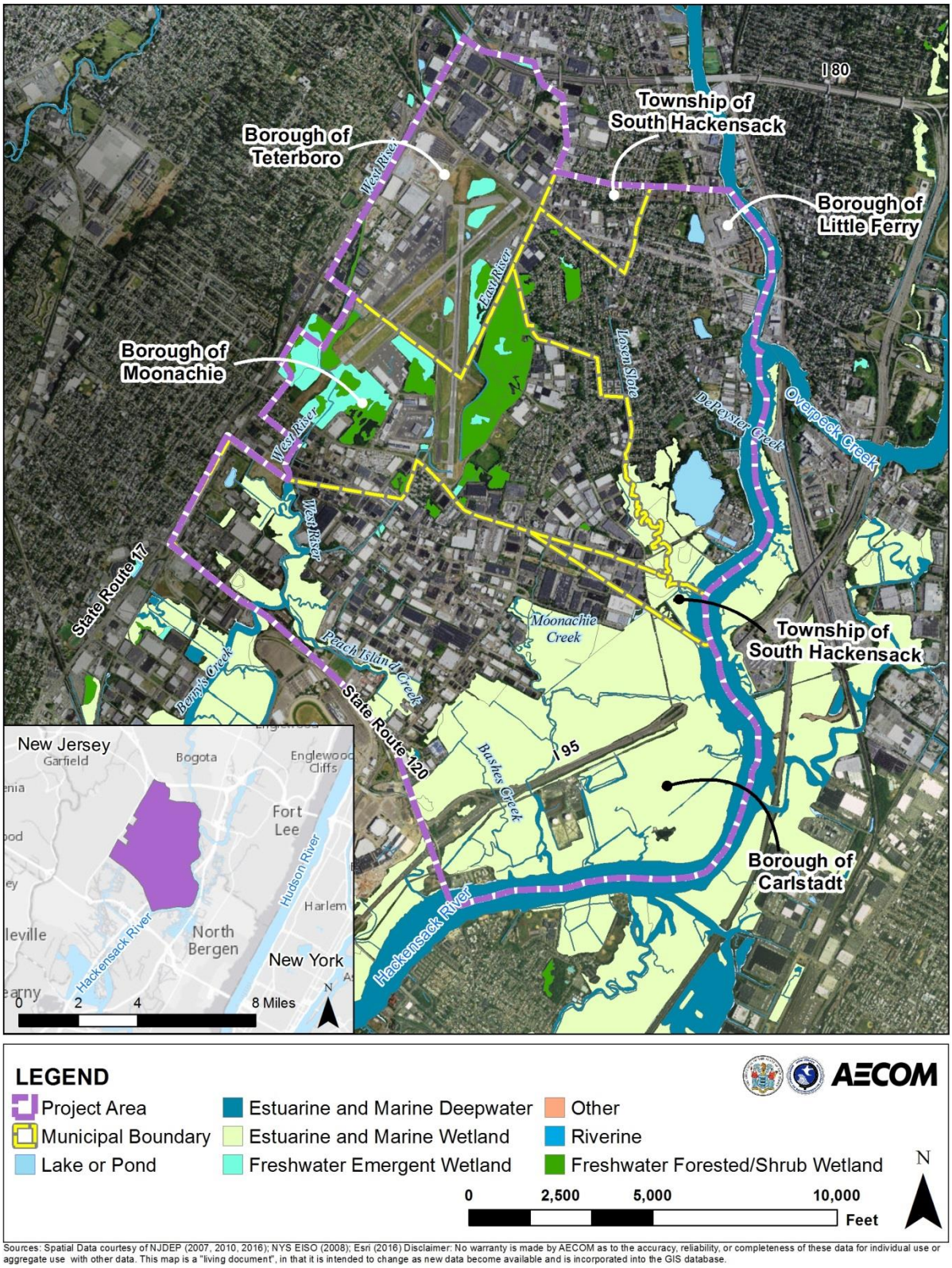
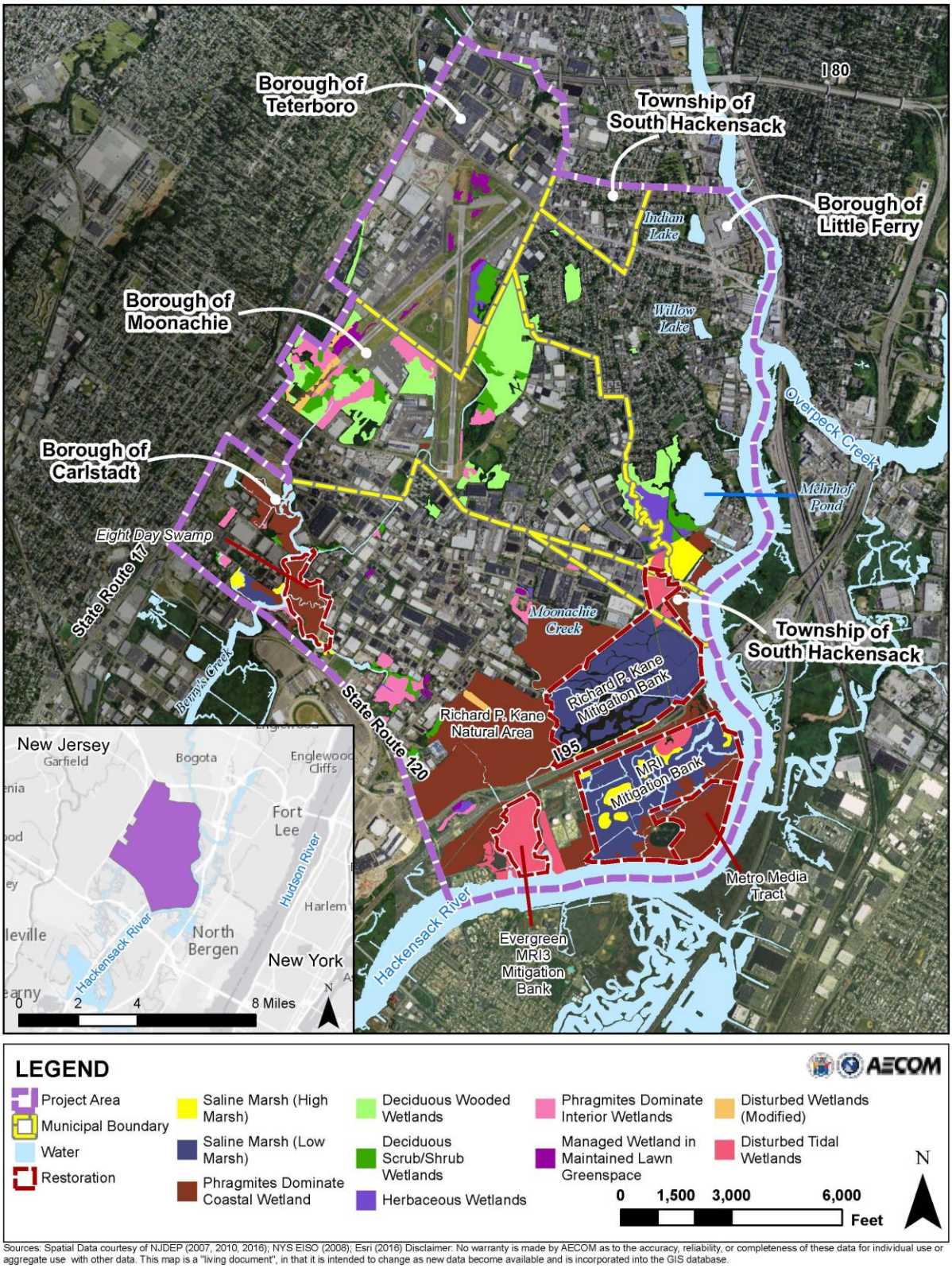


Figure L-3: USFWS NWI Mapped Wetlands in the Project Area



Sources: Spatial Data courtesy of NJDEP (2007, 2010, 2016); NYS EISO (2008); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate use with other data. This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Figure L-4: NJDEP Mapped Wetlands and Open Waters in the Project Area

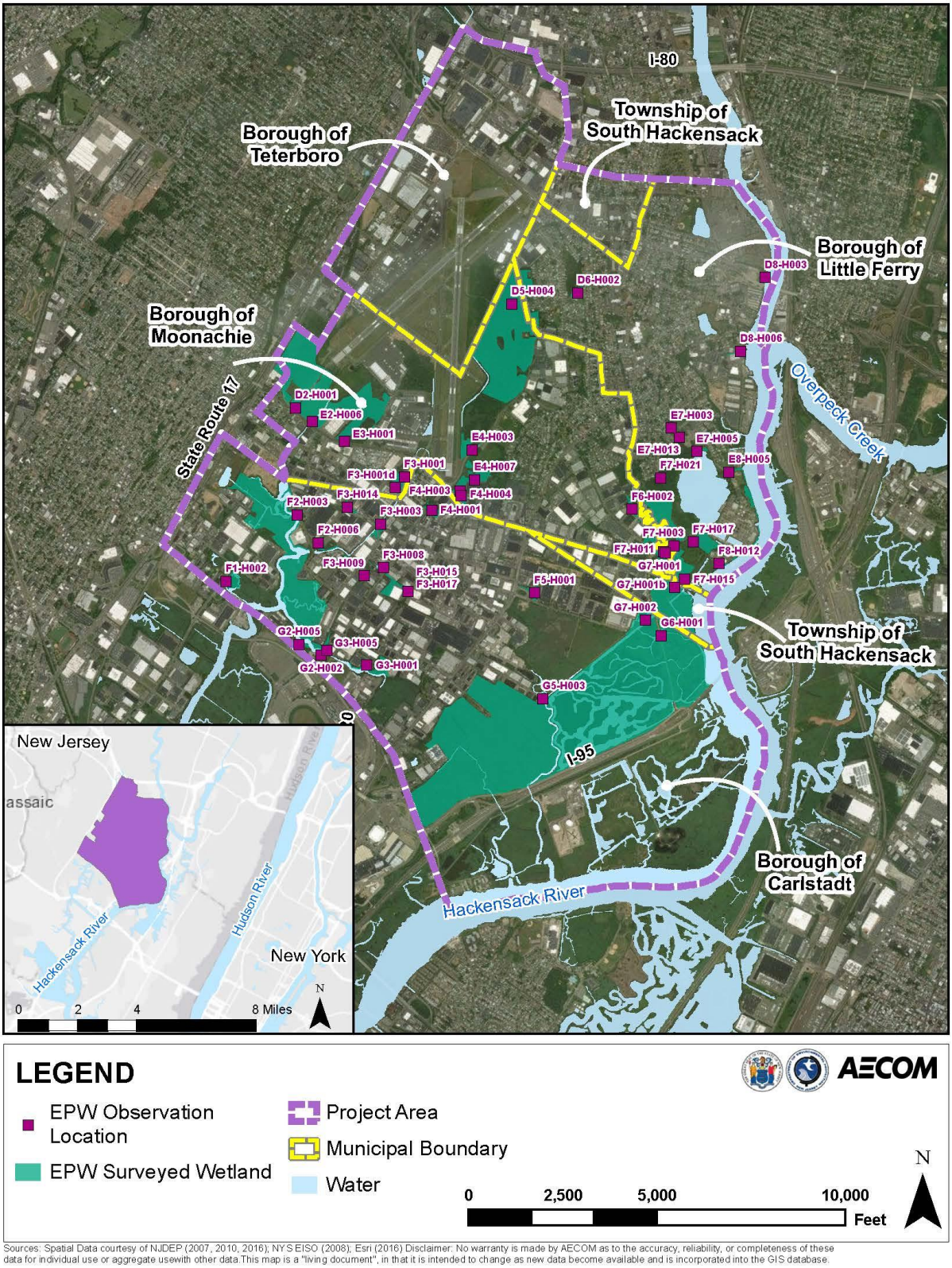
3.2 Wetland Descriptions in the Project Area Based on Field Data Collection

From September 2016 through the spring of 2017, Project biologists performed field investigations to characterize habitats throughout the Project Area; this process included wetland habitat characterization using the EPW methodology. For each mapped wetland habitat that was investigated, a descriptive paragraph is provided below. Field investigation locations are shown on **Figure L-5**; sample identifications are based on the grid pattern described in **Section 2.4** and illustrated in **Figure L-2** Wetland observation locations near, or within, the footprint of one or more of the Build Alternatives are denoted by two asterisks (**) below. A qualitative ranking of ecological value (low, moderate, high) was assigned based on field observations of wetland conditions. The functional values ultimately computed for each site, based on the EPW calculations, are discussed in **Section 3.3**. Many of the mapped wetland habitats are contiguous and form larger wetland complexes.

D2-H001: This mapped habitat is 46.7 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) 14-digit hydrologic unit code (HUC14) drainage area and is mapped by NJDEP as Deciduous Wooded Wetlands, Deciduous Scrub/Shrub Wetlands, *Phragmites* Dominated Coastal Wetlands, and Disturbed Wetlands – Modified. This mapped habitat is located on Teterboro Airport property to the southwest of the runway and adjacent to West Riser Ditch (Berry's Creek). The wetland is shrub swamp and is dominated by oak (*Quercus* sp.), pin oak (*Quercus palustris*), sassafras (*Sassafras albidum*), raspberry (*Rubus* sp.), catalpa (*Catalpa* sp.), and common reed (*Phragmites australis*). The wetland receives hydrological input from groundwater, sheetflow runoff from neighboring parcels, and overbank flooding from West Riser Ditch (Berry's Creek). Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by monoculture of common reed.

****D5-H004:** This mapped habitat is 86.9 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as Deciduous Wooded Wetlands and Deciduous Scrub/Scrub Wetlands. This mapped habitat is located on Teterboro Airport property east of the runway. The wetland is comprised of red maple-sweetgum forest (variant) and is dominated by red maple (*Acer rubrum*), Amur peppervine (*Ampelopsis brevipedunculata*), sweet pepperbush (*Clethra alnifolia*), blackgum (*Nyssa sylvatica*), mile-a-minute weed (*Persicaria perfoliata*), and pin oak. East Riser Ditch runs along the western boundary of D5-H004. The wetland receives hydrological input from groundwater, sheetflow runoff from neighboring parcels, and overbank flooding from the East Riser Ditch. This parcel is former agricultural land. During the field investigations, shallow swales were observed. These swales hold small amounts of ponded water in periods of increased hydrology and could serve as potential vernal pool habitat. Review of the field mapping data and other onsite investigations indicated this is a habitat of high ecological value as it is dominated by palustrine woody species. *A small portion of this wetland is within the footprint of Alternatives 2 and 3.*

D6-H002: This mapped habitat is 1.1 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as Deciduous Wooded Wetlands. This wetland borders a roadway to the south and upland deciduous forest to the north, which is surrounded by residential development. The wetland is red maple-sweetgum forest (variant) and is dominated by red maple, sweetgum (*Liquidambar styraciflua*), winged sumac (*Rhus copallinum*), eastern baccharis (*Baccharis halimifolia*), Allegheny blackberry (*Rubus allegheniensis*), and arrow-wood (*Viburnum dentatum*). An intermittent drainage channel runs through the wetland which receives hydrological input from groundwater and runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it has disturbance due to anthropogenic perturbations and/or invasive and nuisance species.



Sources: Spatial Data courtesy of NJDEP (2007, 2010, 2016); NYS EISO (2008); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate usewith other data.This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Figure L-5: EPW Observation Locations

****D8-H003:** This mapped habitat is 1.1 acre in size. This wetland is located in the Hackensack River (Fort Lee Road to Oradell gage) HUC14 drainage area and is not mapped as wetland by NJDEP. The wetland is located in an area with mixed industrial, commercial, and residential uses. The wetland is adjacent to the Hackensack River from which it receives hydrological input. The wetland is a common reed marsh and is dominated by common reed, Amur peppervine, and climbing hempvine (*Mikania scandens*). Review of the field mapping data and other onsite investigations indicated this is a habitat of low ecological value due to its relatively small size and limited floral species assemblage. *A portion of this wetland is within the footprint of Alternatives 1 and 2.*

D8-H006: This mapped habitat is 0.3 acre in size. This wetland is located in the Hackensack River (Fort Lee Road to Oradell gage) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is in an area of mixed commercial and industrial use. This mapped habitat is a linear drainage feature that discharges directly into the Hackensack River. The wetland primarily receives hydrological input from runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of low ecological value due to its relatively small size and limited floral species assemblage.

E2-H006: This mapped habitat is 7.5 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as *Phragmites* Dominated Coastal Wetlands. This mapped habitat is located on Teterboro Airport property to the south of the runway and is adjacent to West Riser Ditch, a tributary of Berry's Creek. This mapped habitat is contiguous to mapped red maple-blackgum swamp and scrub-shrub mapped habitats. The wetland is a common reed marsh. The wetland receives hydrological input from groundwater, sheetflow runoff from neighboring parcels, and overbank flooding from West Riser Ditch (Berry's Creek). Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by monoculture of common reed.

E3-H001: This mapped habitat is 20.3 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as Deciduous Wooded Wetlands. This mapped habitat is located on Teterboro Airport property to the south of the runway. This mapped habitat is contiguous to mapped common reed marsh, upland, and scrub-shrub mapped habitats. The wetland is red maple-blackgum swamp and is dominated by red maple, blackgum, and pin oak. A tributary to West Riser Ditch, a tributary of Berry's Creek, runs through this wetland which receives hydrological input from the ditch, groundwater, and/or sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it has a level of a disturbance due to anthropogenic perturbations and/or invasive and nuisance species.

E4-H003: This mapped habitat is 3.1 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as *Phragmites* Dominated Coastal Wetlands. This mapped habitat is located on Teterboro Airport property to the southeast of the runway. This mapped habitat is contiguous to mapped red maple-hardwood forest (variant) and upland habitats. The wetland is common reed marsh and is dominated by common reed and spotted touch-me-not (*Impatiens capensis*). East Riser Ditch, a tributary of Berry's Creek, runs along the western boundary of this wetland which receives hydrological input from groundwater, sheetflow runoff from neighboring parcels, and overbank flooding. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by a monoculture of common reed.

E4-H007: This mapped habitat is 6.7 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as Deciduous Wooded Wetlands. The wetland is located in an area of preserved land and is contiguous to mapped common reed marsh and upland habitats. The wetland is red maple-hardwood forest (variant) and is dominated by red maple, coastal sweet pepperbush, Asiatic tearthumb (*Persicaria perfoliata*), eastern cottonwood (*Populus deltoids*), quaking aspen (*Populus tremuloides*), and black cherry (*Prunus serotina*). A tributary to East Riser Ditch flows through this wetland, which receives hydrological input from the ditch, groundwater, and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of high ecological value as it is a wooded forested wetland that contains mature palustrine trees and vernal pool habitat.

E7-H003: This mapped habitat is 0.1 acre in size. This wetland is located in the Hackensack River (Bellmans Creek to Fort Lee Road) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is located near residential development and parkland. This mapped habitat is contiguous to mapped red maple-hardwood wetlands and mowed mapped habitats. The wetland is a common reed marsh. The wetland is not adjacent to a waterbody and therefore receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of low ecological value due to its small size, adjacent anthropogenic developments, and dominant monoculture of common reed.

E7-H005: This mapped habitat is 0.3 acre in size. This wetland is located in the Hackensack River (Bellmans Creek to Fort Lee Road) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is located near preserved land and residential development. This mapped habitat is contiguous to mapped open water and upland habitats. The wetland is a common reed marsh. The wetland is adjacent to a pond on the Bergen County Utilities Authority (BCUA) property and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by monoculture of common reed.

E7-H013: This mapped habitat is 0.3 acre in size. This wetland is located in the Hackensack River (Bellmans Creek to Fort Lee Road) HUC14 drainage area and is mapped by NJDEP as Deciduous Wooded Wetlands. This wetland is located near residential development and preserved land and is contiguous to mapped mowed habitat. The wetland is comprised of red maple-hardwood forest (variant) and is dominated by oak, red maple, tussock sedge (*Carex stricta*), crimson-eyed rosemallow (*Hibiscus moscheutos*), sweet woodreed (*Cinna arundinacea*), and blackgum. The wetland discharges to a drainage channel on the south end and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it has disturbance due to anthropogenic perturbations and/or invasive and nuisance species.

E8-H005: This mapped habitat is 0.8 acre in size. This wetland is located in the Hackensack River (Bellmans Creek to Fort Lee Road) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is located in an area of commercial and municipal (sewage treatment plant property) use. This mapped habitat is contiguous to mapped upland and open water habitats. The wetland is common reed marsh and is dominated by common reed and eastern annual saltmarsh aster (*Symphyotrichum subulatum*). The wetland is adjacent to the Hackensack River and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels, as well as from tidal influence. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by a monoculture of common reed.

F1-H002: This mapped habitat is 3.1 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as Saline Marsh-High Marsh. This wetland is located in an area of commercial and industrial use and is contiguous to mapped common reed marsh habitat. The wetland is floodplain/riparian forest remnant and is dominated by eastern cottonwood, tree-of-heaven (*Ailanthus altissima*), smooth sumac (*Rhus glabra*), green ash (*Fraxinus pennsylvanica*), and slippery elm (*Ulmus rubra*). The wetland is directly adjacent to the Berry's Creek waterbody and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels, as well as from tidal influence. Review of the field mapping data and other onsite investigations indicated this wooded habitat is of moderate ecological value as it has a level of a disturbance due to anthropogenic perturbations and/or invasive and nuisance species.

****F2-H003:** This mapped habitat is 71.8 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as *Phragmites* Dominated Coastal Wetlands. This wetland is located in an area of commercial and industrial use and is contiguous to mapped open water and upland habitats. The wetland is a common reed marsh. The wetland is directly adjacent to the West Riser Ditch (a tributary to Berry's Creek) and receives water from tidal influence and sheetflow runoff from neighboring parcels. This habitat is of moderate ecological value as it is largely dominated by a monoculture of common reed and is subject to high levels of sediment contamination from past industrial activities. *This wetland resembles the non-surveyed wetland along Berry's Creek immediately south of Paterson Plank Road, which would be impacted under Alternative 1. The portion of Berry's Creek south of Paterson Plank Road was not surveyed during the initial habitat mapping process because it is not located within the Project Area; this area would be further evaluated using the EPW protocol, as appropriate, during the permitting phase if Alternative 1 is selected.*

****F2-H006:** This mapped habitat is 0.4 acre in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is located in an area of commercial and industrial use and is contiguous to mapped upland and floodplain/riparian forest remnant mapped habitats. The wetland is a common reed marsh. The wetland is directly adjacent to East Riser Ditch and receives hydrological input from the ditch, groundwater, and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by a monoculture of common reed. Given its proximity to Berry's Creek, there is potential that this habitat may have contaminated sediments. *A portion of this wetland is within the footprint of Alternatives 2 and 3.*

****F3-H001:** This mapped habitat is 2.5 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is located in an area of residential, commercial, and industrial use. This mapped habitat is contiguous to mapped upland and scrub-shrub mapped habitats. The wetland was a successional old field that had recently been subject to clearing activities. At the time of the site investigation (fall 2017), the field was revegetating with native species. The wetland is adjacent to East Riser Ditch and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value due to the recent clearing activities. *A portion of this wetland is within the footprint of Alternatives 2 and 3.*

****F3-H001d:** This mapped habitat is 0.6 acre in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is located in an area of residential, commercial, and industrial use. This mapped habitat is contiguous to

mapped upland and common reed marsh habitats and is classified as shrub swamp. The wetland is adjacent to East Riser Ditch and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. During the field investigation, a 10 foot-high berm separated this habitat from East Riser Ditch. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value due to its woody species, although the habitat is subject to anthropogenic perturbations. *A portion of this wetland is within the footprint of Alternatives 2 and 3.*

****F3-H003**: This mapped habitat is 0.7 acre in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as Deciduous Scrub/Shrub Wetlands. This wetland is located in an area of commercial and industrial use. This mapped habitat is contiguous to mapped upland habitat. The wetland is floodplain/riparian forest remnant and is dominated by silver maple (*Acer saccharinum*), eastern cottonwood, pin oak, and common reed. The wetland is adjacent to East Riser Ditch and receives hydrological input from groundwater, sheetflow runoff from neighboring parcels, and overbank flooding. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value due to its small size, level of a disturbance from adjacent anthropogenic perturbations, and/or invasive and nuisance species. *A portion of this wetland is within the footprint of Alternatives 2 and 3.*

F3-H008: This mapped habitat is 0.5 acre in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is located in an area of commercial and industrial use and is contiguous to mapped upland habitat. The wetland is a common reed marsh. The wetland is adjacent to a tributary to Berry's Creek and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by a monoculture of common reed.

F3-H009: This mapped habitat is 0.4 acre in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is located in an area of commercial and industrial use and is contiguous to mapped upland habitat. The wetland is a linear feature and is dominated by common reed. The wetland is adjacent to a swale that periodically conveys surface water to the Berry's Creek drainage and it receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by a monoculture of common reed.

F3-H014: This mapped habitat is 0.9 acre in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is located in an area of commercial and industrial use and is contiguous to mapped open water habitats. The wetland is a common reed marsh and is dominated by common reed and big-tooth aspen (*Populus grandidentata*). The wetland is adjacent to a tributary to East Riser Ditch and receives hydrological input from groundwater, sheetflow runoff from neighboring parcels, and periodic overbank flooding. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by a monoculture of common reed.

F3-H015: This mapped habitat is 1.9 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is located in an area of commercial and industrial use. This mapped habitat is contiguous to mapped open water habitats. The wetland is floodplain/riparian forest remnant and is dominated by eastern cottonwood, willow (*Salix* sp.), and common reed. The wetland is adjacent to a tributary of Berry's Creek

and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it has a level of a disturbance due to anthropogenic perturbations and/or invasive and nuisance species.

F3-H017: This mapped habitat is 0.8 acre in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is located in an area of commercial and industrial use. This mapped habitat is contiguous to mapped open water and common reed marsh habitats. The wetland is floodplain/riparian forest remnant and is dominated by purple loosestrife (*Lythrum salicaria*), common reed, and eastern cottonwood. The wetland is adjacent to a tributary of Berry's Creek and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it has a level of a disturbance due to anthropogenic perturbations and/or invasive and nuisance species.

F4-H001: This mapped habitat is 1.9 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as Deciduous Wooded Wetlands. This wetland is located in an area of commercial and industrial use. This habitat is contiguous to mapped upland deciduous forest habitat. The wetland is comprised of red maple-hardwood forest (variant) and is dominated by red maple, black cherry (*Prunus serotina*), pin oak, shag-bark hickory (*Carya ovata*), lateflowering thoroughwort (*Eupatorium serontinum*), and netted chainfern (*Woodwardia areolata*). The wetland is adjacent to an unnamed tributary and receives hydrological input from groundwater and runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a forested wetland habitat of moderate ecological value as the habitat is of relatively small size and is surrounded, and affected by, anthropogenic land uses.

F4-H003: This mapped habitat is 0.5 acre in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is located in an area of commercial and industrial use. This habitat is contiguous to mapped forested wetland habitat. The wetland is an emergent wetland within a water recharge basin and is dominated by common threesquare (*Schoenoplectus pungens*) and broad-leaf cat-tail (*Typha latifolia*). The wetland is adjacent to a tributary of East Riser Ditch and receives hydrological input from groundwater and runoff from neighboring parcels. This habitat is classified as being of high ecological value habitat as it recently supported a protected amphibian species, the Atlantic Coast leopard frog. During the field investigations in 2016-2017, evidence of the Atlantic Coast leopard frog was not observed.

F4-H004: This mapped habitat is 1.1 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as Deciduous Wooded Wetlands. This wetland is located in an area of commercial and industrial use. This habitat is contiguous to mapped upland habitat. The wetland is comprised of red maple-hardwood forest (variant) and is dominated by red maple, pin oak, swamp white oak, mile-a-minute weed, fox grape (*Vitis labruscus*), and arrow-wood. The wetland is not adjacent to a waterbody and therefore receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. Even though this wetland is dominated by mature palustrine woody species, it is of moderate value as it is small in size and isolated by impervious surfaces.

F5-H001: This mapped habitat is 1.6 acres in size. This wetland is located in the Hackensack River (Route 3 to Bellmans Creek) HUC14 drainage area and is mapped by NJDEP as Herbaceous Wetlands. This wetland is located in an area of commercial and industrial use. The wetland is floodplain/riparian

forest remnant and is dominated by common reed, arrowleaf tearthumb (*Persicaria sagittata*), silver maple, eastern cottonwood, sweetgum (*Liquidambar styraciflua*), and big-tooth aspen. The wetland is adjacent to Moonachie Creek and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of low ecological value due to its relatively small size and limited floral species assemblage.

F6-H002: This mapped habitat is 2.0 acres in size. This wetland is located in the Hackensack River (Bellmans Creek to Fort Lee Road) HUC14 drainage area and is mapped by NJDEP as Deciduous Wooded Wetlands. This wetland is located in an area of commercial and industrial use. This habitat is contiguous to mapped shrub swamp wetland. The wetland is floodplain/riparian forest remnant and is dominated by pin oak, quaking aspen, sweetgum, black cherry, eastern cottonwood, and wrinkleleaf goldenrod (*Solidago rugosa*). The wetland is adjacent to the Losen Slote waterbody and receives hydrological input from groundwater, sheetflow runoff from neighboring parcels, and periodic overbank flooding from Losen Slote. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it has a level of a disturbance due to anthropogenic perturbations and/or invasive and nuisance species.

F7-H003: This mapped habitat is 12.0 acres in size. This wetland is located in the Hackensack River (Bellmans Creek to Fort Lee Road) HUC14 drainage area and is mapped by NJDEP as Deciduous Scrub/Shrub Wetlands and Herbaceous Wetlands. This wetland is located in preserved land and is contiguous to mapped upland forest habitats. The wetland is successional shrubland and is dominated by red maple, sweetgum, winged sumac (*Rhus copallinum*), eastern baccharis (*Baccharis halimifolia*), Allegheny blackberry (*Rubus allegheniensis*), and arrow-wood. The wetland is adjacent to the Losen Slote waterbody and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. This large successional shrubland is of high ecological value due to its size, species composition, and potential to directly and indirectly support protected species.

F7-H011: This mapped habitat is 2.9 acres in size. This wetland is located in the Hackensack River (Bellmans Creek to Fort Lee Road) HUC14 drainage area and is mapped by NJDEP as Herbaceous Wetlands. This wetland is located adjacent to an area of commercial and industrial use and is contiguous to mapped forested wetland and upland habitats. The wetland is shallow emergent marsh and is dominated by purple loosestrife, Asiatic tearthumb, common reed, flat-top goldentop (*Euthamia graminifolia*), tall goldenrod (*Solidago altissima*), and Pennsylvania smartweed (*Persicaria pennsylvanica*). The wetland is adjacent to the Losen Slote waterbody and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it has a level of a disturbance due to anthropogenic perturbations and/or invasive and nuisance species.

****F7-H015:** This mapped habitat is 5.8 acres in size. This wetland is located in the Hackensack River (Bellmans Creek to Fort Lee Road) HUC14 drainage area and is mapped by NJDEP as Saline Marsh-High Marsh. This wetland is located adjacent to the BCUA and is contiguous to mapped upland forest habitats. The wetland is common reed marsh and is dominated by common reed, Allegheny blackberry, wrinkle-leaf goldenrod, and lateflowering thoroughwort. The wetland is adjacent to Losen Slote as well as the Hackensack River and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels as well as from tidal influence. This large habitat is of high ecological value due to its size, isolation from anthropogenic disturbance, and potential to directly and indirectly support protected species. *A portion of this wetland is within the footprint of Alternative 1.*

F7-H017: This mapped habitat is 4.9 acres in size. This wetland is located in the Hackensack River (Bellmans Creek to Fort Lee Road) HUC14 drainage area and is mapped by NJDEP as *Phragmites* Dominated Coastal Wetlands. This wetland is located within the BCUA. This habitat is contiguous to mapped upland deciduous forest habitat. The wetland is a common reed marsh. The wetland is adjacent to a tributary of the Hackensack River and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels, as well as from tidal influence. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by a monoculture of common reed.

F7-H021: This mapped habitat is 0.2 acre in size. This wetland is located in the Hackensack River (Bellmans Creek to Fort Lee Road) HUC14 drainage area and is mapped by NJDEP as Deciduous Wooded Wetlands. This wetland is located in a residential area and is contiguous to mapped upland deciduous forest habitat to the south. The wetland is red maple-hardwood forest (variant) and is dominated by red maple. The wetland is adjacent to an unnamed tributary/ditch and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. This mapped habitat is of high ecological value and is surrounded by an upland habitat of high ecological value. Both the upland and wetland habitats have similar vegetative cover types. The habitats are dominated by a mature forest and directly and indirectly support protected avifauna species. Review of field mapping data from 2016-2017 and other investigations determined that the oldest stand of trees in the Project Area occurs in this habitat complex. Shallow depressions within portions of this habitat may serve as vernal pool habitat.

****F8-H012:** This mapped habitat is 0.3 acre in size. This wetland is located in the Hackensack River (Bellmans Creek to Fort Lee Road) HUC14 drainage area and is not as mapped as wetland by NJDEP This wetland is located within the BCUA and fringes the Hackensack River. The wetland is shallow emergent marsh and is dominated by common reed, eastern baccharis, seaside goldenrod (*Solidago sempervirens*), lateflowering thoroughwort, Amur peppervine, and Japanese hop (*Humulus japonicas*). The wetland receives hydrological input from groundwater, sheetflow runoff from neighboring parcels, and from tidal influence. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value. The habitat has a level of a disturbance due to anthropogenic perturbations and/or invasive and nuisance species. *A portion of this wetland is within the footprint of Alternative 1.*

G2-H002: This mapped habitat is 0.1 acre in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as Saline Marsh-High Marsh. This wetland is located in an area of commercial and industrial use. This habitat is contiguous to mapped upland habitats. The wetland is a common reed marsh. The wetland is adjacent to the Peach Island Creek and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels, as well as from tidal influence. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by a monoculture of common reed. There is a potential for this site to contain contaminated sediments due to its close proximity to Berry's Creek.

G2-H005: This mapped habitat is 0.5 acre in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is not mapped as wetland by NJDEP. This wetland is located in an area of commercial and industrial use. This habitat is contiguous to mapped upland habitats. The wetland is a common reed marsh. The wetland is adjacent to the Berry's Creek waterbody and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels, as well

as from tidal influence. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by a monoculture of common reed. There is a potential for this site to contain contaminated sediments due to its close proximity to Berry's Creek.

G3-H001: This mapped habitat is 4.8 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as *Phragmites* Dominated Coastal Wetlands and Deciduous Scrub/Shrub Wetlands. This wetland is located in an area of commercial and industrial use and is contiguous to mapped upland habitats. The wetland is a common reed marsh. The wetland is adjacent to the Peach Island Creek and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by a monoculture of common reed. There is a potential for this site to contain contaminated sediments due to its close proximity to Berry's Creek.

G3-H005: This mapped habitat is 1.6 acres in size. This wetland is located in the Berry's Creek (above Paterson Avenue) HUC14 drainage area and is mapped by NJDEP as Saline Marsh-High Marsh. This wetland is located in an area of commercial and industrial use. This habitat is contiguous to mapped upland and wetland habitats. The wetland is a common reed marsh. The wetland is adjacent to Peach Island Creek and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels, as well as from tidal influence. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value as it is largely dominated by a monoculture of common reed. There is a potential for this site to contain contaminated sediments due to its presence to Berry's Creek.

****G5-H003:** This mapped habitat is 197.4 acres in size. This wetland is located in the Hackensack River (Route 3 to Bellmans Creek) HUC14 drainage area and is mapped by NJDEP as *Phragmites* Dominated Coastal Wetlands and Deciduous Scrub/Shrub Wetlands. This habitat is located in an area of commercial and industrial use. This habitat is contiguous to patches of mapped upland successional shrubland and woodland habitats. The wetland is a common reed marsh. The habitat is bounded by Moonachie Creek to the east and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels, as well from overbank flooding from Bashes Creek and Moonachie Creek.

A similar, NJDEP *Phragmites* Dominated-Coastal Wetland is present on the northeast side of Moonachie Creek. This wetland is bordered on the north by Commerce Boulevard and on the southeast by a man-made berm which separates it hydrologically from the Richard. P. Kane Mitigation Bank. *A portion of Alternative 1 would be aligned along the northern edge of this wetland, adjacent to Commerce Boulevard.*

G6-H001: This mapped habitat is 237.5 acres in size. This wetland is located in both the Hackensack River (Bellmans Creek to Fort Lee Road) as well as Hackensack River (Route 3 to Bellmans Creek) HUC14 drainage areas and is mapped by NJDEP as Saline Marsh-High Marsh, *Phragmites* Dominated Coastal Wetlands, Herbaceous Wetland, and Disturbed Tidal Wetlands. This habitat is bounded by a berm separating the common reed marsh to the north and west, the New Jersey Turnpike to the south/southeast, the Hackensack River to the northeast, and Moonachie Creek to the southwest. The habitat is a large tidal wetland mitigation bank. This marsh contains open water, intertidal mudflats, low and high marsh habitats and is dominated with cordgrass (*Spartina* sp.) and common reed. Fauna investigations in 2016-2017 identified large numbers of avifauna (e.g., wading birds and waterfowl)

using the site. Review of the field mapping data and other onsite investigations indicated this is a habitat of very high ecological value due to its large size and mixed emergent estuarine habitats.

G7-H001: This mapped habitat is 1.7 acres in size. This wetland is located in the Hackensack River (Bellmans Creek to Fort Lee Road) HUC14 drainage area and is mapped by NJDEP as Disturbed Tidal Wetlands. This habitat is contiguous to mapped forested wetland habitat. The wetland is successional shrubland and is dominated by common reed, lateflowering thoroughwort, purple loosestrife, flat-top goldentop, wrinkle-leaf goldenrod (*Solidago rugosa*), and eastern baccharis. The wetland is adjacent to Losen Slote and receives hydrological input from groundwater and sheetflow runoff from neighboring parcels, as well as through tidal influence. Review of the field mapping data and other onsite investigations indicated this is a habitat of high ecological value as it is dominated by woody species.

****G7-H001b:** This mapped habitat is 16.3 acres in size. This wetland is located in the Hackensack River (Bellmans Creek to Fort Lee Road) HUC14 drainage area and is mapped by NJDEP as Disturbed Tidal Wetlands. This habitat is located adjacent to an area of commercial and industrial use. This habitat is contiguous to mapped forested wetland habitat and shallow emergent marsh. The wetland is shrub swamp and is dominated by Jesuit's bark (*Iva frutescens*), lateflowering thoroughwort, purple loosestrife, flat-top goldentop, wrinkle-leaf goldenrod, and eastern baccharis. The wetland is adjacent Losen Slote and receives hydrological input from tidal influence as well as from groundwater and sheetflow runoff from neighboring parcels. This site is an active wetland mitigation area. Review of the field mapping data and other onsite investigations indicated this is a habitat of very high ecological value due to its large size and mixed estuarine habitats. *A portion of this wetland is within the footprint of Alternative 1.*

****G7-H002:** This mapped habitat is 4.1 acres in size. This wetland is located in both the Hackensack River (Bellmans Creek to Fort Lee Road) as well as the Hackensack River (Route 3 to Bellmans Creek) HUC14 drainage areas and is not mapped as wetland by NJDEP. This habitat is located adjacent to an area of commercial and industrial use. This wetland is physically separated from nearby wetlands due to the presence of a berm and roads. The wetland is a common reed marsh. The wetland receives hydrology from groundwater and sheetflow runoff from neighboring parcels. Review of the field mapping data and other onsite investigations indicated this is a habitat of moderate ecological value due to its size, isolation, and species composition. *A portion of this wetland is within the footprint of Alternative 1.*

3.3 Results of EPW

The EPW results for each of the wetland habitats investigated are summarized in **Table L-3**. Each function is assessed separately and receives a separate FCI; EPW does not provide for the summation of FCIs into an overall grand score for a wetland. As indicated in **Table L-3**, the investigated wetland parcels have a wide ranging set of functions and values. Many of the wetlands in the Project Area have high FCI scores for SS and SB. It should be noted that these higher scores are not necessarily indicative of a wetland of high ecological value. Dense monocultures of common reed often receive high SS and SB scores as monocultures are effective at retaining sediments and stabilizing shorelines and soils; however, the nature of the monoculture often provides reduced wildlife values. For example, wetland habitat G5-H003, a large monoculture of common reed in the southern portion of the Project Area, had SS and SB scores of 0.83 and 0.83 respectively; however, the scores for WQ, WL, and Fish were 0.54, 0.21, and 0.59, respectively. It is these discrepancies in FCI that could guide mitigation decisions. FCU scores (calculated during the permitting phase) would be factored in to the overall EPW process to promote ecological uplift during mitigation planning.

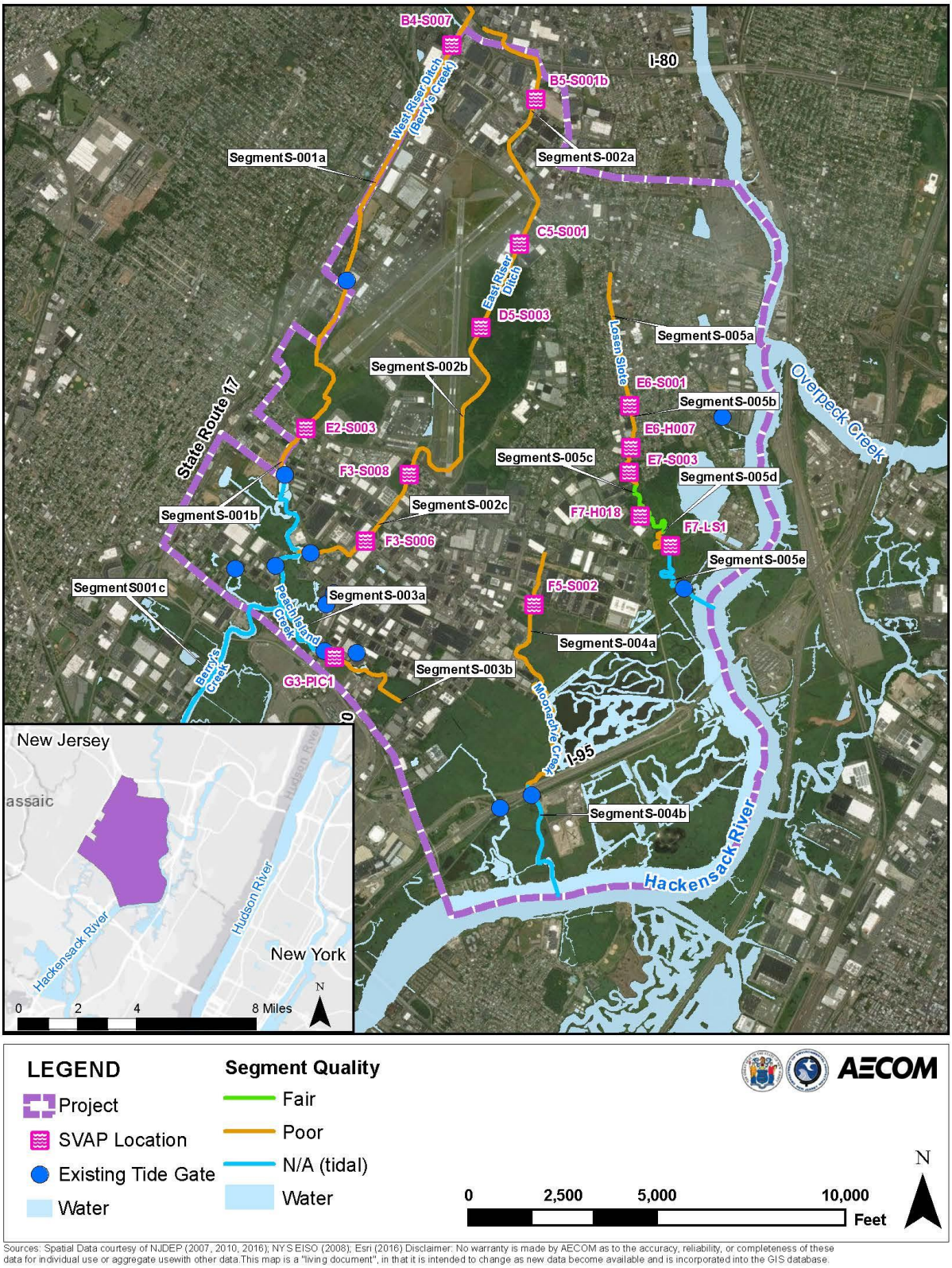
Table L-3: FCI Values of Investigated Wetlands

Function	FCI Scores													
	D2-H001	D5-H004**	D6-H002	D8-H003**	D8-H006	E2-H006	E3-H001	E4-H007	E7-H003	E7-H005	E7-H013	E8-H005	F2-H003	F2-H006**
SB	0.8	0.5	0.7	0.54	0.5	0.8	0.7	0.6	0.7	0.9	0.7	0.35	0.37	0.8
SS	1.0	0.8	0.8	0.75	0.8	0.8	0.8	0.4	0.9	1.0	0.6	0.53	0.49	0.8
WQ	0.9	0.6	0.7	0.59	0.4	0.7	0.8	0.5	0.5	0.6	0.8	0.51	0.48	0.8
WL	0.3	0.6	0.6	0.19	0.1	0.1	0.3	0.5	0.2	0.2	0.5	0.11	0.27	0.1
FT	0.2	N/A	N/A	0.34	N/A	0.2	N/A	N/A	N/A	0.4	N/A	0.31	0.38	N/A
	F3-H001**	F3-H001d**	F3-H003**	F3-H008	F3-H009	F3-H014	F3-H015	F4-H001	F4-H003	F4-H004	F5-H001	F6-H002	F7-H003	F7-H011
SB	0.9	0.8	0.58	0.79	0.59	0.7	0.60	0.4	0.9	0.85	0.54	0.6	0.93	0.93
SS	0.53	0.6	0.50	0.75	0.68	0.8	0.75	0.6	1.00	0.69	0.53	0.9	0.95	0.95
WQ	0.51	0.6	0.52	0.69	0.41	0.8	0.72	0.5	1.00	0.88	0.59	0.6	0.88	0.66
WL	0.20	0.2	0.29	0.17	0.23	0.1	0.20	0.3	0.11	0.25	0.16	0.7	0.24	0.24
FT	N/A	N/A	0.34	0.34	0.27	N/A	0.31	0.3	N/A	N/A	0.31	N/A	0.19	0.19
	F7-H015**	F7-H017	F7-H021	F8-H012**	G2-H002	G2-H005	G3-H001	G3-H005	G5-H003	G6-H001	G7-H001	G7-H001b**	G7-H002**	
SB	0.83	0.85	0.65	0.34	0.82	0.79	0.32	0.63	0.83	0.75	0.41	0.84	0.8	
SS	0.55	1.00	0.63	0.53	0.75	0.73	0.53	0.53	0.83	0.84	0.41	0.63	0.7	
WQ	0.53	0.75	0.44	0.51	0.61	0.63	0.51	0.54	0.54	0.77	0.50	0.58	0.6	
WL	0.11	0.12	0.28	0.23	0.16	0.23	0.17	0.19	0.21	0.37	0.23	0.31	0.1	
FT	0.23	0.44	N/A	0.31	N/A	0.28	0.31	0.31	0.59	0.64	0.30	0.51	0.2	

Notes: All habitats are assumed to have a UH score of 1.0 as they are either in a floodplain, potentially serve as habitat for special status species, are rare in the immediate region, or serve as a study site.
** Wetland observation locations near, or within, the footprint of one or more of the Build Alternatives.

3.4 Waters of the US in the Project Area and SVAP Results

Freshwater, non-tidal streams within the Project Area were evaluated under the SVAP using field data collected from September 2016 through the spring of 2017. Locations of the SVAP field observations are shown on **Figure L-6**. All of the streams that were evaluated flow through a tide gate or tidal control structure before entering the Hackensack River or Berry's Creek. The numerical scores for applicable assessment categories for each observation location are presented in **Table L-4**. A score of 6.0 or less on the SVAP scale is considered poor. Except for one observation location at Losen Slote, all observation locations were rated poor with scores ranging from 2.18 to 5.82. **Figure L-6** depicts the segments of the waterbodies along with their SVAP ratings. Descriptions of the evaluated waterbodies are discussed below. The SVAP ratings for the non-tidal waterbodies are also discussed.



Sources: Spatial Data courtesy of NJDEP (2007, 2010, 2016); NYS EISO (2008); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate usewith other data.This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Figure L-6: SVAP Observation Locations and Results

Table L-4: SVAP Scores of Sampled Locations

Stream Name	West Riser Ditch			East Riser Ditch									Losen Slote							Moonachie Creek		Peach Island Creek	
Observation Location	B4-S007	E2–S003		B5-S001b		C5-S001		D5-S003	F3-S008		F3-S006		E6-S001	E6-H007	E7-S003		F7-H018	F7-LS1		F5-S002		G3-PIC1	
Substrate	silt, mud	mud		silt, mud		silt, mud		silt, mud	silt, mud		mud		silt, mud	sandy silt w/ rocks	mud		silt	silt, mud		silt, mud		mud	
Sampling Date	05/17	05/17	11/16	05/17	11/16	05/17	11/16	11/16	05/17	11/16	05/17	11/16	05/17	11/16	05/17	11/16	11/16	05/17	11/16	05/17	11/16	05/17	11/16
Channel Condition	3	1	1	1	1	1	1	4	1	1	1	1	1	5	6	6	8	7	7	2	2	1	1
Hydrologic Alteration	5	1	1	1	1	3	3	7	1	1	2	2	3	5	6	6	8	7	7	5	1	1	1
Riparian Zone	6	3	3	2	3	5	5	10	3	3	5	5	6	8	9	9	10	9	9	8	8	4	4
Bank Stability	8	3	3	7	7	5	5	5	7	7	5	7	5	7	8	8	7	3	3	7	5	7	7
Water Appearance	3	3	3	5	2	5	5	6	3	7	5	5	7	7	3	3	6	5	7	5	7	3	3
Nutrient Enrichment	3	7	7	3	3	5	5	7	3	5	2	2	7	7	7	7	7	7	7	5	6	3	3
Barriers to Fish Movement	10	10	5	3	5	3	5	5	10	5	10	5	8	5	6	8	5	10	10	10	10	5	1
Instream Fish Cover	5	3	1	3	3	1	1	4	3	1	1	1	3	3	4	3	4	2	2	3	3	1	1
Pools	1	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	3	1	1	2	3	1	1
Invertebrate Habitat	3	1	1	1	1	1	1	3	1	1	1	1	3	3	7	7	3	1	1	1	1	1	1
Canopy Cover	4	1	1	1	7	7	7	8	5	1	1	1	7	7	6	6	8	1	1	1	1	1	1
Macro-invertebrates	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	†	NA	NA	NA	NA	†	†	†	†	NA	NA
Total Score	51	34	27	28	34	37	39	62	38	33	34	31	51	58	63	64	69	53	55	49	47	28	24
Weighted Score	4.64	3.09	2.45	2.55	3.09	3.36	3.55	5.64	3.45	3.00	3.09	2.82	4.64	5.27	5.73	5.82	6.27	4.27	4.10	4.45	3.82	2.55	2.18
Rank	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor

Note: Manure Presence, Salinity and Riffle Embeddedness were not applicable to the streams in this evaluation and are not included in the results.
†Refer to **Section 3.14.3.2** of the DEIS and **Appendix J** for benthic macroinvertebrate survey results

3.4.1 West Riser Ditch

The overall length of West Riser Ditch within the Project Area is 3 miles (from headwaters to its confluence with Berry's Creek). A tide gate located approximately 0.3 mile south of Moonachie Avenue separates West Riser Ditch from Berry's Creek. For the purpose of this project, upstream of the tide gate is considered West Riser Ditch. The original headwaters of West Riser Ditch originated from springs in an area of historical wetlands (now filled and developed); the main headwaters are now located in a small area bounded between the intersections of I-80, State Route 46, and State Route 17. The area surrounding the headwaters is highly developed with commercial and industrial use buildings, impervious surfaces, and roadways. Several ponds and retention basins that are hydrologically connected to the headwaters are present in the area. Based on field investigations, it appeared that all but one of the original wetland springs have been contained within these surface waterbodies. Underground piping and overflow channels convey water from these surface water bodies to the channelized stream course.

Approximately 2,800 feet downstream of the headwater sources, the headwaters combine to create the main channel. At State Route 46, the stream is conveyed underground through pipes. The stream then reemerges several hundred yards south of State Route 46 in two distinct channels on either side of a railroad berm. From there, the stream channels continue south alongside the berm with little to no sinuosity or gradient. This upper portion is characterized by a very narrow upland forest/maintained lawn riparian corridor bifurcated by railroad tracks that is between State Route 17 and commercial development/impervious surfaces.

The two stream channels recombine after passing underneath Malcolm Avenue. The stream then continues in a straight, channelized course through a narrow band of upland riparian zone bounded by commercial development until it reaches a pump station. After the pump station, the stream regains some sinuosity. Approximately 1,200 feet from the pump station, West Riser Ditch enters into the Teterboro Airport property, where it is joined by several ditches draining the surrounding vegetated parcels. The vegetated riparian zone within the airport is comparatively large versus the upstream environments.

The main substrates of West Riser Ditch are silt and mud. The water depth ranges from approximately one foot deep in the upper reaches to up to three feet deep through the airport property. The depth of the lower tidal portion of the stream, south of Moonachie Avenue, is currently unknown.

Fisheries surveys were performed within West Riser Ditch. Review of the data indicated the fish community is comprised of species tolerant of disturbed conditions (See **Appendix J**). Contamination from heavy metals (including mercury) has been recorded in West Riser Ditch, in addition to other stressors, including limited riparian areas and runoff from adjacent development (Hobble et al. 2015).

The headwaters of West Riser Ditch were observed to have poor channel condition, water appearance, bank stability, and riparian zone, and they lacked pools and invertebrate habitat. The main body of West Riser Ditch has been highly altered. West Riser Ditch has been straightened and channelized and receives runoff from roads and urban areas. A substantial vegetated riparian zone is not present. According to the results of the SVAP analysis, the quality of the upper segment (sample location B4-S007) and lower segment (observation location E2-S003) of West Riser Ditch is poor.

3.4.2 East Riser Ditch

The overall length of East Riser Ditch is 4.2 miles from its headwaters to its confluence with Berry's Creek. Originating from springs in an area of historical wetlands (now filled and developed), East Riser Ditch runs alongside the north edge of I-80 for a short distance before crossing underneath the highway and reemerging into a grassy swale. The stream then runs alternately underneath and alongside an abandoned railroad grade before it runs underground beneath North Street and an adjacent parking lot. South of the parking lot, the stream returns to the surface for approximately 1,000 feet before returning underground. This 1,000-foot above-ground segment is the only portion of the stream north of Route 46 with an appreciable riparian corridor, although the width of the corridor is negligible and grassy areas extend to the waterline in several places. After this segment, the stream goes underground. In this portion (north of Route 46), the surrounding properties are comprised of almost entirely impervious surfaces associated with the commercial district. Small mowed and brushy areas are interspersed sporadically amongst the buildings and parking lots in the area.

The stream reemerges south of State Route 46 across from Huyler Street and continues for approximately 1,500 feet between two paved roads adjacent to Teterboro Airport. The area between the two roads is vegetated with trees, shrubs, and grass. The stream then enters the Teterboro Airport property, first along the interface between the forested habitats and the scrub-shrub wetlands, then between the interface of maintained lawn and upland successional meadow within the airport property. At the southern limit of the airport, the stream briefly goes underground along Redneck Avenue. The wetlands located to the east of the airport (across Redneck Avenue) appear to drain into the stream at this location via cross drains.

The stream continues south from Teterboro Airport, through a narrow forested corridor between commercial and residential development. Four roadways and a railroad bridge cross the stream in this portion and it then converges with Berry's Creek. At the junction of East Riser Ditch with Berry's Creek, there are remnants of a trash rack and a tide gate.

The main substrates of East Riser Ditch are silt and mud. The depth of the stream is approximately 1-foot with occasional small pools (normally associated with culverts). One large pool of unknown depth exists at the tide gate at the south end of the stream.

Fisheries surveys were performed within East Riser Ditch. Review of the data indicated the species assemblage was comprised of species tolerant of disturbed conditions (See **Appendix J**). Contamination from heavy metals (including mercury) has been recorded in East Riser Ditch in addition to other stressors, including limited riparian areas, and runoff from adjacent development (Hobble et al. 2015).

For the purpose of the field investigation, East Riser Ditch was separated into three hydrologic segments: the upper headwater (Segment S-002a), middle (Segment S-002b), and lower (Segment S-002c). The upper headwater segment (observation locations B5-S001 and C5-S001), middle segment (observation location D5-S003), and lower segment (observation locations F3-006 and F3-008) were classified in accordance with the SVAP analyses as being poor quality.

In the upper reaches, there were signs of water impediment where the stream flows under North Street. It appeared that the culvert may be clogged. There was a lack of riparian vegetation along the corridor, especially on the eastern bank. The stream has been straightened in the upper reaches and receives significant runoff from the surrounding urban area, which contributes to sedimentation.

In the upper-middle stretch, the stream has been straightened and confined by development on both sides of the stream. Sedimentation from significant urban runoff impedes macroinvertebrate habitat. A lack of riparian zone and in-stream vegetation decreases available fish habitat.

In the lower-middle stretch, the stream channel has been straightened and is confined by bulkheads and berms. The bulkheads and berms preclude urban runoff from entering the stream here. It also precludes access to the floodplain and its filtering function.

The lower stretch has been straightened and a floodplain is not present. The lower stretch of East Riser Ditch receives significant urban runoff from surrounding roads and parking lots. A lack of vegetative diversity exists in the limited adjacent riparian area. Significant silt deposits on the banks and in the channel point to erosion and active down-cutting of the upstream embankments.

3.4.3 Berry's Creek

The tidal portion of Berry's Creek starts at a tide gate, located approximately 0.3 mile south of Moonachie Avenue, which separates Berry's Creek from West Riser Ditch. The overall length of Berry's Creek from the junction of West Riser Ditch to its confluence with the Hackensack River is approximately 5 miles. Berry's Creek is a major tributary to the Hackensack River. Major tributaries that flow to Berry's Creek from the Project Area include Peach Island Creek, West Riser Ditch, and East Riser Ditch. Several larger wetland complexes also contribute to these tributaries and Berry's Creek itself. The lower portion of Berry's Creek from just south of Paterson Plank Road to the Hackensack River, including Berry's Creek Canal, are outside of the Project Area.

The creek ranges in depth from approximately 1-foot in the upper reaches to as deep as 15 feet in the canal that is downstream of the Project Area. Fisheries surveys were performed within Berry's Creek. Review of the data indicated the species assemblage is comprised of species tolerant of disturbed conditions (See **Appendix J**). Contamination from heavy metals (including mercury) has been recorded in Berry's Creek, in addition to other stressors, including limited riparian areas, and runoff from adjacent development (NOAA and USFWS 2014).

3.4.4 Moonachie Creek

Moonachie Creek begins in a narrow tree- and common reed-vegetated corridor in a commercially developed area between Empire Boulevard and Commerce Boulevard. Moonachie Creek runs for 2.2 miles before reaching the Hackensack River. After crossing underneath Commerce Boulevard the stream flows through a large system of common reed marsh, where the stream is low gradient, moves slowly, and is prone to damming by logs and debris. In this marsh, Moonachie Creek is joined by several tributaries, all of which are channelized ditches draining the surrounding marsh. A tide gate installed at the culvert underneath the New Jersey Turnpike removes tidal influences from the upper reaches of Moonachie Creek. Below the turnpike, the remaining short segment of stream is tidal and flows through a smooth cordgrass marsh.

The stream has been straightened in several areas and there is evidence of bank erosion. The stream is adjacent to developed areas and receives urban runoff. The stream has a low base flow and lacks a substantial riparian area in the upper reaches. Areas surrounding the stream lack diverse vegetation. A monoculture of common reed is prevalent.

Fisheries surveys were performed within Moonachie Creek. Review of the data indicated the species assemblage was comprised of species tolerant of disturbed conditions (See **Appendix J**).

Contamination from heavy metals (including mercury) has been recorded in the Moonachie Creek, in addition to other stressors, including limited riparian areas and runoff from adjacent development (Hobble et al. 2015).

The non-tidal upper segment of Moonachie Creek (near Commerce Boulevard) was investigated in the field. This segment has limited flow, invasive vegetation-dominated banks, and the presence of anthropogenic fill and refuse within the corridor and the streambed. Accordingly, the non-tidal portion of Moonachie Creek (observation location F5-S002) received SVAP scores of 4.45 (spring 2017) and 3.82 (fall 2016), respectively, which are considered poor.

3.4.5 Peach Island Creek

Peach Island Creek is a small tributary to Berry's Creek totaling 1 mile in length. A tide gate is present to the west of where Gotham Parkway crosses the stream dividing the tidal portion from the non-tidal portion to the east. The stream begins in a common reed marsh north of Paterson Plank Road and flows west parallel to the road. Industrial and commercial properties are situated along Paterson Plank Road and Gotham Parkway adjacent to Peach Island Creek. The riparian area of the creek has some small upland berms with trees but the surrounding area is mainly common reed marsh. The stream has been straightened with restricted riprap banks. In the upper portion of the stream, there is no riparian zone on the north bank of the stream. Where present, the riparian zone in the corridor has sparse vegetation. The SVAP observation location G3-PIC1 scored 2.55 (spring 2017) and 2.18 (fall 2016), both of which are considered poor.

3.4.6 Losen Slote

With an overall length of 2.3 miles, Losen Slote originates north of U.S. Route 46 as a culverted and channelized stream running through commercial and residential neighborhoods in South Hackensack and Little Ferry. The stream runs for approximately 1,500 feet through a narrow tree lined corridor between homes in the residential area before passing through a defunct tide gate near the end of East Joseph Street. After the tide gate, Losen Slote enters into a small lowland forest with wetland patches. In this forest, the stream banks are steep and the stream regains some natural sinuosity. After passing through the middle of the small forested area, it enters into a scrub-shrub meadow vegetated with mainly native species. In the meadow area, Losen Slote makes several sharp turns and bends. After passing under the BCUA driveway bridge, it flows through a common reed marsh area south to the Hackensack River. One small tributary joins Losen Slote from the west in this area. A tide gate installed at the confluence of the stream with the Hackensack River prevents any tidal influence in Losen Slote.

Fisheries surveys were performed within Losen Slote. Review of the data indicated the species assemblage was comprised of species tolerant of disturbed conditions (See **Appendix J**). Contamination from heavy metals (including mercury) has been recorded in Losen Slote, in addition to other stressors, including limited riparian areas and runoff from adjacent development (Hobble et al. 2015).

Losen Slote can be separated into four non-tidal hydrologic segments and one tidal segment. The upper headwater segment (Segment S-005a), upper middle segment (Segment S-005b), middle segment (Segment S-005c) and lower middle (Segment S-005d) segments are non-tidal and the lower segment (Segment S-005e) is tidal.

The upper headwaters segment (S-005a) of Losen Slote has been channelized. The east side of the bank is adjacent to a paved roadway and lacks a riparian area. Losen Slote receives runoff from

adjacent roadways and surrounding developed areas. There was a lack of in-stream cover for fish, and pools were absent. There was also a lack of macroinvertebrate habitat due to straightening and sedimentation. The riparian area was limited and lacked vegetative diversity as invasive Japanese knotweed (*Fallopia japonica*) lines the banks. The upper middle segment (S-005b) of Losen Slote features an old tide gate that acts as a barrier to fish movement and is adjacent to residential areas that reduces the riparian zone and contributes to increased nutrient loading, runoff, and sedimentation. Increased sedimentation has led to a reduction in available macroinvertebrate habitat. Pools and riffles were absent and there was a lack of habitat for aquatic biota during episodes of low flow. The results of the SVAP analysis indicate that the upper headwaters segment and upper middle segment are considered poor. Observation location E6-S001 scored 4.6, observation location E6-H007 scored 5.27, and observation location E7-S003 scored 5.73 (spring 2017) and 5.82 (fall 2016).

On the middle (S-005c) and lower middle (S-005d) segments of Losen Slote, the left bank had evidence of its vegetative cover being removed and was experiencing moderate erosion. The mud substrate was not conducive to benthic macroinvertebrate habitat. The results of the SVAP analysis indicate that the middle segment (observation location F7-H018) is considered fair due to a score of 6.27, while the lower middle segment (observation location F7-LS1) is considered poor due to scores of 4.27 (spring 2017) and 4.10 (fall 2016).

3.5 Results of Refinement of Wetlands Mapping in the Footprints of the Three Alternatives

The results of the refinement of the wetlands and WOUS mapping within the footprints of the three Build alternatives are presented in **Figure L-7** through **Figure L-11**, and are summarized in **Table L-5** through **Table L-7** below. Due to the similarity in impacts between Alternatives 2 and 3, a separate set of figures for Alternative 3 was not created; the Alternative 2 wetland and WOUS impact figures (**Figure L-10** and **Figure L-11**) include notes to indicate how wetland and WOUS impacts would differ between those Build Alternatives. The majority of wetlands within the footprints of the Build Alternatives are freshwater emergent (PEM) wetlands and tidal emergent wetlands that are dominated by common reed. Non-tidal and tidal WOUS are also present within the footprints of the alternatives. Wetland observation locations near, or within, the footprint of one or more of the Build Alternatives are denoted by two asterisks (**) in **Section 3.2**. FCI values from the EPW analysis conducted from September 2016 through the spring of 2017 can be found in **Table L-3**. Further, **Section 2.4** provides a description of the watercourses within the Project Area, along with their SVAP scores by segment (see **Table L-4**). Photographs of wetlands that could potentially be impacted by the Build Alternatives are provided in **Attachment L-1**.

Table L-5: Anticipated Alternative 1 Wetland and WOUS Impacts

Classification	Total Impact (Acres)	Permanent* Impact (Acres)	Temporary** Impact (Acres)
Freshwater Emergent Wetlands	0.9	0.6	0.3
Freshwater Forested Wetlands	0.0	0.0	0.0
Tidal Emergent Wetlands	1.9	0.6	1.3
Tidal Open Water	1.5	1.0	0.5
Non-Tidal Open Water	0.0	0.0	0.0
Totals	**4.3**	**2.2**	**2.1**

* Permanent impacts represent a long-term impact (e.g., permanent loss of area or function).

** Temporary impacts represent a short-term impact (e.g., the total wetland area and function is restored fully upon completion of construction activities).

Table L-6: Anticipated Alternative 2 Wetland and WOUS Impacts

Classification	Total Impact (Acres)	Permanent* Impact (Acres)	Temporary** Impact (Acres)
Freshwater Emergent Wetlands	3.3	0.3	3.0
Freshwater Forested Wetlands	0.1	0.0	0.1
Tidal Emergent Wetlands	1.1	0.0	1.1
Tidal Open Water	1.9	0.2	1.7
Non-Tidal Open Water	3.5	0.1	3.4
Totals	**9.9**	**0.6**	**9.6**

* Permanent impacts represent a long-term impact (e.g., permanent loss of area or function).
** Temporary impacts represent a short-term impact (e.g., the total wetland area and function is restored fully upon completion of construction activities).

Table L-7: Anticipated Alternative 3 Wetland and WOUS Impacts

Classification	Total Impact (Acres)	Permanent* Impact (Acres)	Temporary** Impact (Acres)
Freshwater Emergent Wetlands	3.3	0.3	3.0
Freshwater Forested Wetlands	0.1	0.0	0.1
Tidal Emergent Wetlands	0.0	0.0	0.0
Tidal Open Water	0.3	0.2	0.1
Non-Tidal Open Water	3.5	0.1	3.4
Totals	**7.2**	**0.6**	**6.6**

* Permanent impacts represent a long-term impact (e.g., permanent loss of area or function).
** Temporary impacts represent a short-term impact (e.g., the total wetland area and function is restored fully upon completion of construction activities).

This Page has been Intentionally Left Blank.

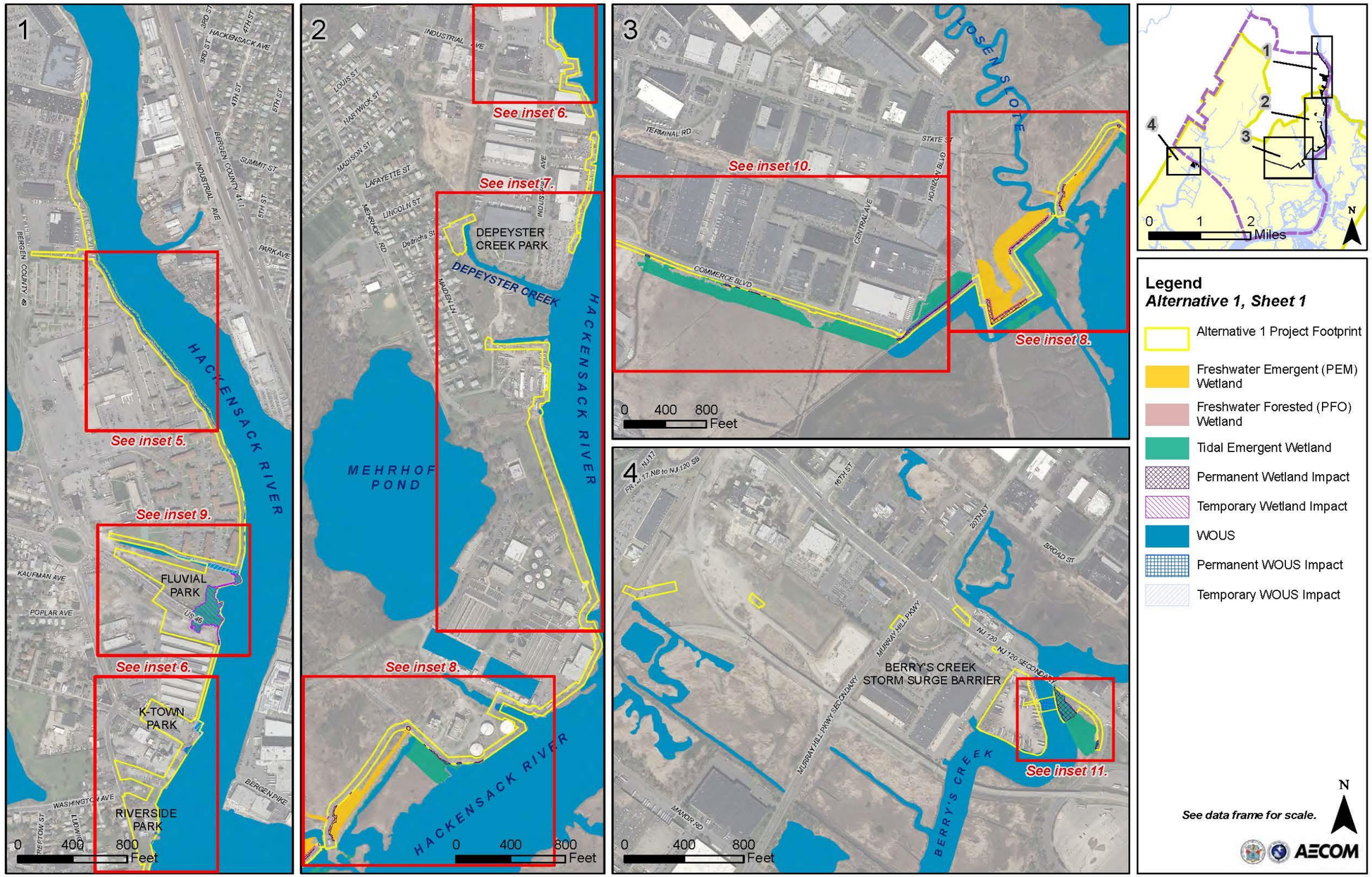


Figure L-7: Anticipated Alternative 1 Wetland and WOUS Impacts (Sheet 1)

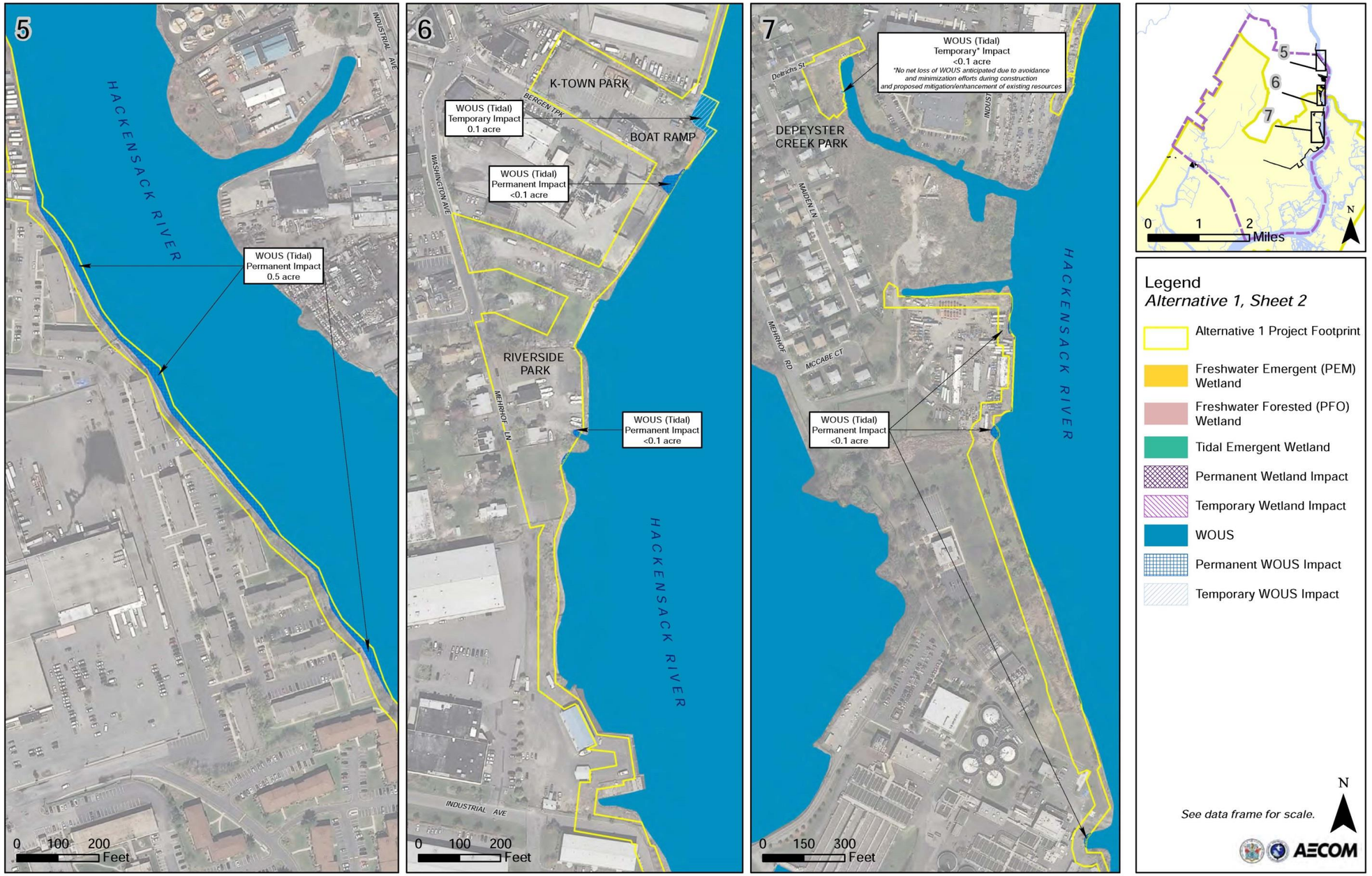


Figure L-8: Anticipated Alternative 1 Wetland and WOUS Impacts (Sheet 2)

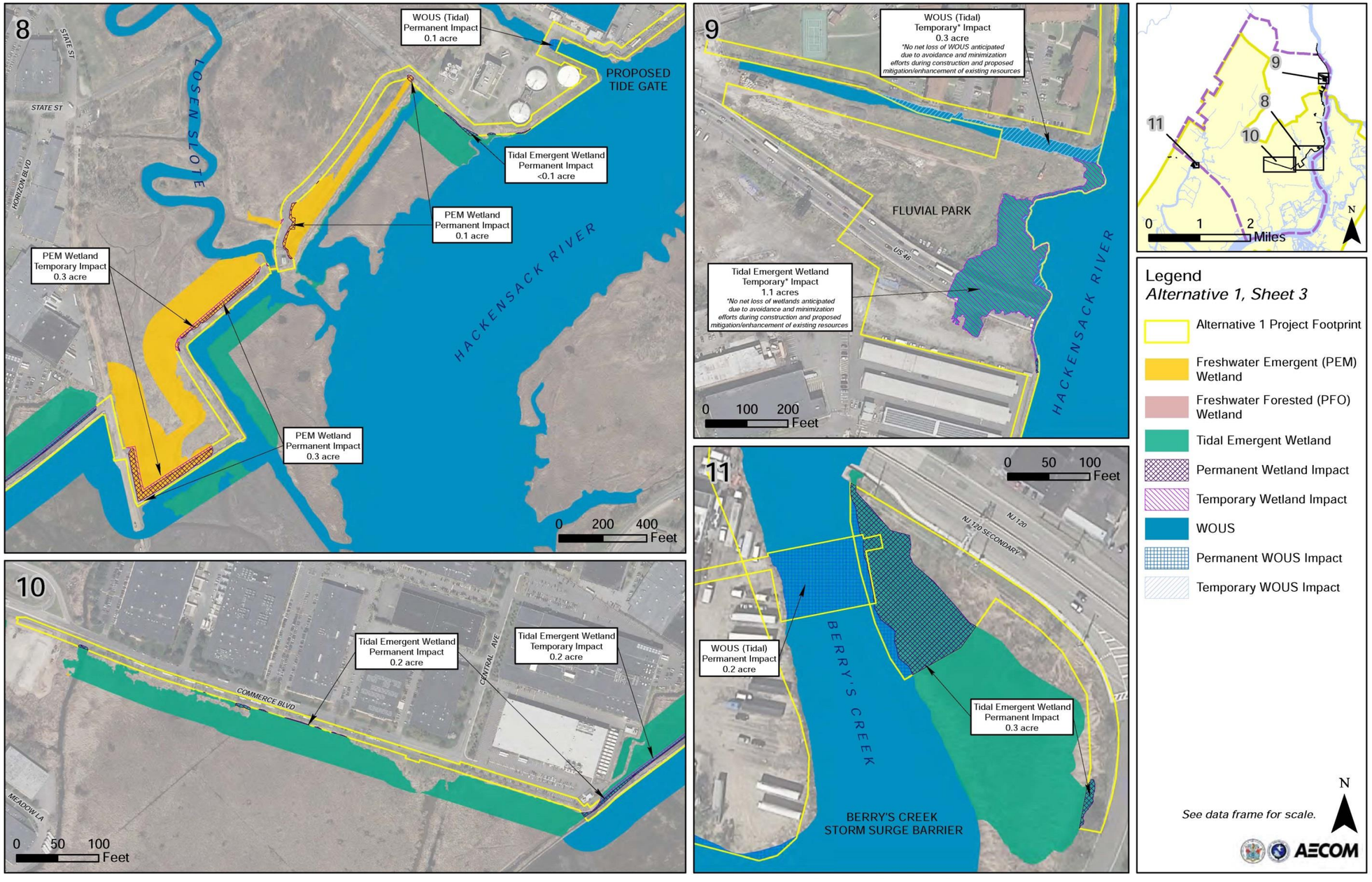


Figure L-9: Anticipated Alternative 1 Wetland and WOUS Impacts (Sheet 3)

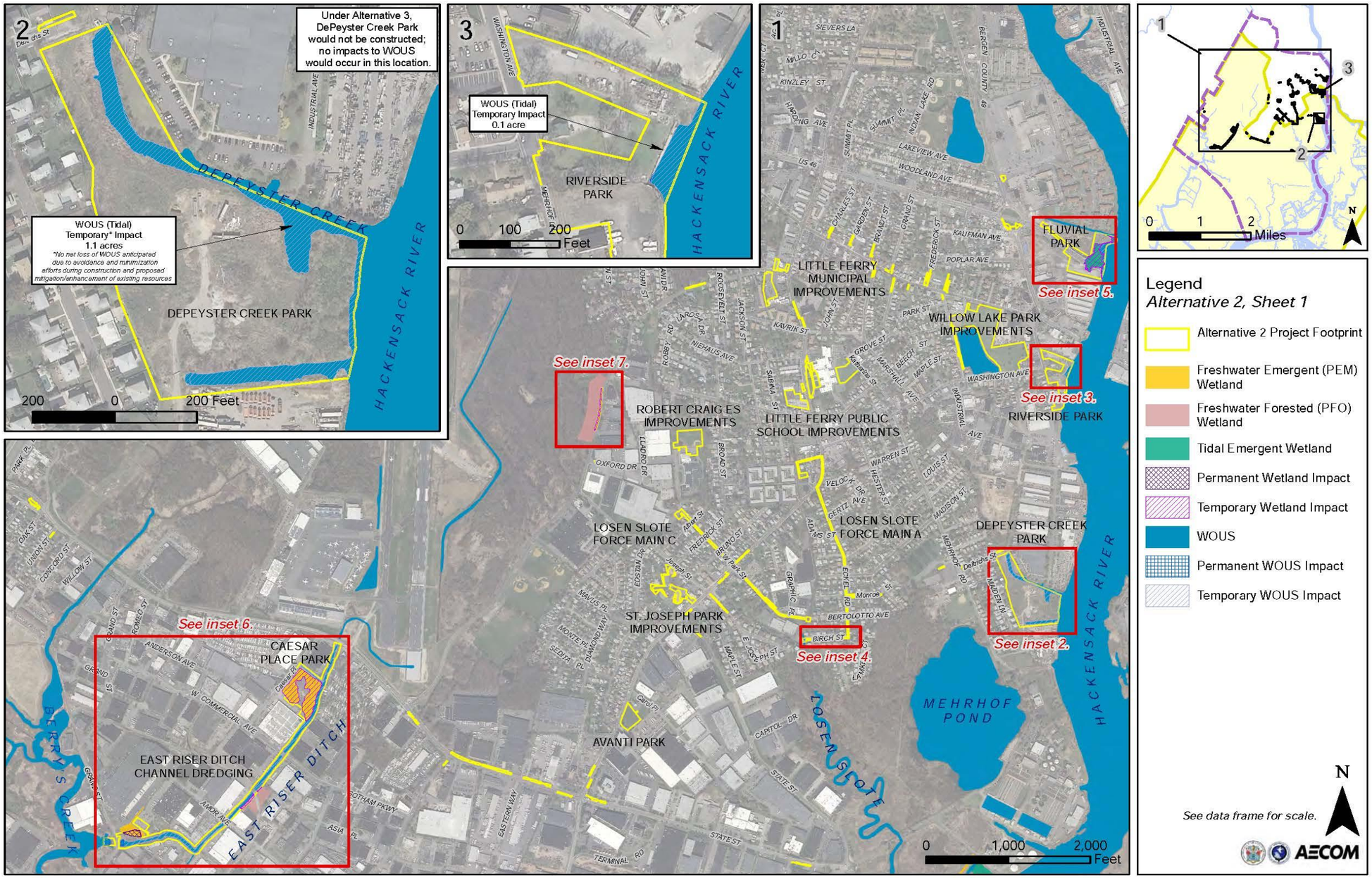


Figure L-10: Anticipated Alternative 2 and Alternative 3 Wetland and WOUS Impacts (Sheet 1)

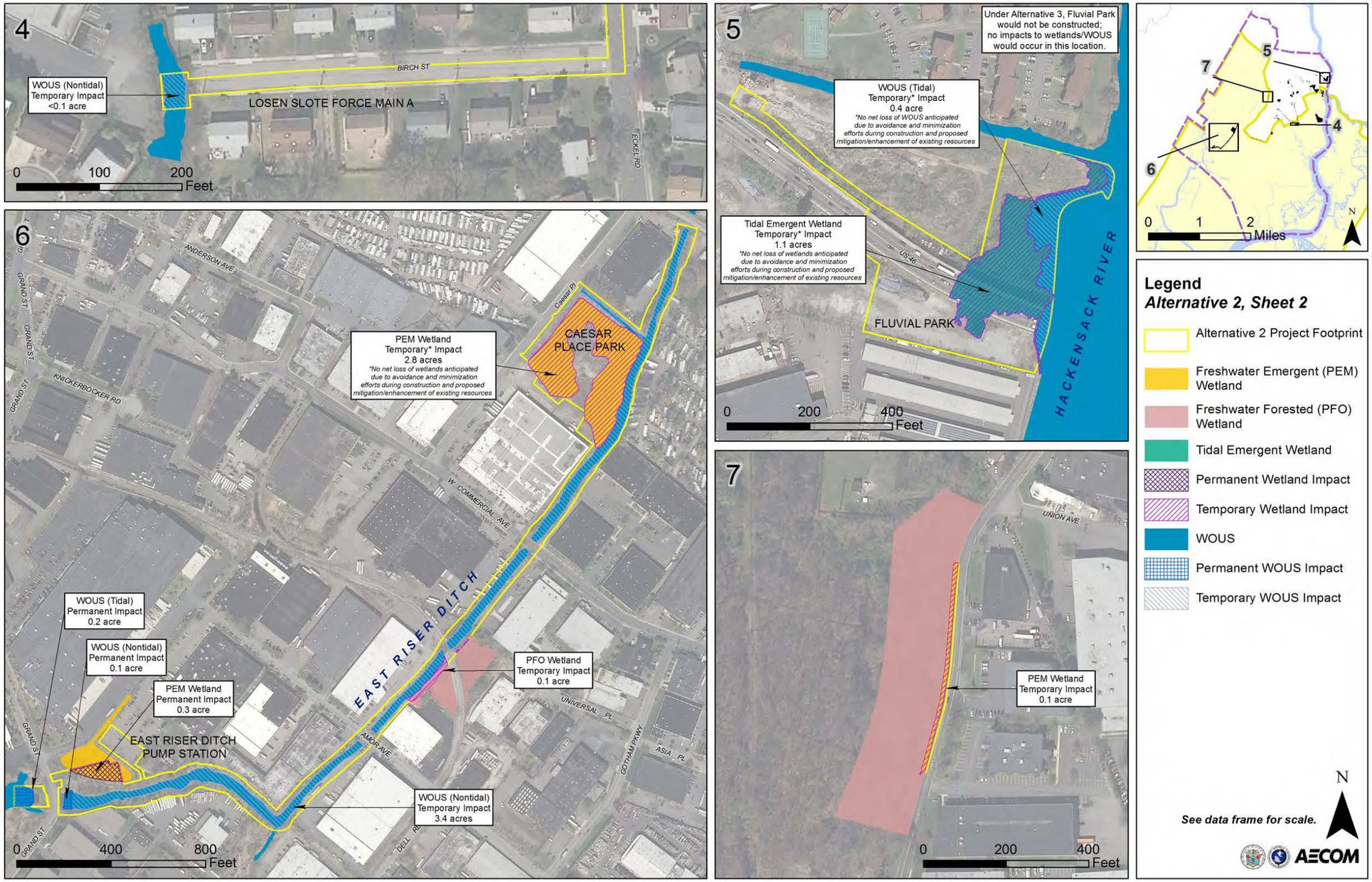


Figure L-11: Anticipated Alternative 2 and Alternative 3 Wetland and WOUS Impacts (Sheet 2)

This Page has been Intentionally Left Blank.

4.0 References

Bartoldus, C.C., E.W. Garbisch, and M.L. Kraus. 1994. Evaluation for Planned Wetlands (EPW): A Procedure for Assessing Wetland Functions and a Guide to Functional Design. St. Michaels, MD: Environmental Concern Inc.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Performed for U.S. Fish and Wildlife Service. Accessed March 1, 2018.

Edinger, G.J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, and A.M. Olivero (editors). 2014. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.

Hobble, Christine; Artigas, Francisco; Stepowyj, Michael; Kojak, Sal; Bosits, Stephanie; Elefante, Dom; Grzyb, Joe; Yao, Cheryl. April 2015. Heavy Metal Gradients in the Hackensack River Estuary: A Baseline for Improving Ecosystem Health. Society of Environmental Toxicology and Chemistry Spring Conference Hudson-Delaware Annual Spring Meeting. April 29-30 New Brunswick, NJ. Accessed October 10, 2017. http://meri.njmeadowlands.gov/downloads/pdf/MikeS_SETAC_20150423.pdf

National Oceanic and Atmospheric Administration and US Forest Service. 2014. Pre-assessment Screen Determination for the Berry's Creek Watershed, Bergen Count, New Jersey. Accessed October 10, 2017. https://www.fws.gov/northeast/njfieldoffice/pdf/BCSA_PAS.pdf

Natural Resources Conservation Service. 1998. Stream Visual Assessment Protocol, Technical Note 99-1. U.S. Department of Agriculture – Natural Resources Conservation Service.

NJDEP. State of New Jersey Department of Environmental Protection Bureau of GIS . February 17th, 2015. http://www.nj.gov/dep/gis/lulc12c.html (accessed September 27th, 2017).

Tiner, R. W., J. Q. Swords, and H. C. Bergquist. The Hackensack Meadowlands District: Wetland Inventory and Remotely-sensed Assessment of "Natural Habitat" Integrity. Hadley, Massachusetts: U.S. Fish and Wildlife Service, National Wetlands Inventory, Ecological Services, Region 5, 2005.

USFWS. 2018. Wetlands Mapper. National Wetlands Inventory. Accessed March 1, 2018. https://www.fws.gov/wetlands/data/mapper.html

Wright, Victoria A. and Blauvelt, Robert P. 2010. "Berry's Creek: A Glance Backward and a Look Forward," International Journal of Soil, Sediment and Water: Vol. 3: Issue 2, Article 1. Accessed October 10, 2017. http://scholarworks.umass.edu/intljssw/vol3/iss2/1

This Page has been Intentionally Left Blank.

Attachment L-1: Photographic Log

This Page has been Intentionally Left Blank.

Photo 1: Looking south at Berry's Creek from Paterson Plank Road (State Route 120) in Carlstadt.

Photo 2: Looking west at Berry's Creek from tide gate at Starke Road in Carlstadt.

Photo 3: Looking east along Riser Ditch off of Starke Road in Carlstadt

Photo 4: Looking west from Amor Avenue in Carlstadt at East Riser Ditch.

Photo 5: Looking east with East Riser Ditch on the right and wetland area to the left (Between Amor Avenue and West Commercial Avenue).

Photo 6: Looking southwest across Caesar Place Woods

Photo 7: Looking northwest at upland area on northern shore of East Riser Ditch and east of Caesar Place Woods, with ditch dividing Caesar Place Woods from adjacent property in view

Photo 8: View of wetlands along west side of Hackensack River from US Route 46

Photo 9: Looking west along northern ditch at end of Gates Road in Little Ferry.

Photo 10: Looking north along Losen Slote at end of Birch Street in Little Ferry.

Photo 11: Looking south at drainage feature along west side of Redneck Avenue in Moonachie.

Photo 12: Looking west at drainage feature that drains west to forested wetlands to the east of Teterboro Airport.

Photo 13: Looking northwest along Commerce Boulevard in Carlstadt with *Phragmites* dominated wetlands to the west.

This Page has been Intentionally Left Blank.

Attachment L-2: HUD Eight-Step Process for Compliance with Executive Order 11988 (*Floodplain Management*) and Executive Order 11990 (*Protection of Wetlands*) as Provided by 24 CFR Part 55

This Page has been Intentionally Left Blank.

Eight-Step Process for Compliance with Executive Order 11988 *(Floodplain Management*) and Executive Order 11990 (*Protection of Wetlands*) as Provided by 24 CFR Part 55

US Department of Housing and Urban Development

Rebuild by Design (RBD) Meadowlands Flood Protection Project

Step 1: Determine if the proposed action is in a floodplain or wetland.

Executive Order (EO) 11988 (*Floodplain Management*) requires that Federal agencies must avoid the long- and short-term adverse impacts associated with the occupancy and modification of floodplains, to the extent practicable. Federal actions must strive to reduce the risk of flood loss and minimize the impacts of floods. EO 11990 (*Protection of Wetlands*) requires that Federal agencies minimize the destruction, loss, or degradation of wetlands and preserve and enhance the natural and beneficial values of wetlands. Federal actions must consider alternatives to wetland sites or limit potential damage to wetlands. The Proposed Project (Rebuild by Design [RBD] Meadowlands Flood Protection Project) is a proposed federally funded action that is located within a 100-year floodplain and wetlands; therefore, these EOs apply to the Proposed Project. To comply with the requirements of 24 Code of Federal Regulations (CFR) Part 55, and because the exceptions of 24 CFR 55.12 do not apply to the Proposed Project, United States (US) Department of Housing and Urban Development's (HUD's) eight-step decision-making process has been completed for EO 11988 and 11990.

The approximately 5,405-acre Project Area for the Proposed Project includes the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack, all in Bergen County, New Jersey. The Project Area is susceptible to chronic flooding due to the nature of the landscape, low elevation, and poor stormwater infrastructure. The Proposed Project is needed to address: (1) systemic inland flooding from high-intensity rainfall/runoff events; and/or (2) coastal flooding from storm surges. The purpose of the Proposed Project is to reduce flood risk by implementing flood risk reduction measures within the Project Area to minimize both the inland and coastal flooding and to increase the resiliency of the communities and ecosystems within the Project Area, thereby protecting critical infrastructure and facilities, residences, businesses, and ecological resources from frequent and intense flood events anticipated in the future.

Approximately 4,950 acres (or more than 91 percent) of the Project Area is located within the Federal Emergency Management Agency (FEMA) 100-year floodplain, as indicated on FEMA Flood Insurance Rate Map (FIRM) Panels 34003C0262G, 34003C0266G, 34003C0258G, 34003C0259G, 34003C0257G, 34003C0256G, 34003C0252G, 34003C0254G, 34003C0253G, and 34003C0261G. A review of the New Jersey Department of Environmental Protection (NJDEP) geographic information system (GIS) wetland mapping data and the US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) mapping data was conducted to identify the approximate location and extent of wetlands and waterbodies in the Project Area. Based on this desktop review, approximately 1,823 acres of wetlands occur in the 5,405-acre Project Area. Following the initial desktop review, the Project Team used these available wetland mapping resources to conduct a field reconnaissance to refine actual wetland boundaries within the footprints of each Build Alternative of the Proposed Project. This desktop review and field investigation did not include a formal wetland delineation, but rather provided a

refinement of the wetland and stream data depicted on available mapping resources. Please refer to Section 2.0 in Appendix L of the RBD Meadowlands Flood Protection Project Environmental Impact Statement (EIS) for a detailed description of the methodology used to identify the approximate locations and types of wetlands and streams within the footprints of the Build Alternatives. An overview of the acreages and types of wetlands within the Build Alternative footprints is provided in Step 4.

Step 2: Notify the public for early review of the proposal and involve the affected and interested public in the decision making process.

In compliance with 24 CFR Part 55, a *Notice of Early Public Review of a Proposed Activity in a 100-year Floodplain and Wetlands* was published on June 21, 2016 concurrent with the *Notice of Intent (NOI) to Prepare a Draft Environmental Impact Statement (DEIS)*. The notice, which is available at www.rbd-meadowlands.nj.gov, informed the public that the Proposed Action would be located within a 100-year floodplain and that the Project Area contains large tracts of tidal emergent wetlands. The purpose of the notice was threefold: (1) to present an opportunity to comment for people who may be affected by activities within the floodplains and wetlands; (2) to facilitate and enhance Federal efforts to reduce the risks associated with the occupancy and modification of these special areas through the dissemination of floodplain and wetland information; and (3) to inform those who may be put at greater or continued risk when actions take place in floodplains and wetlands.

The notice was published in *The Record*, *El Diario*, and *Korea Daily*, which are local English, Spanish, and Korean newspapers, respectively, and allowed for a 30-day comment period. Letters were also submitted to 14 Federal agencies informing them of the notice and inviting them to provide input. Several public citizens, non-government organizations, and the USFWS and US Environmental Protection Agency (USEPA) responded to the notice and provided comments.

In total, six comments pertaining to the *Water Resources, Water Quality, and Waters of the US* resource area of the EIS and three comments pertaining to the *Hydrology and Flooding* resource areas of the EIS were received during the 30-day public scoping and comment period. Overall, commenters shared the sentiment that existing wetlands should be protected or expanded and measures should be taken to avoid further fill or degradation of wetlands. Commenters also requested a thorough evaluation and impact analysis be conducted for wetlands in the Project Area. Commenters drew attention to the already degraded existing environment and regular inundation from floods and storm surges, indicating that the Proposed Project should take into consideration different types of floods and storm surge events when conducting the impact analysis. The NJDEP agrees that impacts to wetlands should be minimized to the extent feasible, and has evaluated the potential impacts of the Proposed Project on wetlands, inland/stormwater flooding, and coastal storm surge flooding in the EIS.

Step 3: Determine if there is a practicable alternative.

NJDEP identified and evaluated three Build Alternatives that meet the purpose of and need for the Proposed Project. Due to the nature of the Proposed Project (i.e., reducing flooding in existing developed portions of the 100-year floodplain), the NJDEP has determined that there is no practicable alternative to locating within the floodplain. However, the Build Alternatives have been designed to avoid floodplain and wetland impacts to the extent practicable while still reducing flood risk for the Project Area. The three Build Alternatives (Alterative 1, 2, and 3) are summarized below. The No Action Alternative was also considered, although it would not satisfy the purpose of or need for the Proposed Project. Section 2.0 of the Proposed Project's EIS provides further details and discussion on the Build Alternatives and the No Action Alternative.

No Action Alternative

Under the No Action Alternative, the Proposed Project would not be implemented and current conditions and operations would generally continue in the Project Area. In addition, no changes to floodplains or wetlands attributable to development of the Proposed Project would occur. However, as a result of the No Action Alternative, the projected increase in sea level could cause long-term changes to the areal extent and types of wetlands in the Project Area. As sea level rises and the tidal influence extends farther inland, existing tidal wetlands could be converted to unvegetated tidal flats and open water, and existing freshwater wetlands would be converted to tidal wetlands if existing berms are overtopped; therefore, the net acreage of tidal and freshwater wetlands would likely decline. These changes to wetland types would permanently alter the functions and services provided by these wetlands, including the quantity and quality of habitats. Additionally, as a result of the increased frequency and intensity of coastal and inland flooding, wetland resources would be permanently impacted from increased shoreline erosion.

Alternative 1: Structural Flood Reduction

Alternative 1 includes various infrastructure-based solutions intended to provide protection against coastal storm surges. Under Alternative 1, a line of protection (LOP) would be constructed to connect high ground along the Hackensack River and Berry's Creek using a range of grey infrastructure, such as floodwalls, levees/berms, a tide gate, closure gates, and a storm surge barrier and pump station. This LOP would be designed to provide flood protection to an elevation of 7 feet (NAVD 88). The LOP would begin at the Hackensack Riverwalk located at the Riverfront shopping center in the City of Hackensack and extend south along the river and existing wetlands, and then to high ground near the intersection of Commerce Boulevard and Washington Avenue in the Borough of Carlstadt. This high ground would extend to the Berry's Creek watershed, where a new surge barrier at the Paterson Plank Road Bridge and several other small LOP components would extend the LOP west to existing high ground near the Rutherford Commons shopping center in the Borough of East Rutherford. Additionally, four new parks, a cantilever riverwalk, pathways, and various open space features and green infrastructure elements would be integrated into the proposed LOP.

Alternative 2: Stormwater Drainage Improvements

Alternative 2 would implement various grey and green infrastructure-based solutions, in conjunction with new parks and open spaces, to improve stormwater management throughout the Project Area. Whereas Alternative 1 would be concentrated along the Hackensack River and Berry's Creek, Alternative 2 components would be distributed throughout the Project Area. Specifically, stormwater management would be enhanced through the installation of 41 green infrastructure features along roads (e.g., bioswales, storage/tree trenches, and rain gardens), five new parks, and improvements to five existing open spaces. Additionally, flood reduction under Alternative 2 would primarily be achieved through the grey infrastructure to improve channel conveyance, which would include three new pump stations (one at East Riser Ditch and two at Losen Slote), two new force mains associated with the Losen Slote pump stations, and dredging of the lower reach of East Riser Ditch.

Alternative 3: Hybrid Alternative – *Build Plan*

Alternative 3 would consist of a hybrid of Alternative 1 (coastal flood protection) and Alternative 2 (stormwater drainage improvements). To achieve this, the majority of both Alternatives 1 and 2 would be implemented. However, due to funding and construction constraints, the Alternative 3 features would be

separated into two stages: a *Build Plan*, which includes all features to be constructed as part of the Proposed Project; and a *Future Plan*, which includes the remaining features that could be constructed by others over time as funding sources become available and construction feasibility permits. Because the Alternative 3 *Future Plan* components were analyzed as a reasonably foreseeable future action in the cumulative impacts analysis (Section 5.0) in the Proposed Project's EIS, they would require additional environmental analysis in the future prior to implementation, and are not included in this Eight-Step Process.

The Alternative 3 *Build Plan* would reduce flooding in the East Riser Ditch and Losen Slote watersheds similar to Alternative 2. Specifically, the Alternative 3 *Build Plan* would consist of 41 green infrastructure systems (bioswales, storage/tree trenches, and rain gardens) along roadways, three new parks (comprising approximately 7.6 acres in total), improvements to five existing open spaces/public amenities, two new pump stations, one new force main, and dredging of the lower East Riser Ditch. The Alternative 3 *Build Plan* would not incorporate two of the parks and one of the pump stations and force mains along Losen Slote that are associated with Alternative 2. Additionally, under the Alternative 3 *Build Plan*, one of the proposed open space improvements would be reconfigured from the Alternative 2 design.

Step 4: Identify potential direct and indirect impacts associated with floodplain and wetland development.

Due to the nature of the Proposed Project, impacts associated with development in a 100-year floodplain and wetlands would occur. However, the purpose of the Proposed Project is to reduce flood risk and increase the resiliency of the communities and ecosystems within the Project Area; therefore, the Build Alternatives would provide varying degrees of flood risk reduction and stormwater drainage improvements. Overall, the Proposed Project would benefit infrastructure, residences, businesses, and ecological resources within the 100-year floodplain by minimizing long-term flood severity and frequency. Potential direct and indirect impacts to floodplains and wetlands resulting from the Proposed Project are described below.

Direct and Indirect Impacts to Floodplains

The majority of the Project Area (over 91 percent) is within a 100-year floodplain; therefore, floodplains would be impacted by construction and operation of the Proposed Project. The permanent and temporary easements of all three Build Alternatives would be located entirely within the 100-year floodplain; however, adverse impacts to floodplains would generally be minimal due to the lack of new structures/fill proposed. Additionally, there would be beneficial impacts to existing communities and ecosystems due to reduced coastal flooding and improved stormwater management. Direct and indirect impacts to floodplains are described by Build Alternative below.

Alternative 1: Portions of the Project Area at risk of coastal flooding would be substantially reduced under Alternative 1 when compared to the No Action Alternative. Under a 2.4-foot sea level rise (SLR) scenario, Alternative 1 would reduce the area at risk of flooding in the Project Area by 1,313 acres. During normal tide, Alternative 1 would provide increased flood protection to approximately 29 percent of the Borough of Little Ferry, 25 percent of the Borough of Moonachie, 29 percent of the Borough of Carlstadt, 3 percent of the Borough of Teterboro, and 24 percent of the Township of South Hackensack.

Alternative 1 would have a permanent easement of 26.6 acres, which would be entirely located within the 100-year floodplain. However, much of that acreage would be comprised of the proposed new parks

and open spaces, which would not impact existing floodwater storage capacity. New structures proposed to be constructed within the floodplain under Alternative 1 include the LOP components (i.e., floodwalls, berms, and surge barrier) and recreational features associated with four public parks (e.g., seating and playground equipment). As noted previously, these components would be designed to reduce flooding in the Project Area, and must not increase flooding within or outside of the Project Area. In addition, there would be a net decrease of 0.8 acre of impervious surfaces along the LOP, which would increase stormwater infiltration capacity.

Alternative 1, based on preliminary modeling results, could potentially indirectly induce increased flooding outside the Project Area during storm surge events, but this would be eliminated through additional design and modeling refinement as the Proposed Project progresses.

Alternative 2: Alternative 2 would increase stormwater infiltration during low intensity rainfall events and increase the conveyance capacity of both East Riser Ditch and Losen Slote. There would be a reduction in impervious surfaces (3.4 acres) and a reduction in depth and extent of inland flooding, in addition to a fewer number of buildings anticipated to be impacted by inland flooding when compared to the No Action Alternative. With implementation of Alternative 2, under existing conditions, flooding extent would be reduced by approximately 14 acres during a 2-year storm, 19 acres during a 10-year storm, 22 acres during a 25-year storm, and 33 acres during a 100-year storm. Under future conditions, flooding extent would be reduced by approximately 23 acres during a 2-year storm, 31 acres during a 10-year storm, 45 acres during a 25-year storm, and 46 acres during a 100-year storm.

Alternative 2 would have a permanent easement of 41.1 acres. Similar to Alternative 1, much of this disturbed area would be comprised of channel improvements, new parks, improvements to open spaces, and green infrastructure features that would increase floodwater storage in the floodplain. New structures proposed to be constructed under Alternative 2 include three new pump stations and small features associated with five new public parks.

Alternative 2 would not result in any indirect impacts to floodplains.

Alternative 3 *Build Plan*: The Alternative 3 *Build Plan* would increase stormwater infiltration during low intensity rainfall events, and increase the conveyance capacity of both East Riser Ditch and Losen Slote, similar to Alternative 2. Additionally, the net reduction in impervious surfaces within the Alternative 3 *Build Plan* footprint would be approximately 3.6 acres. The combination of new stormwater management features and reductions in the amount of impervious surfaces would increase the rate and capacity of stormwater infiltration and reduce stormwater runoff in the Project Area during routine rainfall events. The Alternative 3 *Build Plan* would benefit the Project Area by reducing the depth and extent of inland flooding from East Riser Ditch and Losen Slote, as well as reducing the number of buildings expected to be impacted by inland flooding when compared to the No Action Alternative.

The Alternative 3 *Build Plan* would have a permanent easement of 28.5 acres. Much of this disturbed area would be comprised of channel improvements, new parks, improvements to open spaces, and new green infrastructure features that would increase floodwater storage in the floodplain. New structures proposed to be constructed under the Alternative 3 *Build Plan* include two new pump stations and recreational features associated with three new public parks.

The Alternative 3 *Build Plan* would not result in any indirect impacts to floodplains.

Direct and Indirect Impacts to Wetlands

A total of 1,823.3 acres of wetlands exist within the Project Area, including 840.4 acres of estuarine emergent wetlands, 484.8 acres of open water, 193.0 acres of freshwater forested wetlands, 130.7 acres of modified wetlands, 108.8 acres of freshwater emergent wetlands, and 65.5 acres of freshwater scrub/shrub wetlands. Overall, there would be temporary and permanent adverse impacts to wetlands from construction and operation of the Proposed Action. However, impacted areas under each Build Alternative represent only small portions of the wetlands within the Project Area. In addition, there would be beneficial impacts from the enhancement of existing wetlands or creation of new wetlands. Direct and indirect impacts to wetlands are described by Build Alternative below.

Alternative 1: Approximately 4.3 acres of wetlands and open water would be impacted under Alternative 1 due to the placement of permanent fill or structures to construct the proposed floodwall, berm, tide gate, and storm surge barrier. Of the approximately 4.3 acres, approximately 2.2 acres would be permanently impacted (1.0 acre tidal open water, 0.6 acre freshwater wetlands, and 0.6 acre tidal wetlands), while approximately 2.1 acres would be temporarily impacted (0.5 acre tidal open water, 0.3 acre freshwater wetlands, and 1.3 acre tidal wetlands). Additionally, approximately 8.8 acres of State-regulated riparian zones along open water would be permanently impacted, while approximately 2.3 acres of State-regulated riparian zones along open water would be temporarily impacted. All temporarily impacted wetlands and riparian zones would be restored to pre-construction conditions immediately following construction and would recover within a short period of time.

While approximately 2.2 acres of wetland and open water would be permanently impacted by the construction of Alternative 1, an approximately 1.1-acre tidal wetland would be created as part of the proposed Fluvial Park. It is estimated that the creation of this wetland would partially replace wetland functions and services lost during the construction of Alternative 1. Created wetlands would naturally filter the water by storing nutrients and contaminants in the soil and vegetation, thereby improving water quality. In addition, the existing wetland functions and services of the impacted wetlands are already somewhat diminished as they are located in previously disturbed habitats and in an urban setting. Many of the wetland areas that would be permanently impacted are located adjacent to roads, man-made berms, and other structures that diminish their quality.

Indirectly, Alternative 1 would benefit wetland functions and services through: (1) increased protection of wetlands from the effects of SLR; and (2) increased flood protection against coastal storm surges. However, operation of Alternative 1 could adversely affect wetland area, functions, and services upstream of the proposed tide gate on the unnamed tributary to the Hackensack River. The tidal regime within this area would be impacted by the installation of the proposed new tide gate, which would influence the transport of water, nutrients, and sediment to the upstream wetlands. However, as the tributary consists of a short length of open channel prior to transitioning to a subsurface piped conveyance, the associated wetland area upstream of the proposed structure is small. In addition, the tributary is not directly connected to estuarine wetlands. Therefore, the existing functions and services of this wetland are already diminished.

Alternative 2: A total of approximately 9.9 acres of wetlands and open water would be impacted under Alternative 2. Of the approximately 9.9 acres, 0.6 acre would be permanently impacted (0.1 acre non-tidal open water, 0.2 acre tidal open water, and 0.3 acre freshwater wetlands), while approximately 9.3 acres would be temporarily impacted (3.4 acres non-tidal open water, 1.7 acres tidal open waters, 3.0 acres freshwater wetlands, and 1.1 acres tidal wetlands). Additionally, approximately 1.4 acres of State-regulated riparian zones along open water would be permanently impacted, and approximately 7.3

acres of State-regulated riparian zones would be temporarily impacted. All temporarily impacted wetlands and riparian zones would be restored to pre-construction conditions immediately following construction and would recover within a short period of time.

While 0.6 acre of wetlands and open water would be permanently impacted by the construction and operation of Alternative 2, much of these wetlands are already degraded due to their location in an urban environment where they have been subjected to previous and ongoing impacts. In addition, approximately 7.2 acres of wetlands would be created and/or enhanced under Alternative 2 within the proposed Fluvial Park, Riverside Park, DePeyster Creek Park, Caesar Place Park, and Avanti Park. These enhanced or created wetlands would partially replace wetland functions and services lost during the construction and operation of Alternative 2, providing beneficial effects to wetland functions and services in the Project Area.

Indirect, long-term, beneficial effects to off-site wetland functions and services throughout the Project Area would be anticipated from the proposed stormwater conveyance capacity, infiltration, and treatment improvements under Alternative 2.

Alternative 3 *Build Plan*: Permanent impacts to wetlands and open waters under the Alternative 3 *Build Plan* would be the same as Alternative 2 (approximately 0.6 acre), but only 6.6 acres of wetlands would be temporarily impacted (3.4 acres non-tidal open water, 0.1 acre tidal open water, and 3.1 acres freshwater wetlands). Additionally, approximately 0.8 acre of State-regulated riparian zone along open water would be permanently impacted, while approximately 4.1 acres of State-regulated riparian zone would be temporarily impacted.

As discussed under Alternative 2, the 0.6 acre of wetland and open water that would be permanently impacted under the Alternative 3 *Build Plan* is currently degraded. In addition, 3.5 acres of wetlands would be enhanced or created to partially replace wetland functions and services lost during the construction and operation of the Alternative 3 *Build Plan*, providing beneficial effects to wetland functions and services in the Project Area.

No indirect short- or long-term adverse impacts to existing wetlands are anticipated as a result of the Alternative 3 *Build Plan*. However, long-term, beneficial effects to off-site wetland functions and services throughout the Project Area would be anticipated from the proposed stormwater improvements.

Step 5: Where practicable, design or modify the proposed action to minimize the potential adverse impacts to lives, property, and natural values within floodplains and wetlands, and to restore and preserve the values of floodplains and wetlands.

The Project Area has an extensive history of both coastal storm surge and systemic inland flooding. As such, numerous tide gates, pump stations, berms, levees, and ditches have been constructed within and surrounding the Project Area over time in an attempt to alleviate flooding. The Proposed Project seeks to integrate targeted improvements to the existing infrastructure and natural environment by installing new infrastructure and other flood protection measures, which would support a cohesive and efficient flood reduction solution for the Project Area. The Build Alternatives represent a range of designs and efforts presenting varying degrees of flood protection to minimize potential adverse impacts to lives, property, and natural values within floodplains and wetlands.

The RBD Meadowlands Flood Protection Project concept, as entered into the RBD competition, had originally included both a MeadowBand and a MeadowPark. The MeadowBand would have consisted of

extensive new LOP infrastructure throughout the Meadowlands District that would have involved disconnecting large portions of the 100-year floodplain and impacting dozens of acres of wetlands. The MeadowPark, conversely, would have included extensive new wetland restoration. This original proposal would have had large ramifications for the existing floodplain and wetland resources in the Meadowlands District overall and in the current Project Area. However, this vision has evolved to consist of more targeted improvements to flood reduction grey and green infrastructure in the Project Area. Additionally, during the alternatives development and screening processes, numerous potential concepts were evaluated to reduce coastal and stormwater flooding in the Project Area. As discussed in Section 2.0 of the Proposed Project's EIS, anticipated wetland impacts were one of the specific criteria evaluated during the screening process, and helped shape the Proposed Project in a manner that has thus far reduced anticipated wetland impacts in the Project Area to the extent feasible while maximizing flood reduction benefits to the local communities and ecosystems.

As the Proposed Project progresses, impacts to floodplains and wetlands would be further avoided and minimized to the extent practicable during the final design process. Temporarily impacted wetlands would be restored immediately following construction, and a compensatory mitigation plan would be developed and implemented to compensate for long-term unavoidable impacts. The plan could consist of purchasing mitigation credits; onsite or offsite creation, restoration, or enhancement of wetlands; or a combination of mitigation methods. Wetland and waterbody impacts from construction dredge and fill activities would be coordinated with the NJDEP, US Army Corps of Engineers (USACE), and other applicable regulatory agencies during project permitting. Overall, any potential adverse impacts would be minimized through the implementation of construction and operation best management practices (BMPs), flood proofing and mitigation measures, and compliance with Federal, state, and local jurisdictions. In addition, coordination with local emergency services would also take place to ensure that access to critical facilities is maintained during construction.

Section 4.0 of the RBD Meadowlands Flood Protection Project EIS further details specific mitigation measures to address the Proposed Project's potential adverse impacts.

Step 6: Reevaluate the alternatives.

The purpose of the Proposed Project is to reduce flood risk and increase the resiliency of the communities and ecosystems within the Project Area, which has an extensive history of both coastal storm surge and systemic inland flooding. Due to the nature of this Proposed Project, all of the Build Alternatives are located within the 100-year floodplain and wetlands. However, the three Build Alternatives analyzed included numerous flood reduction methods and potential locations to address various types of flooding; these alternatives would result in range of floodplain and wetland impacts.

NJDEP has identified Alternative 3 (Hybrid Alternative) as the Preferred Alternative for implementation of the Proposed Project. As described in Step 3, the Alternative 3 features would be separated into two stages: a *Build Plan* and a *Future Plan*. The Alternative 3 *Build Plan* is proposed to be constructed with the available HUD CDBG-DR grant funds and would include all features to be constructed as part of the Proposed Project. Under the Alternative 3 *Build Plan*, approximately 7.6 acres of new parks would be created and designed to improve local stormwater drainage with increased pervious surfaces and native plantings. Additionally, grey infrastructure improvements to East Riser Ditch and the Losen Slote drainage basin include channel dredging, three new pump stations, and two new force mains. Overall, there would be a net reduction in impervious surfaces under the Alternative 3 *Build Plan*, which would increase the rate and capacity of stormwater infiltration and reduce stormwater runoff. Wetlands would also be enhanced or created to partially replace wetland functions and services lost during the

construction and operation of the Alternative 3 *Build Plan*. Overall, the Alternative 3 *Build Plan* would provide numerous co-benefits, including new recreational opportunities, water quality improvements, new and enhanced habitats, and aesthetic benefits; adhere to the feasibility constraints of the Proposed Project, and minimize adverse impacts to existing resources, including the floodplain and wetlands.

When combined with the *Build Plan*, implementation of the Alternative 3 *Future Plan*, which could be constructed by others over time as funding sources become available and construction feasibility permits, would present a hybrid solution of both coastal and inland flooding reduction would constitute the most holistic flood reduction strategy for the Project Area. Overall, the Preferred Alternative would benefit infrastructure, residences, businesses, and ecological resources within the 100-year floodplain by minimizing long-term flood severity and frequency, while minimizing new construction in the floodplain and permanent impacts to wetlands.

Step 7: Issue findings and determination of no practicable alternative.

Because the Proposed Project is intended to reduce flooding in existing developed portions of the 100-year floodplain, there is no practicable alternative to locating the Proposed Project in a 100-year floodplain and wetlands. Pursuant to 24 CFR Part 55, a *Final Notice and Public Explanation of a Proposed Activity in a 100-year Floodplain and Wetland* were published with a 30-day comment period concurrent with publication of the *Notice of Availability of the Final Environmental Impact Statement*. The purpose of the notice was threefold: (1) to present an opportunity to comment for people who may be affected by activities within the floodplains and wetlands; (2) to facilitate and enhance Federal efforts to reduce the risks associated with the occupancy and modification of these special areas through the dissemination of floodplain and wetland information; and (3) to inform those who may be impacted. The notice describes the Proposed Project; including all three Build Alternatives and the floodplains and wetlands involved; discusses mitigation and minimization measures; and explains the justification behind the finding of no practicable alternative for locating the Proposed Project in a 100-year floodplain and wetlands.

Step 8: Implement the Proposed Action.

Implementation of the Proposed Project would include BMPs, mitigation measures, and regulatory compliance during construction and operation activities to restore and preserve natural values of floodplains and wetlands and to protect properties and persons within floodplains and wetlands, as detailed in the Proposed Project's EIS. NJDEP assures that the Proposed Project would be executed as necessary to minimize any potential adverse impacts resulting from development within a floodplain and wetland. To this end, construction activities would be monitored for compliance with the final design of the Proposed Project and all pre-determined BMPs and mitigation measures.

This Page has been Intentionally Left Blank.

Appendix M: Coastal Zone Management

This Page has been Intentionally Left Blank.

Table of Contents

1.0 Federal Consistency Statement M-1
1.1 Coastal Zone Management M-1
1.2 Compliance with Special Area Policies (Subchapter 9) M-9
1.2.1 Special Water Areas M-9
1.2.2 Special Water's Edge Areas M-13
1.2.3 Special Land Areas M-15
1.2.4 Coastwide Special Areas M-16
1.3 Compliance with Requirements of Subchapters 10 and 11 of the Coastal Zone Management Rules M-21
1.3.1 Standards for Beach and Dune Activities (Subchapter 10) M-21
1.3.2 Standards for Conducting and Reporting the Results of an Endangered or Threatened Wildlife or Plant Species Habitat Impact Assessment and/or Endangered or Threatened Wildlife Species Habitat Evaluation (Subchapter 11) M-21
1.3.3 Compliance with General Water Area Policies (Subchapter 12) M-21
1.3.4 Compliance with Requirements for Impervious Cover and Vegetative Cover for General Land Areas and Certain Special Areas (Subchapter 13) M-26
1.3.5 General Location Rules (7:7 Subchapter 14) M-26
1.3.6 Use Rules (7:7 Subchapter 15) M-27
1.3.7 Resource Rules (7:7 Subchapter 16) M-29

List of Tables

Table M-1: Consistency Assessment for the Build Alternatives and No Action Alternative M-3

Acronyms and Abbreviations

APE	Area of Potential Effect
AST	aboveground storage tank
BCUA	Bergen County Utilities Authority
CAFRA	Coastal Area Facility Review Act
CEA	Classification Exception Area
CFR	Code of Federal Regulations
CZMA	Coastal Zone Management Act
DLUR	Division of Land Use Regulation
EIS	Environmental Impact Statement
HUD	Department of Housing and Urban Development
ISRA	Industrial Site Recovery Act
KCS	Known Contaminated Site
LOP	line of protection
LSRP	Licensed Site Remediation Professional
NEPA	National Environmental Policy Act
NJAC	New Jersey Administrative Code
NJDCA	New Jersey Department of Community Affairs
NJDEP	New Jersey Department of Environmental Protection
NJHPO	New Jersey Historic Preservation Office
NJSEA	New Jersey Sports and Exposition Authority
NMFS	National Marine Fisheries Service
NPL	National Priorities List
NRHP	National Register of Historic Places
NOAA	National Oceanic and Atmospheric Administration
RBD	Rebuild by Design
REC	Recognized Environmental Condition
SWPPP	Stormwater Pollution Prevention Plan
US	United States
USACE	US Army Corps of Engineers
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
UST	underground storage tank

1.0 Federal Consistency Statement

1.1 Coastal Zone Management

The proposed Rebuild by Design (RBD) Meadowlands Flood Protection Project (the Proposed Project) is located in New Jersey's Coastal Zone. The Project Area includes the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack in Bergen County, New Jersey. The Project Area has the following approximate boundaries: the Hackensack River to the east; Paterson Plank Road (State Route 120) and the southern boundary of the Borough of Carlstadt to the south; State Route 17 to the west; and Interstate 80 (I-80) and the northern boundary of the Borough of Little Ferry to the north. Approximately 76 percent (4,129 acres) of the 5,405 total acres of the Project Area is within the Meadowlands District.

The Proposed Project is being funded by the United States (US) Department of Housing and Urban Development (HUD) through a grant to the State of New Jersey Department of Community Affairs (NJDCA). The New Jersey Department of Environmental Protection (NJDEP) is the "Responsible Entity," as defined by HUD regulations at 24 Code of Federal Regulations (CFR) § 58.2(a)(7)(i), for the Proposed Project's compliance with environmental regulations, such as the National Environmental Policy Act (NEPA) and the Coastal Zone Management Act (CZMA). Because Federal funding would be provided for the Proposed Project, it is considered a Federal action under the CZMA (15 CFR Part 930, Subpart F), triggering the need for a Federal Consistency Determination.

This Consistency Statement presents an evaluation of reasonably foreseeable coastal effects associated with the Proposed Project as related to the enforceable coastal policies of New Jersey. The coastal policies are detailed in New Jersey's Coastal Zone Management Rules (NJAC 7:7). The NJDEP Division of Land Use Regulation (DLUR), a component office of New Jersey's Coastal Management Program, is the State agency responsible for consistency review and determination of Federal Consistency for proposed activities. The NJDEP DLUR would coordinate, as necessary, with the Office of Coastal Management within the National Oceanic and Atmospheric Administration's (NOAA's) National Ocean Service to formalize the Federal Consistency Determination during the final design process of the Proposed Project.

The three Build Alternatives for the Proposed Project and the No Action Alternative have been compared to the detailed location rules (NJAC 7:7-9 through 14), use rules (NJAC 7:7-15), and resource rules (NJAC 7:7-16) that stem from, and provide specificity in relation to, compliance with the broader goals and supplemental policies of the New Jersey Coastal Management Program as listed at New Jersey Administrative Code (NJAC) 7:7-1.1(c). Descriptions of these alternatives are included with the Environmental Impact Statement (EIS).

This comparison is discussed in the following sections that identify policies and rules that are either applicable or not applicable to the Proposed Project. For those rules/policies that are not applicable to the Proposed Project, a justification has been provided. For those rules/policies that are applicable to the Proposed Project, an explanation of the Proposed Project's compliance with the coastal policy is discussed.

The results of the consistency assessment for the three Build Alternatives and the No Action Alternative are summarized in **Table M-1**. This assessment includes an evaluation of consistency with coastal policies (i.e., location, use, and resource rules). This simplified presentation format allows for ready comparison between the various alternatives from the perspective of Federal Consistency without the need for preparation of an individual Consistency Statement for each alternative. The Build Alternatives

are reviewed in the compliance discussion for General Location Rules (Subchapter 14, NJAC 7:7-14), as these rules require evaluation of alternatives that would minimize potential impacts.

As the No Action Alternative represents a continuation of the existing conditions, a determination of Coastal Consistency is superfluous, and the majority of the coastal policies do not apply. Therefore, a detailed discussion of how the No Action Alternative meets the various coastal policies is not provided. For the purposes of comparison to the three Build Alternatives, **Table M-1** identifies topics for which the No Action Alternative does not advance the goals of the policy. For example, the Flood Hazard Area policy (7:7-9.25) is intended to facilitate protection of life and property and safeguard ports and waterfronts for overall public economic benefit. The No Action Alternative would do nothing to achieve these objectives. Similarly, no potential reduction in flood damages to historic resources (7:7-9.34) would occur in the Project Area that would provide protection to these resources.

Table M-1: Consistency Assessment for the Build Alternatives and No Action Alternative

N.J.A.C. 7:7 COASTAL ZONE MANAGEMENT RULES	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
COMPLIANCE WITH SPECIAL AREA POLICIES (SUBCHAPTER 9)				
Special Water Areas				
Shellfish Habitat (7:7-9.2)				
Surf Clam Areas (7:7-9.3)				
Prime Fishing Areas (7:7-9.4)				
Finfish Migratory Pathways (7:7-9.5)		Consistent to the extent practicable, with mitigation	Consistent – with Mitigation	Consistent – with Mitigation
Submerged Vegetation Habitat (7:7-9.6)				
Navigation Channels (7:7-9.7)		Consistent	Consistent	Consistent
Canals (7:7-9.8)				
Inlets (7:7-9.9)				
Marina Moorings (7:7-9.10)		Consistent to the extent practicable	Consistent – Advances Goals of Policy	Consistent – Advances Goals of Policy
Ports (7:7-9.11)				
Submerged Infrastructure Routes (7:7-9.12)		Consistent		
Shipwrecks and Artificial Reef Habitats (7:7-9.13)				
Wet Borrow Pits (7:7-9.14)				
Intertidal and Subtidal Shallows (7:7-9.15)		Consistent - with Mitigation	Consistent	Consistent
Special Water's Edge Areas				
Dunes (7:7-9.16)				
Overwash Areas (7:7-9.17)				
Coastal High Hazard Areas (7:7-9.18)				
Erosion Hazard Area (7:7-9.19)				
Barrier Island Corridor (7:7-9.20)				

N.J.A.C. 7:7 COASTAL ZONE MANAGEMENT RULES	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Bay Islands (7:7-9.21)				
Beaches (7:7-9.22)				
Filled Water's Edges (7:7-9.23)		Consistent	Consistent	Consistent
Existing Lagoon Edges (7:7-9.24)				
Flood Hazard Areas (7:7-9.25)	Consistent - Does NOT Advance Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy
Riparian Zone (7:7-9.26)	Consistent - Does NOT Advance Goals of Policy	Consistent - with Mitigation; Advances Goals of Policy	Consistent - with Mitigation; Advances Goals of Policy	Consistent - with Mitigation; Somewhat Advances Goals of Policy
Wetlands and Wetland Buffers (7:7-9.27 / 9.28)		Consistent - with Mitigation	Consistent - with Mitigation	Consistent - with Mitigation
Coastal Bluffs (7:7 –9.29)				
Intermittent Stream Corridors (7:7-9.30)				
Special Land Areas				
Farmland Conservation Areas (7:7-9.31)				
Steep Slopes (7:7-9.32)				
Dry Borrow Pits (7:7-9.33)				
Coastwide Special Areas				
Historic and Archaeological Resources (7:7-9.34)	Consistent – Does NOT advance goals of policy	Consistent - with Mitigation	Consistent - with Mitigation	Consistent - with Mitigation
Specimen Trees (7:7-9.35)				
Endangered or Threatened Wildlife or Plant Species Habitat (7:7-9.36)		Consistent - with Mitigation (if needed)	Consistent - with Mitigation (if needed)	Consistent - with Mitigation (if needed)
Critical Wildlife Habitat (7:7-9.37)				
Public Open Space (7:7-9.38)	Consistent - Does NOT Advance Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy	Consistent – Somewhat Advances Goals of Policy
Special Hazard Areas (7:7-9.39)		Consistent	Consistent	Consistent
Excluded Federal Lands (7:7-9.40)				

N.J.A.C. 7:7 COASTAL ZONE MANAGEMENT RULES	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Special Urban Areas (7:7-9.41)				
Pinelands National Preserve / Pinelands Protection Area (7:7-9.42)				
Hackensack Meadowlands District (7:7-9.43)	Consistent - Does NOT Advance Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy
Wild and Scenic Rivers Corridor (7:7-9.44)				
Geodetic Control Reference Marks (7:7-9.45)		Consistent	Consistent	Consistent
Hudson River Waterfront Area (7:7-9.46)				
Atlantic City (7:7E-3.47)				
Lands and Waters Subject to Public Trust Rights (7:7-9.48)		Consistent – Advances Goals of Policy	Consistent – Advances Goals of Policy	Consistent – Advances Goals of Policy
Dredged Material Management Areas (7:7-9.49)				
COMPLIANCE WITH REQUIREMENTS OF SUBCHAPTER 10				
Standards for Beach and Dune Activities (Subchapter 10)				
COMPLIANCE WITH REQUIREMENTS OF SUBCHAPTER 11				
Standards for Conducting and Reporting the Results of an Endangered or Threatened Wildlife or Plant Species Habitat Impact Assessment and/or Endangered or Threatened Wildlife Species Habitat Evaluation		Consistent	Consistent	Consistent
COMPLIANCE WITH GENERAL WATER AREA POLICIES (SUBCHAPTER 12)				
Shellfish Aquaculture (7:7-12.2)				
Boat Ramps (7:7-12.3)		Consistent to the extent practicable	Consistent – Advances Goals of Policy	Consistent
Docks and Piers for Cargo and Commercial Fisheries (7:7-12.4)				
Recreational Docks and Piers (7:7-12.5)		Consistent to extent practicable	Consistent – Advances Goals of Policy	Consistent

N.J.A.C. 7:7 COASTAL ZONE MANAGEMENT RULES	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Maintenance Dredging (7:7-12.6)				
New Dredging (7:7-12.7)			Consistent	Consistent
Environmental Dredging (7:7-12.8)				
Dredged Material Disposal (7:7-12.9)				
Solid Waste or Sludge Dumping (7:7-12.10)				
Filling (7:7-12.11)		Consistent - with Mitigation	Consistent – with Mitigation as necessary	Consistent – with Mitigation as necessary
Mooring (7:7-12.12)				
Sand and Gravel Mining (7:7-12.13)				
Bridges (7:7-12.14)			Consistent to the extent practicable	Consistent to the extent practicable
Submerged Pipelines (7:7-12.15)				
Overhead Transmission Lines (7:7-12.16)				
Dams and Impoundments (7:7-12.17)		Consistent to the extent practicable		
Outfalls and Intakes (7:7-12.18)		Consistent	Consistent	Consistent
Realignment of Water Areas (7:7-12.19)		Consistent – with Mitigation		
Vertical Wake or Wave Attenuation Structures (7:7E-12.20)				
Submerged Cables (7:7-12.21)				
Artificial Reefs (7:7-12.22)				
Living Shorelines (7:7-12.23)				
Miscellaneous Uses (7:7-12.24)				
COMPLIANCE WITH REQUIREMENTS FOR IMPERVIOUS COVER AND VEGETATIVE COVER FOR GENERAL LAND AREAS AND CERTAIN SPECIAL AREAS (SUBCHAPTER 13)				
This Subchapter is applicable to the CAFRA Zone only; not applicable to Project Area				

N.J.A.C. 7:7 COASTAL ZONE MANAGEMENT RULES	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
GENERAL LOCATION RULES (7:7 SUBCHAPTER 14)				
Rule on Location of Linear Development (7:7-14.1)		Consistent - with Mitigation	Consistent - with Mitigation	Consistent - with Mitigation
Basic Location Policy (7:7-14.2)		Consistent	Consistent	Consistent
Secondary Impacts (7:7-14.3)		Consistent	Consistent	Consistent
USE RULES (7:7 SUBCHAPTER 15)				
Housing (7:7-15.2)				
Resort/Recreational (7:7-15.3)	Consistent - Does NOT Advance Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy
Energy Facility (7:7-15.4)				
Transportation (7:7-15.5)	Consistent - Does NOT Advance Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy
Public Facility (7:7-15.6)				
Industry (7:7-15.7)				
Mining (7:7-15.8)				
Port (7:7-15.9)				
Commercial Facility (7:7-15.10)				
Coastal Engineering (7:7-15.11)		Consistent	Consistent	Consistent
Dredged Material Placement on Land (7:7-15.12)				
National Defense Facility (7:7-15.13)				
High-rise Structures (7:7-15.14)				
RESOURCE RULES (7:7 SUBCHAPTER 16)				
Marine Fish and Fisheries (7:7-16.2)		Consistent to extent practicable, with Mitigation	Consistent – with Mitigation	Consistent – with Mitigation
Water Quality (7:7-16.3)		Consistent	Consistent	Consistent
Surface Water Use (7:7-16.4)				
Groundwater Use (7:7-16.5)				

N.J.A.C. 7:7 COASTAL ZONE MANAGEMENT RULES	No Action Alternative	Alternative 1	Alternative 2	Alternative 3
Stormwater Management (7:7-16.6)		Consistent	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy
Vegetation (7:7-16.7)	Consistent - Does NOT Advance Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy
Air Quality (7:7-16.8)				
Public Access (7:7-16.9)	Consistent - Does NOT Advance Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy	Consistent – Somewhat Advances Goals of Policy
Scenic Resources and Design (7:7-16.10)	Consistent - Does NOT Advance Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy
Buffers and Compatibility (7:7-16.11)		Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy	Consistent - Advances Goals of Policy
Traffic (7:7-16.12)		Consistent – Advances Goals of Policy	Consistent	Consistent
Subsurface Sewage Disposal Systems (7:7-16.13)				
Solid and Hazardous Waste (7:7-16.14)		Consistent	Consistent	Consistent
Key:				
Not applicable to the Alternative.				

1.2 Compliance with Special Area Policies (Subchapter 9)

Special Areas are areas that are naturally valuable, important for human use, hazardous, sensitive to impact, or particular in their planning requirements as to merit focused attention and special management. Special Area policies are part of the detailed location rules component of the New Jersey's Coastal Zone Management.

The New Jersey Coastal Zone Management Rules (NJAC 7:7) identify 48 Special Areas in the following four categories: Special Water Areas (NJAC 7:7-9.2 through 9.15), Special Water's Edge Areas (see NJAC 7:7-9.16 through 9.30), Special Land Areas (NJAC 7:7-9.31 through 3.33), and Coastwide Special Areas (NJAC 7:7-9.34 through 9.47).

Compliance of the Proposed Project with policies for each of these areas, if applicable, is addressed in the following sections. A brief explanation of the policy requirements is provided where deemed helpful or necessary. For those policy areas that are self-explanatory, such as submerged infrastructure routes, a description of the policy is not re-iterated. The reader is referred to the New Jersey Coastal Zone Management Rules for a complete description of all coastal policies and requirements.

1.2.1 Special Water Areas

Special water areas that were evaluated and found not to be affected, either directly or indirectly, by the Proposed Project include:

- Shellfish Habitat (7:7-9.2)
- Surf Clam Areas (7:7-9.3)
- Prime Fishing Areas (7:7-9.4)
- Submerged Vegetation Habitat (7:7-9.6)
- Canals (7:7-9.8)
- Inlets (7:7-9.9)
- Ports (7:7-9.11)
- Shipwrecks and Artificial Reef Habitats (7:7-9.13)
- Wet Borrow Pits (7:7-9.14)

For the following special water areas, additional explanation is provided to demonstrate the Proposed Project's compliance.

Finfish Migratory Pathways (7:7-9.5)

The Hackensack River and any associated free-flowing tributaries serve as migratory pathways for a variety of finfish, including alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*), as well as additional species.

Alternative 1: Much of the Alternative 1 alignment is located along the shoreline of the Hackensack River, landward of the water's edge, and would not affect finfish migration or movements. A new tide gate is proposed near the mouth of an unnamed tidal tributary adjacent to the Bergen County Utilities Authority (BCUA) facility in the Borough of Little Ferry. This new tide gate would restrict fish access upstream; however, as the tributary consists of a very short length of open channel prior to transitioning to a subsurface piped conveyance, there is little habitat upstream of the proposed structure. In addition,

the tributary is adjacent to the wastewater treatment facility and filled lands; there is no direct connection to estuarine wetlands.

In addition, a storm surge barrier would be constructed across Berry's Creek in the Borough of East Rutherford, just south of State Route 120. This barrier would remain open during normal conditions and would only be closed during severe storm events. Although there would be some loss of open water habitat, fish passage would not be blocked by the structure under normal conditions.

To minimize potential for impacts to finfish during key migration periods, work that may introduce sediments into the water would not be conducted without appropriate sediment and erosion control measures in place and seasonal restrictions on in-water work would be implemented, as discussed in Section 4.14.4.2 of the EIS.

With mitigation, Alternative 1 would be consistent to the extent practicable with this coastal policy.

Alternative 2: Alternative 2 would not include any new barriers to fish migration. It would include an energy dissipation structure downstream of the existing tide gate at East Riser Ditch, a new pump station upstream of the tide gate, and dredging of the East Riser Ditch channel upstream of the tide gate. However, the existing tide gate already restricts fish access to East Riser Ditch. In addition, some work would be conducted along the shoreline of the Hackensack River, primarily associated with green infrastructure improvements. Mitigation, in the form of seasonal restrictions on in-water work and appropriate sediment and erosion control measures to maintain water quality, would be implemented during construction.

With mitigation, Alternative 2 would be consistent with this coastal policy.

Alternative 3: Alternative 3 would not include any new barriers to fish migration. As with Alternative 2, the existing tide gate at East Riser Ditch already restricts fish access to the area. Some work would be located along the shoreline of the Hackensack River. Mitigation, in the form of seasonal restrictions on in-water work and appropriate sediment and erosion control measures to maintain water quality, would be implemented during construction.

With mitigation, Alternative 3 would be consistent with this coastal policy.

Navigation Channels (7:7-9.7)

Alternative 1: The majority of the work associated with Alternative 1 would be performed along the shoreline of the Hackensack River, primarily landward of mean-high water, and would not impact navigation within the river. Despite its shallow depth and contaminated sediments, Berry's Creek is considered a navigable water; however, it does not have a maintained navigation channel. In addition, because of existing infrastructure, including the State Route 120 bridge and the railroad bridge, the creek is not navigable in practice by other than small boats, such as canoes, kayaks, etc. The proposed storm surge barrier across Berry's Creek, which would be located between State Route 120 and the railroad bridge, would remain open under normal conditions and would be closed only during coastal storms. The small boats that could utilize this waterway would be unlikely to be used during these storms. Consequently, the storm surge barrier component of Alternative 1 would not result in an additional impediment to navigation as compared to existing conditions.

Alternative 1 would be consistent with this coastal policy.

Alternative 2: Alternative 2 includes construction of a new pump station on the bank of East Riser Ditch. Although regulated as navigable waters, East Riser Ditch and Losen Slote are not navigable in practice due to the presence of a tide gate at the mouths of these waterways. In addition, much of East Riser Ditch is within Teterboro Airport and is not publicly accessible. Further, the proposed pump stations along Losen Slote would not alter the navigability of that waterway. Other in-water work would be located along the shoreline of the Hackensack River and DePeyster Creek and would not impact navigation. Alternative 2 would not construct any new structures across navigable waters that would reduce navigation from existing conditions.

Alternative 2 would be consistent with this coastal policy.

Alternative 3: As with Alternative 2, Alternative 3 would not include any new structures across navigable waters that would reduce navigation from existing conditions.

Alternative 3 would be consistent with this coastal policy.

Marina Moorings (7:7-9.10)

Per this policy, marina moorings are areas of water that provide mooring or docking and land access for five or more recreational boats. Non-water-dependent uses in marina mooring areas are prohibited; uses that detract from marina uses are discouraged.

There are five marina moorings located within the Project Area. These include two private marinas in the Borough of Little Ferry as well as two private and one public marina in the Borough of Carlstadt.

Alternative 1: Alternative 1 would not impact the marinas in the Borough of Carlstadt as they are located south of the proposed alignment for Alternative 1.

Access to the Little Ferry Marina on Gates Road would be temporarily disrupted during construction of Alternative 1; however, closure gates in the proposed floodwall would provide both pedestrian and vehicular access to this marina. The land-based facilities associated with the Little Ferry Marina would be protected from flooding following construction of Alternative 1.

Access to the Riverside Boat Works and nearby ramps on Riverside Avenue that provide water access would change as the result of the construction of the cantilever riverwalk associated with the proposed Riverside Park component of Alternative 1. Space and engineering constraints associated with the elevation of the flood protection measures in these locations, as well as planned conversion of these locations to a public park, would need to be coordinated with these facilities during the final design and permitting phase of Alternative 1 to establish long-term access for these marinas. The proposed public open space associated with this portion of Alternative 1 would include a boat dock and kayak launch at the northern end of the cantilever riverwalk to provide public access to the water for small watercraft.

Alternative 1 is not a water-dependent use; however, the public benefit of flood risk reduction is best achieved with a waterfront location.

Because the potential impact to the private marinas would be offset by a new boat dock and kayak launch and protections to another private marina, Alternative 1 would be consistent to the extent practicable with this coastal policy.

Alternative 2: Alternative 2 would have no impact to the marinas located in the Borough of Carlstadt or the Little Ferry Marina.

Alternative 2 includes establishing a public park (i.e., Riverside Park) around the private Riverside Boat Works, which would provide additional public access to the water. The existing boat docks would also be improved, and a boat launch for trailered vessels would be installed. As with Alternative 1, a kayak launch would also be added, which would be located at the proposed Fluvial Park. .

Alternative 2 would be consistent with, and advance the goals of, this coastal policy.

Alternative 3: Alternative 3 would have no impact to marinas located in the Boroughs of Carlstadt or the Little Ferry Marina.

As in Alternatives 1 and 2, Alternative 3 would establish the proposed Riverside Park around the private Riverside Boat Works, providing additional access to the water. The existing boat dock would be improved and a public boat launch for trailered vessels would be added.

Alternative 3 would be consistent with, and advance the goals of, this coastal policy.

Submerged Infrastructure Routes (7:7-9.12)

Alternative 1: Submerged electrical, gas, and sewer lines could be impacted as they run parallel to the Alternative 1 footprint, or cross the footprint perpendicularly. Several lines could be disrupted temporarily while they are relocated as part of construction of Alternative 1. All work would be coordinated with the appropriate utility company to maintain services, avoid damage or breakage of the infrastructure, and maintain maintenance operations.

Alternative 1 would be consistent with this coastal policy.

Alternatives 2 and 3: Alternatives 2 and 3 would not impact any existing submerged infrastructure.

This coastal policy is not applicable to Alternatives 2 and 3.

Intertidal and Subtidal Shallows (7:7-9.15)

Intertidal and subtidal shallows would be both temporarily and permanently impacted as a result of the Proposed Project.

Alternative 1: Alternative 1 would involve construction within the Hackensack River, below mean-high water, in eight locations. Impacts to these areas would be minimized to the extent possible during the final design and permitting phase, and coordinated with the NJDEP, US Army Corps of Engineers (USACE), and other applicable regulatory agencies.

Additionally, a permanent storm surge barrier would be constructed within Berry's Creek; intertidal and subtidal shallows would be impacted by this Alternative 1 component. Furthermore, approximately 43 new storm drainage outlet structures would be constructed. Installation of these structures would include temporary dewatering, as well as the installation of storm drainage piping, tide flex valves, sluice gates, and cast-in-place and/or precast concrete.

Mitigation would be conducted as required for any permanent net loss of intertidal and subtidal shallows, as discussed in Section 4.16.4.2 of the EIS.

With mitigation, Alternative 1 would be consistent with this coastal policy.

Alternative 2: Alternative 2 would not permanently impact subtidal shallows. Most impacts to intertidal shallows resulting from Alternative 2 would be associated with tidal wetland restoration and public water access at the proposed parks along the Hackensack River (i.e., Fluvial Park, Riverside Park, and DePeyster Creek Park). Any permanent changes to intertidal shallows, such as in the areas of the proposed kayak launch, would be offset by the tidal marsh creation incorporated into this alternative. The energy dissipation structure associated with the new pump station on East Riser Ditch would result in temporary disturbance to intertidal and subtidal shallows in the ditch downstream of the existing tide gate.

Alternative 2 would be consistent with this coastal policy.

Alternative 3: Alternative 3 would not permanently impact subtidal shallows. Impacts to intertidal shallows would be associated with tidal wetland restoration and public water access at the proposed Riverside Park along the Hackensack River. Any permanent changes to intertidal shallows, such as the proposed boat launch, would be offset by the tidal marsh creation incorporated into this alternative. The energy dissipation structure associated with the new pump station on East Riser Ditch would result in temporary disturbance to intertidal and subtidal shallows downstream of the existing tide gate.

Alternative 3 would be consistent with this coastal policy.

1.2.2 Special Water's Edge Areas

Work associated with the Proposed Project would not impact any of the following special water's edge areas:

- Dunes (7:7-9.16)
- Overwash Areas (7:7-9.17)
- Coastal High Hazard Areas (7:7-9.18)
- Erosion Hazard Area (7:7-9.19)
- Barrier Island Corridor (7:7-9.20)
- Bay Islands (7:7-9.21)
- Beaches (7:7-9.22)
- Existing Lagoon Edges (7:7-9.24)
- Coastal Bluffs (7:7–9.29)
- Intermittent Stream Corridors (7:7-9.30)

For the following special water's edge areas, additional explanation is provided to demonstrate compliance of the Proposed Project.

Filled Water's Edges (7:7-9.23)

The Proposed Project is located along the Hackensack River, some areas of which contain filled water's edge. Per this policy, development within these areas shall be water dependent, water oriented, and provide public access to the waterfront. As the purpose of the Proposed Project is to provide flood protection, there is no feasible alternative that would eliminate development within this area.

Alternative 1: Alternative 1 would create additional opportunities for public access to the waterfront along the filled water's edge of the Hackensack River, and would be consistent with this coastal policy. Alternative 1 would include the addition of four public parks, a riverwalk, and a boat dock/kayak launch.

Alternative 1 would be consistent with this coastal policy.

Alternative 2: Alternative 2 would create additional public access to the waterfront along the filled water's edge of the Hackensack River. New public access areas would include the proposed Fluvial Park, Riverside Park, and DePeyster Creek Park.

Alternative 2 would be consistent with this coastal policy.

Alternative 3: Alternative 3 would create additional public access to the waterfront along the filled water's edge of the Hackensack River through the creation of the proposed Riverside Park.

Alternative 3 would be consistent with this coastal policy.

Flood Hazard Areas (7:7-9.25)

The Proposed Project is located within the 100-year tidal flood zone of the Hackensack River. As the purpose of the Proposed Project is to reduce flood risk within the Project Area, construction within 100 feet of the Hackensack River is necessary.

Alternatives 1, 2, and 3: The design of Alternatives 1, 2, and 3 is consistent with applicable Flood Hazard Control Act Rules and Federal flood reduction standards; applicable permits would be obtained prior to construction.

As such, Alternatives 1, 2, and 3 would be consistent with, and advance the goals of, this coastal policy.

Riparian Zone (7:7-9.26)

The Proposed Project is located within the riparian zone of the Hackensack River. Due to its nature, location of the Proposed Project outside of the riparian zone is not feasible.

Alternative 1: Unavoidable permanent loss of vegetated riparian zone would likely occur in some locations as a result of construction of Alternative 1, and would be mitigated as appropriate as discussed in Section 4.14.4.2 of the EIS. Creation of public parks would include new upland plantings, wetland creation, and riparian planting areas, and would be expected to yield an overall increase in vegetated riparian zone in the Project Area.

With mitigation and plantings, Alternative 1 would be consistent with, and advance the goals of, this coastal policy.

Alternative 2: Due to the nature and locations of the work proposed for Alternative 2, disturbance within the riparian zone would occur, but would be mitigated as discussed in Section 4.14.4.3 of the EIS. Any permanent impacts to riparian zone vegetation along East Riser Ditch in the new pump station location would be offset by the permanent protection of the proposed Caesar Place Park and habitat enhancements within that parcel that borders East Riser Ditch. This alternative also includes plans to improve and/or restore the Hackensack River waterfront, including the riparian zone, within three new

parks (i.e., Fluvial Park, Riverside Park, and DePeyster Creek Park) which would yield an overall increase in protected riparian zone vegetation throughout the Project Area.

With mitigation, Alternative 2 would be consistent with, and advance the goals of, this coastal policy.

Alternative 3: Alternative 3 would disturb and enhance the same riparian areas along East Riser Ditch with construction of the new pump station and creation of Caesar Place Park, which would constitute mitigation. Additional mitigation would be conducted as discussed in Section 4.14.4.4 of the EIS. The proposed Fluvial and DePeyster Creek Parks are not included in Alternative 3; therefore, temporary disturbance and corresponding riparian zone enhancements associated with Alternatives 1 and 2 at these locations would not occur. Alternative 3 would include the proposed Riverside Park riparian zone enhancements.

With mitigation, Alternative 3 would be consistent with, and would somewhat advance the goals of, this coastal policy.

Wetlands and Wetland Buffers (7:7-9.27 and 9.28)

Alternative 1: Prior to construction, applicable permits would be obtained under the Clean Water Act and the Freshwater Wetland Protection Act. During the design process, impacts to wetlands and wetland buffers would be minimized to the extent necessary to complete Alternative 1. Compensatory mitigation would be conducted for any unavoidable permanent loss to wetlands and wetland buffers as a result of Alternative 1 implementation (see Section 4.16.4.2 of the EIS).

With mitigation, Alternative 1 would be consistent with this coastal policy.

Alternative 2: As with Alternative 1, applicable wetland permits would be obtained prior to construction. Alternative 2 includes the creation and/or enhancement of wetland habitat in several locations. These creations/enhancements would serve as compensatory mitigation for unavoidable permanent loss to wetlands and wetland buffers associated with grey infrastructure aspects of the alternative (see Section 4.16.4.3 of the EIS).

With mitigation, Alternative 2 would be consistent with this coastal policy.

Alternative 3: As under Alternatives 1 and 2, applicable wetland permits would be obtained prior to construction. Alternative 3 includes the creation and/or enhancement of less wetland habitat, but it would still serve as compensatory mitigation for unavoidable permanent loss to wetlands and wetland buffers associated with grey infrastructure aspects of the alternative (see Section 4.16.4.4 of the EIS).

With mitigation, Alternative 3 would be consistent with this coastal policy.

1.2.3 Special Land Areas

None of the following special land areas are located in the Project Area:

- Farmland Conservation Areas (7:7-9.31)
- Steep Slopes (7:7-9.32)
- Dry Borrow Pits (7:7-9.33)

1.2.4 Coastwide Special Areas

The Proposed Project would not impact any of the following coastwide special areas:

- Specimen Trees (7:7-9.35)
- Critical Wildlife Habitat (7:7-9.37)
- Excluded Federal Lands (7:7-9.40)
- Special Urban Areas (7:7-9.41)
- Pinelands National Preserve and Pinelands Protection Area (7:7-9.42)
- Wild and Scenic Rivers Corridor (7:7-9.44)
- Hudson River Waterfront Area (7:7-9.46)
- Atlantic City (7:7E-3.47)
- Dredged Material Management Areas (7:7-9.49)

For the following coastwide special areas, additional explanation is provided to demonstrate Proposed Project compliance.

Historic and Archaeological Resources (7:7-9.34)

Section 4.6 of the EIS analyzes the potential impacts of the Proposed Project to Historic and Archaeological Resources.

Alternative 1: A Phase IA archaeological survey determined that most of the direct Area of Potential Effect (APE) for Alternative 1 has been impacted by prior earth-moving activities associated with the construction of buildings, roads, and other development unrelated to Alternative 1. No known archaeological resources are located within the direct APE. However, five areas with a high potential to contain prehistoric and historic period archaeological resources (i.e., high archaeological sensitivity areas) were identified for portions of the direct APE based on background research, historic maps, aerial photographs, and a site visit; they include the proposed Fluvial Park, K-Town Park, DePeyster Creek Park, BCUA, and Berry's Creek areas.

A total of 11 historic architectural resources were recorded within the Alternative 1 APE (see **Table 4.6-3** in the EIS). Of those 11 resources, one had been previously surveyed and identified through background research: the US Route 46 Bascule Bridge constructed in 1934 (determined to be National Register of Historic Places [NRHP]-eligible on February 21, 1997). The remaining 10 historic architectural resources were identified through field survey; this work included preliminary assessment of each structure's eligibility for listing in the NRHP based on visual inspection, historic mapping analysis, and desktop research. Based on these preliminary assessments, four of the 10 identified resources were determined to be potentially NRHP-eligible.

As identified in **Section 4.6** of the EIS, additional investigations, consultation with the New Jersey Historic Preservation Office (NJHPO) in accordance with Section 106 of the NHPA, and implementation of required mitigation to address identified adverse effects would be conducted pursuant to 36 CFR 800.5 to comply with Section 106 of the NHPA.

With mitigation, Alternative 1 would be consistent with this coastal policy.

Alternative 2: Alternative 2 would have a smaller footprint of disturbance than Alternative 1. Three areas with high archaeological sensitivity, specifically the proposed Caesar Place Park, Avanti Park, and

DePeyster Creek Park, would be within the Alternative 2 footprint. Mitigation would be conducted as necessary and as determined through coordination with the NJHPO to avoid permanent impact to any potential archaeological resources.

As detailed in Table 4.6-6 in the EIS, 32 historic architectural resources are within the Alternative 2 APE. Of those 32 resources, only one (the US Route 46 Bascule Bridge) has been determined to be NRHP-eligible. The remaining 31 resources were identified through background research and field survey. Based on these preliminary assessments, 8 of the 31 resources were determined to be potentially NRHP-eligible. Of those eight resources, only one (the American Sokol Little Ferry) was recommended as NRHP-eligible. As noted in the EIS, Alternative 2 has the potential to directly impact the NRHP-eligible US Route 46 Bascule Bridge. Effects to the American Sokol Little Ferry would be indirect. Mitigation would be conducted as necessary and as determined through coordination with the NJHPO to avoid permanent impacts to any potential archaeological resources.

With mitigation, Alternative 2 would be consistent with this coastal policy.

Alternative 3: Alternative 3 would have a smaller footprint of disturbance than Alternatives 1 or 2. Two areas with high archaeological sensitivity, specifically the proposed Caesar Place Park and Avanti Park, would be within the Alternative 2 footprint. As detailed in Table 4.6-9 in the EIS, 31 historic architectural resources are within the Alternative 3 APE. With the exception of the US Route 46 Bascule Bridge, Alternative 3 has the same potential to affect historic architectural resources as Alternative 2. Mitigation for any unavoidable impacts to these resources would be conducted as needed. Under Alternative 3, there would be no construction activity in the vicinity of the historic US Route 46 Bascule Bridge.

With mitigation (if needed), Alternative 3 would be consistent with this coastal policy.

Endangered or Threatened Wildlife or Plant Species Habitat (7:7-9.36)

A complete description of Endangered or Threatened Wildlife and Plant Species Habitat in the Project Area, and a corresponding analysis of potential impacts to these resources, are presented in **Section 3.14** and **Section 4.14** of the EIS, respectively.

Alternatives 1, 2, and 3: No federally listed threatened or endangered species have been documented by National Marine Fisheries Service (NMFS) or US Fish and Wildlife Service (USFWS) in the Project Area. Federally listed species that may occur in the Project Area include: northern long-eared bat (*Myotis septentrionalis*), Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), and shortnose sturgeon (*Acipenser brevirostrum*).

Several State-listed species have been identified within the Project Area, including bald eagle (*Haliaeetus leucocephalus*) and yellow-crowned night-heron (*Nyctanassa violacea*). A complete summary of all listed species within the Project Area, as well as those within the Meadowlands District, is provided within **Section 3.14** in the EIS.

Alternatives 1, 2, and 3 would not eliminate or jeopardize an existing or documented habitat for any threatened or endangered species, and would not jeopardize the continued existence of local populations of any threatened or endangered species. Please see **Section 4.14** of the EIS for further information.

Any sensitive habitats that would be temporarily disturbed as a result of construction of Alternative 1, 2, or 3 would be identified during the permitting process and appropriate mitigation measures, including timing restrictions and other measures as necessary, would be followed to protect sensitive populations and habitats. Please see **Section 4.14** of the EIS for further information.

With mitigation measures, Alternatives 1, 2, and 3 would be consistent with this coastal policy.

Public Open Space (7:7-9.38)

Alternative 1: Direct public access to the waterfront would be enhanced under Alternative 1. The Alternative 1 design includes the creation of four parks (i.e., Fluvial Park, K-Town Park, Riverside Park, and DePeyster Creek Park). Fluvial Park would be a 3.8-acre park designed to protect against tidal storm surge while providing public access to the waterfront; it would include paved and elevated walkways that connect to paved pathways along the line of protection (LOP) to the north and south of the park. South of Fluvial Park, a paved path would be constructed, providing a connection to K-Town Park and access to the waterfront. This path would connect to a proposed cantilever riverwalk at an existing vacant lot. On the northern end of the proposed cantilever riverwalk, a proposed boat dock/kayak launch would be built in the Hackensack River to allow recreational access to the Hackensack River. The northern and southern ends of the proposed cantilever riverwalk would be anchored by parks. The 1.4-acre K-Town Park would be constructed on the northern end of the cantilever riverwalk; this area would be converted from a vacant lot to recreation fields. The 2.2-acre Riverside Park would be constructed at the southern end of the cantilever riverwalk; it would provide passive recreational space and views of the Hackensack River. Riverside Park would constitute the southern terminus of the proposed public access pathway along the LOP.

South of Riverside Park and immediately west of the existing DePeyster Creek tide gate, DePeyster Creek Park would be created. The proposed 0.6-acre park would incorporate passive recreational space that could include open lawn, picnic tables, chairs, and a bird watching platform.

Alternative 1 would be consistent with, and advances the goals of, this coastal policy.

Alternative 2: Alternative 2 includes the creation of three waterfront parks (i.e., Fluvial Park, Riverside Park, and DePeyster Creek Park) which would enhance public access to the Hackensack River. All three would include recreation areas and river views, and the proposed Fluvial and Riverside Parks would include direct access to the water through a kayak launch and boat launch (capable of supporting trailered vessels), respectively. With Alternative 2, the proposed DePeyster Creek Park would be approximately 8.0 acres, a substantial size increase over Alternative 1. With Alternative 2, two additional parks would be created (Caesar Place Park and Avanti Park) and the existing Willow Lake Park would be improved.

Alternative 2 would be consistent with, and advance the goals of, this coastal policy.

Alternative 3: Alternative 3 includes the creation of Riverside Park, which would enhance public access to the Hackensack River. The proposed park would include public access to the water through a boat launch, as well as recreation areas and river views. Alternative 3 does not include Fluvial Park or DePeyster Creek Park.

Alternative 3 would be consistent with, and somewhat advance the goals of, this coastal policy.

Special Hazard Areas (7:7-9.39)

Per this policy, development in areas of known or potential hazard to public health, safety and welfare, or to public or private property, is discouraged. Special hazard areas include, but are not limited to: navigable air space around airports and seaplane landing areas, potential evacuation zones, and areas of hazardous substances and contamination. Any development in these areas would need to include appropriate mitigating measures.

Special hazard areas in the Project Area include the airspace around Teterboro Airport and numerous locations where hazardous substances are stored or contamination is present. Hazardous substance areas present include US Environmental Protection Agency (USEPA) Superfund sites on the National Priorities List (NPL), historic landfills, groundwater Classification Exception Areas (CEAs), Known Contaminated Sites (KCSs), other Recognized Environmental Conditions (RECs), including underground storage tanks (USTs), remediation sites, automobile filling stations and service stations and NJDEP-mapped historic fill. Details on the hazardous subtance and contamination areas and associated impacts are presented in Section 3.20 and Section 4.20 of the EIS.

None of the alternatives include structures of sufficient height in proximity to Teterboro Airport such that they would infringe upon regulated airspace. Coordination with the Federal Aviation Administration and Teterboro Airport would be conducted as needed to obtain any necessary permits for operation of cranes or other equipment during construction. With coordination and appropriate permits, the Proposed Project would be consistent with the intent of this policy regarding navigable airspace.

Discussion regarding hazardous substances and contamination is provided in the following paragraphs.

Alternatives 1, 2, and 3: During construction, each Build Alternative would have the potential to trigger near-term remediation under the Industrial Site Recovery Act (ISRA); disrupt or mobilize previously known hazardous materials; disturb hazardous materials on the subsurface at KCSs and historic fill areas; and delay planned remedial activities. Spills (e.g. gasoline and diesel) could potentially occur during the proposed construction and operational activities of each of the alternatives. Indirectly, implementation of the alternatives could mobilize contaminant plumes in soil or groundwater, locally increase water velocity that could cause scour and mobilize contaminated sediments, cause risk of thermal radiation or blast-overpressure damage from aboveground storage tanks (ASTs), interfere with future remedial investigations, and potentially create volatile organic compound (VOC)/methane preferential pathways.

Alternatives 1, 2, and 3 could provide benefits to special hazard areas through the removal of potentially contaminated soils during construction and the long-term protection of contaminated sites from the erosive effects of coastal flooding.

Construction contractors would be required to use, store, and transport hazardous materials in compliance with Federal, State, and local regulations during construction and a Materials Management Plan would be developed to address how any contaminated soil, sediment, surface water, groundwater, or waste materials would be handled for off-site disposal or on-site reuse. Approvals from the NJDEP Solid and Hazardous Waste Program would be obtained prior to any construction activity in or in proximity to a landfill. Additionally, during constrcution, a New Jersey Licensed Site Remediation Professional (LSRP) would oversee those portions of the project considered to be a Linear Construction Project as defined by the NJDEP, and Alternatives 1, 2, and 3 would comply with these and other provisions of Chapter 16 of the NJDEP Administrative Requirements for the Remediation of Contaminated Sites,

NJAC. 7:26C, as necessary. During operations, activities would need to address NJ Site Remediation and Reform Act requirements for contaminated sites.

Because the potential to mobilize sediments and impact remedial activities would be offset by the removal of contaminated soils during construction and the reduction in contaminant transport by floodwaters and erosion, Alternatives 1, 2, and 3 would be consistent with the goals of this coastal policy.

Hackensack Meadowlands District (7:7-9.43)

Approximately 76 percent (4,129 acres) of the Project Area is located within the Hackensack Meadowlands District.

Alternatives 1, 2, and 3: A zoning certificate from the New Jersey Sports and Exposition Authority (NJSEA) would be required prior to the construction of Alternative 1, 2, or 3.

As the purpose of the Proposed Project is to reduce the flood risk within the Project Area, Alternatives 1, 2, and 3 are consistent with the New Jersey Meadowlands Master Plan, and specifically with System Plans, *System 1: Natural Environment, Strategy 2*, and *System 5: Community Facilities, Strategy 3*.

Alternatives 1, 2, and 3 would be consistent with, and advance the goals of, this coastal policy.

Geodetic Control Reference Marks (7:7-9.45)

Alternative 1: Several horizontal geodetic reference marks are located within the Project Area along the Hackensack River. In addition, vertical control marks are located throughout the study area, including along Berry's Creek and within Teterboro Airport. Only those within the proposed LOP would be affected by Alternative 1. The movement or removal of these marks in association with Alternative 1 would be avoided to the extent practicable. Where unavoidable, relocation would be coordinated with the New Jersey Geodetic Control Survey at least 60 days prior to the disturbance. The geodetic control reference marks would be re-located or repositioned following project construction to avoid loss of the information associated with these control points.

Alternative 1 would be consistent with this coastal policy.

Alternative 2: Two reference marks are located within the footprint of Alternative 2; one is located within the proposed footprint for the proposed Avanti Park within an existing retaining wall. The other is located within an abutment of the US Route 46 Bridge, within the footprint of the proposed Fluvial Park. Relocation of these marks, if needed, would be coordinated with the New Jersey Geodetic Control Survey.

Alternative 2 would be consistent with this coastal policy.

Alternative 3: One benchmark disc is located within the proposed footprint of construction activities associated with Alternative 3. It is within an existing retaining wall at the proposed Avanti Park. Relocation of this mark, if needed, would be coordinated with the New Jersey Geodetic Control Survey.

Alternative 3 would be consistent with this coastal policy.

Lands and Waters Subject to Public Trust Rights (7:7-9.48)

Public access to the waterfront is limited within the Project Area. While portions of the Proposed Project would limit access to the waterfront, the Proposed Project would provide an increase in waterfront points for water-dependent activities within the Project Area.

Alternative 1: As stated in Public Open Space policy discussion above, Alternative 1 includes the development of parks, a boat dock/kayak launch, and walking paths along the Hackensack River waterfront for public use and increased access to the water.

Alternative 1 would be consistent with, and advance the goals of, this coastal policy.

Alternative 2: Alternative 2 would provide an increase in waterfront access through the development of three waterfront parks (i.e., Fluvial Park, Riverside Park, and DePeyster Creek Park), which would include a boat dock, boat launch, kayak launch, and walking paths.

Alternative 2 would be consistent with, and advance the goals of, this coastal policy.

Alternative 3: Alternative 3 would provide an increase in waterfront access through the development of the proposed Riverside Park, which would include a boat dock, boat launch, and walking paths.

Alternative 3 would be consistent with, and advance the goals of, this coastal policy.

1.3 Compliance with Requirements of Subchapters 10 and 11 of the Coastal Zone Management Rules

1.3.1 Standards for Beach and Dune Activities (Subchapter 10)

None of the policies in Subchapter 10 are applicable to the Proposed Project. There are no beaches and no dunes within the Project Area. The Proposed Project scope does not include the maintenance or creation of beaches or dunes.

1.3.2 Standards for Conducting and Reporting the Results of an Endangered or Threatened Wildlife or Plant Species Habitat Impact Assessment and/or Endangered or Threatened Wildlife Species Habitat Evaluation (Subchapter 11)

A description of endangered or threatened wildlife and plant species that may be present in the Project Area is presented in **Section 3.14** of the EIS. A comprehensive analysis of potential habitat and/or species impacts is presented in **Section 4.14** of the EIS. The information provided in the EIS documents compliance with the Special Area Rule at NJAC 7:7-9.36, and is sufficient to meet the standards of Subchapter 11.

1.3.3 Compliance with General Water Area Policies (Subchapter 12)

The Hackensack River is a medium river as defined under the General Water Area policy. New Jersey's coastal policies include conditions specific to different types of development in water areas. The Proposed Project does not involve any of the types of development listed below; accordingly, these General Water Area policies are not addressed herein.

- Shellfish aquaculture (7:7-12.2)
- Docks and Piers for Cargo and Commercial Fisheries (7:7-12.4)

- Maintenance Dredging (7:7-12.6)
- Environmental Dredging (7:7-12.8)
- Dredged Material Disposal (7:7-12.9)
- Solid Waste or Sludge Dumping (7:7-12.10)
- Mooring (7:7-12.12)
- Sand and Gravel Mining (7:7-12.13)
- Submerged Pipelines (7:7-12.15)
- Overhead Transmission Lines (7:7-12.16)
- Vertical Wake or Wave Attenuation Structures (7:7-12.20)
- Submerged Cables (7:7-12.21)
- Artificial Reefs (7:7-12.22)
- Living Shorelines (7:7-12.23)
- Miscellaneous Uses (7:7-12.24)

Compliance with requirements of the General Water Area coastal policies related to the types of development included in the Proposed Project is discussed in the following paragraphs.

Boat Ramps (7:7-12.3)

Alternative 1: Alternative 1 would include the installation of a public launch/dock for small craft at the northern end of the cantilever riverwalk. There are few existing public boat ramps or marinas in the Project Area and vicinity (see Marina Moorings [7:7-9.10]). As such, the current need is not met by existing facilities. Through coordination with Riverside Boat Works and Little Ferry Marina in the final design stages, water access for both of these facilities would be maintained.

The proposed public launch/dock location would minimize disturbance to intertidal flats and subaqueous vegetation. Additional considerations, such as use of environmentally appropriate construction materials and placement of trash cans, would be incorporated during the detailed design phase and would be consistent with this policy and associated permit requirements.

Alternative 1 would be consistent to the extent practicable with this coastal policy.

Alternative 2: Under Alternative 2, a public boat launch and improved docks would replace an existing private boat ramp/dock at the proposed Riverside Park, and a new kayak launch would be located at the proposed Fluvial Park. Disturbance to intertidal flats and subaqueous vegetation would be minimized during construction of these new recreational features. As with Alternative 1, environmentally appropriate construction materials and features would be included with Alternative 2.

Alternative 2 would be consistent with, and advance the goals of, this coastal policy.

Alternative 3: Alternative 3, a public boat launch and improved docks would replace an existing private boat ramp/dock at the proposed Riverside Park. Disturbance to intertidal flats and subaqueous vegetation would be minimized during construction of the park. As with Alternatives 1 and 2, environmentally appropriate construction materials and features would be included with Alternative 3. The Alternative 3 Build Plan does not include the kayak launch that would be installed as part of Alternative 1 (at the northern end of the proposed cantilever riverwalk) or Alternative 2 (at the proposed Fluvial Park).

Alternative 3 would be consistent with this coastal policy.

Recreational Docks and Piers (7:7-12.5)

This policy addresses provisions for projects that include the construction of recreational docks and piers in the coastal zone.

Public access to existing docks or piers in the Project Area and its vicinity are limited. Therefore, the current need is not met by existing facilities.

Alternative 1: During construction, access to the existing Little Ferry Marina and Riverside Boat Works would be temporarily disrupted. Closure gates or other measures would allow for vehicular and pedestrian access to the docks at these marinas during the operation phase of Alternative 1.

Alternative 1 includes installation of a recreational dock and hand-carry boat launch at the northern end of the proposed cantilever riverwalk. The proposed location adjacent to an existing private marina would minimize disturbance to intertidal flats and subaqueous vegetation. Additional considerations, such as use of environmentally sensitive construction materials, would be incorporated during the detailed design phase and would be consistent with this coastal policy and associated permit requirements.

Because the potential impacts to private marinas would be offset by a new public kayak launch and dock, Alternative 1 would be consistent to the extent practicable with this coastal policy.

Alternative 2: As described for Alternative 1, Alternative 2 would also impact operations at the Riverside Boat Works. However, with Alternative 2, Riverside Park would include a boat launch (for trailered vessels) and docks. Alternative 2 also includes the installation of a kayak launch within the proposed Fluvial Park. No impacts to the existing Little Ferry Marina would be incurred with Alternative 2.

Alternative 2 would be consistent with, and advance the goals of, this coastal policy and would have less impact than Alternative 1.

Alternative 3: As discussed above, Alternative 3 would also impact operations at the Riverside Boat Works. However, Riverside Park would include a boat launch (for trailered vessels) and docks. No impacts to the existing Little Ferry Marina would be incurred with Alternative 3.

Alternative 3 would be consistent with this coastal policy and would have less impact than Alternative 1.

New Dredging (7:7-12.7)

This policy addresses provisions for dredging not conducted for maintenance purposes within navigation channels or for environmental purposes.

Alternative 1: Alternative 1 does not propose any dredging.

This coastal policy is not applicable to Alternative 1.

Alternatives 2 and 3: Alternatives 2 and 3 include dredging of East Riser Ditch, upstream of the tide gate, for sediment removal. Silt curtains would be utilized as necessary to maintain water quality, in accordance with the conditions of NJDEP and USACE permits issued to authorize the dredging. Dredging in some sections may be done in the dry, following cofferdam installation and the dewatering conducted during construction of the forebay and force main discharge structures. Dredged material would be

managed in accordance with applicable requirements of New Jersey's Coastal Regulations, including Appendix G of the Coastal Zone Management Rules.

Alternatives 2 and 3 would be consistent with this coastal policy.

Filling (7:7-12.11)

Alternative 1: Alternative 1 would involve construction within the Hackensack River, below mean-high water, in eight locations. Due to constraints imposed by existing structures in these areas, alternative sites on the existing water's edge are not feasible. Alternative 1 has been designed to limit the amount of fill in these areas. Impacts to these areas would be minimized to the extent possible during the final design and permitting phase, and coordinated with the NJDEP, USACE, and other applicable regulatory agencies.

Additionally, a permanent storm surge barrier would be constructed within Berry's Creek; intertidal and subtidal shallows would be impacted by this Alternative 1 component.

Mitigation would be conducted as required for any permanent net loss of intertidal and subtidal shallows, open water, and wetlands. See Section 4.16.4.2 of the EIS for additional information.

With mitigation, Alternative 1 would be consistent with this coastal policy.

Alternative 2: Fill material associated with Alternative 2 would include riprap for scour protection in East Riser Ditch just downstream of the existing tide gate, as well as materials upstream of the tide gate as needed for the proposed pump station construction. Riprap scour protection would also be placed in Losen Slote at the discharge ends of both new force mains, upstream of the existing tide gate. In addition, fill material would be placed to construct the boat launch and kayak launch at the proposed Riverside Park and Fluvial Park, respectively. Only fill material free from contaminants in toxic amounts would be used. There would be no loss of open water area or intertidal or subtidal shallows associated with these fill areas. If necessary, compensation for fill areas would be incorporated into the habitat restoration aspects of the proposed parks. See Section 4.16.4.3 for additional mitigation information.

Alternative 2 would be consistent with this coastal policy, with mitigation implemented as necessary.

Alternative 3: Fill material associated with Alternative 3 would include riprap for scour protection in East Riser Ditch just downstream of the existing tide gate, as well as materials upstream of the tide gate as needed for the proposed pump station construction. Scour protection would also be placed in Losen Slote at the pump station discharge point. Fill material would also be placed to construct the boat launch at the proposed Riverside Park. Only fill material free from contaminants in toxic amounts would be used. There would be no loss of open water area or intertidal or subtidal shallows associated with these fill areas. If necessary, compensation for fill areas would be incorporated into the habitat restoration aspects of the proposed park. See Section 4.16.4.4 for additional mitigation information.

Alternative 3 would be consistent with this coastal policy, with mitigation implemented as necessary.

Bridges (7:7-12.14)

Any continuous structure that spans a water body, except an overhead transmission line, is considered a bridge under this policy. Bridges are conditionally acceptable provided there is a need that cannot be met

by existing facilities and that pedestrian and bicycle use and fishing platflorms are factored into the design where appropriate.

Alternative 1: Alternative 1 does not include construction of any bridges.

This coastal policy is not applicable to Alternative 1.

Alternatives 2 and 3: Alternatives 2 and 3 would require the removal and replacement of the railroad bridge supporting the NJ Transit Seaman Lead. There are no new bridges associated with Alternatives 2 and 3. Pedestrian and bicycle use and fishing platforms would not be incorporated on this active railroad bridge as they are not appropriate from a public safety perspective.

Alternatives 2 and 3 would be consistent to the extent practicable with this coastal policy.

Dams and Impoundments (7:7-12.17)

Alternative 1: Alternative 1 does not include any permanent dams or impoundments across the Hackensack River. The construction of a storm surge barrier within Berry's Creek would be permanently installed across this medium river. This structure would be "open" to allow water flow during normal conditions and would be closed only during severe storm events. The structure would alter the normal flow patterns in Berry's Creek; however, it has been designed to minimize both direct and indirect sediment disturbance to the extent practicable. Alternative 1 would be located within a medium river, Berry's Creek; therefore, Alternative 1 is conditionally acceptable. Navigation routes would not be affected under Alternative 1 and impacts would be minimized to the extent possible.

Alternative 1 would be consistent to the extent practicable with this coastal policy.

Alternatives 2 and 3: There are no new dams or impoundments associated with Alternatives 2 or 3.

This coastal policy is not applicable to Alternatives 2 and 3.

Outfalls and Intakes (7:7-12.18)

Alternative 1: The construction of approximately 43 new storm drainage outlet structures are included as part of Alternative 1. Outfalls associated with Alternative 1 meet the applicable rules of this chapter.

Alternative 1 would be consistent with this coastal policy.

Alternative 2: Alternative 2 would include two 36-inch force mains from proposed pump stations in the Boroughs of Little Ferry and Moonachie that would discharge stormwater from residential areas to a non-tidal section of the Losen Slote. Stormwater outfalls associated with the proposed pump station on East Riser Ditch would convey stormwater to the ditch, downstream of the existing tide gate.

Stormwater outfalls associated with Alternative 2 meet the applicable rules of this chapter; therefore Alternative 2 would be consistent with this coastal policy.

Alternative 3: Alternative 3 would include one 36-inch force main from a proposed pump station in the Borough of Little Ferry that would discharge stormwater from residential areas to a non-tidal section of

Losen Slote. Stormwater outfalls associated with the proposed pump station on East Riser Ditch would convey stormwater to the ditch, downstream of the existing tide gate.

Stormwater outfalls associated with Alternative 3 meet the applicable rules of this chapter; therefore Alternative 3 would be consistent with this coastal policy.

Realignment of Water Areas (7:7-12.19)

Physical alteration of the surface area configuration of any water area is considered realignment and is discouraged unless it is in the public interest and the impact to water areas is mitigated. Replacement of existing bulkheading or new bulkhead above the spring high water line is not considered realignment.

Alternative 1: Alternative 1 would include the construction of 18,000 linear feet of floodwall. Much of this length would be situated landward of the spring high water line in previously bulkheaded sections of the river. The length of floodwall requiring placement below the spring high water line and constituting realignment of the river would be minimized to the extent practicable. The Proposed Project is in the public interest and any impacts to open waters and wetlands would be mitigated (see Section 4.16.4.2).

With mitigation, Alternative 1 would be consistent with this coastal policy.

Alternatives 2 and 3: There would be no floodwalls, and, consequently, no realignment of water areas associated with Alternative 2 or the Alternative 3 *Build Plan.*

This policy is not applicable to Alternatives 2 and 3.

1.3.4 Compliance with Requirements for Impervious Cover and Vegetative Cover for General Land Areas and Certain Special Areas (Subchapter 13)

Subchapter 13 details impervious cover and vegetative cover percentages in the upland waterfront development area and Coastal Area Facility Review Act (CAFRA) area, and provides the details for determining requirements of, and compliance with, the policies of this subchapter. The requirements under this subchapter do not apply to areas located within the Meadowlands District, nor do they apply to linear development; therefore, demonstration of compliance with coastal policies detailed in Subchapter 13 is not required for the Proposed Project.

1.3.5 General Location Rules (7:7 Subchapter 14)

Rule on Location of Linear Development (7:7-14.1)

As the Proposed Project is intended to provide flood risk reduction to areas along the Hackensack River, alternative locations are not feasible. An EIS has been prepared to evaluate the potential direct, indirect, and cumulative impacts associated with the three Build Alternatives.

All three Build Alternatives have been designed to minimize environmental impacts to the extent possible. The EIS provides a comparative analysis of the potential impacts of all four considered alternatives, and identifies the Preferred Alternative.

Alternative 1: As identified in the EIS, there would be no permanent or long-term loss of unique or irreplaceable areas under Alternative 1; appropriate measures would be used to mitigate adverse impacts where feasible.

With mitigation, Alternative 1 would be consistent with this coastal policy.

Alternative 2: Linear development associated with Alternative 2 consists of the two 36-inch subsurface force mains that would be located in the Losen Slote residential areas of the Boroughs of Little Ferry and Moonachie. These features would not result in permanent loss or impact to unique or irreplaceable areas and appropriate mitigation would be conducted, as necessary.

With mitigation, Alternative 2 would be consistent with this coastal policy.

Alternative 3: Alternative 3 would include one 36-inch subsurface force main that would be located in the Losen Slote residential area of the Borough of Little Ferry. This feature would not result in a permanent loss or impact to unique or irreplaceable areas and appropriate mitigation would be conducted, as necessary.

With mitigation, Alternative 3 would be consistent with this coastal policy.

Basic Location Policy (7:7-14.2)

Alternatives 1, 2, and 3: A basic purpose of the Proposed Project is to provide flood risk reduction to areas along the Hackensack River; thus, Alternatives 1, 2, and 3's location along the Hackensack River cannot be changed. Another basic purpose of the Proposed Project is to promote public health, safety, and welfare.

Alternatives 1, 2, and 3 would be consistent with this coastal policy.

Secondary Impacts (7:7-14.3)

Alternatives 1, 2, and 3: Alternatives 1, 2, and 3 would not result in the types of secondary impacts described in this policy.

This coastal policy is not applicable to Alternatives 1, 2, and 3.

1.3.6 Use Rules (7:7 Subchapter 15)

The purpose of this subchapter is to ensure the proposed development is consistent with the use rules and conditions. The Proposed Project would not significantly alter the existing land use; therefore, the following rules are not applicable:

- Housing (7:7-15.2)
- Energy Facility (7:7-15.4)
- Public Facility (7:7-15.6)
- Industry (7:7-15.7)
- Mining (7:7-15.8)
- Port (7:7-15.9)
- Commercial Facility (7:7-15.10)
- Dredged Material Placement on Land (7:7-15.12)
- National Defense Facility (7:7-15.13)
- High-rise Structures (7:7-15.14)

Applicable components of this subchapter are addressed in the following paragraphs.

Resort/Recreational (7:7-15.3)

Alternative 1: Alternative 1 would convert 10.1 acres of land in the Project Area to accessible public recreational land. Approximately 147 acres of parks and other recreational fields/facilities exist currently; this would represent an increase of approximately 6 percent of recreational land within the Project Area. In addition, waterfront paths and walkways would be incorporated into the Alternative 1 design. All new parks and paths would be open to the public.

Therefore, Alternative 1 would be consistent with, and advance the goals of, this coastal policy.

Alternative 2: Alternative 2 would create approximately 20.0 acres of park/recreation land. All proposed parks and paths would be open to the public.

Alternative 2 would be consistent with, and advances the goals of, this coastal policy.

Alternative 3: Alternative 3 would create approximately 7.6 acres of park/recreation land. All proposed parks and paths would be open to the public.

Alternative 3 would be consistent with, and advance the goals of, this coastal policy, although to a lesser extent than Alternative 2.

Transportation (7:7-15.5)

This coastal policy is relevant to the Proposed Project because it includes standards for foot and bicycle paths and parking facilities. The Proposed Project includes new paths, walkways, and parking facilities.

Alternative 1: Under Alternative 1, a total of approximately 9,270 linear feet of public paths and walkways and 0.2 acre of parking areas would be added within the Project Area. These proposed areas would not interfere with existing or planned mass transit services, would minimize the extent of paved surfaces, and would be landscaped with native species.

Alternative 1 would be consistent with, and advance the goals of, this coastal policy.

Alternatives 2 and 3: Alternatives 2 and 3 enhance pedestrian use through paths, boardwalks, walkways, and parking facilities at various locations. These alternatives would not interfere with existing or planned mass transit services.

Alternatives 2 and 3 would be consistent with, and advance the goals of, this coastal policy.

Coastal Engineering (7:7-15.11)

The Coastal Engineering use rule includes storm risk reduction measures, which is the purpose of this Proposed Project.

Alternative 1: Where feasible, vegetation plantings have been incorporated into the Alternative 1 design. All sections of Alternative 1 have been designed to minimize impacts to the shoreline and would be consistent with the Shore Protection Master Plan.

Alternative 1 would be consistent with this coastal policy.

Alternatives 2 and 3: The purpose of the Proposed Project is to reduce storm risk. Bioswales, rain gardens, and vegetation plantings have been incorporated into the design of Alternatives 2 and 3 and impacts to the shoreline would be minimized.

Alternatives 2 and 3 would be consistent with this coastal policy.

1.3.7 Resource Rules (7:7 Subchapter 16)

The purpose of this subchapter is to analyze the proposed development in terms of its potential effects on various resources in the coastal zone, including the Project Area and vicinity.

Based on the location of the Proposed Project, impacts would not occur to the following resources:

- Surface Water Use (7:7-16.4)
- Groundwater Use (7:7-16.5)
- Air Quality (7:7-16.8)
- Subsurface Sewage Disposal Systems (7:7-16.13)

Applicable components of this subchapter are addressed in the following paragraphs.

Marine Fish and Fisheries (7:7-16.2)

This coastal policy discourages activities which have the potential to adversely impact the natural functioning of marine, estuarine, and anadromous fish, including reproductive, spawning, and migratory patterns, and species abundance and diversity.

Alternative 1: Construction of the new tide gate on the unnamed creek within the BCUA facility, the storm surge barrier in Berry's Creek, and the various fill areas along the Alternative 1 alignment have the potential to adversely impact marine and estuarine fishes. These impacts would be minimized and compensated for to the extent practicable with mitigation measures, which would include seasonal restrictions on in-water work during key migration or life cycle periods of fishes, turbidity barriers, other measures that would be detailed in the Stormwater Pollution Prevention Plan (SWPPP) for Alternative 1, and mitigation to offset loss of intertidal and subtidal shallows and wetlands.

With mitigation, Alternative 1 would be consistent, to the extent practicable, with this coastal policy.

Alternatives 2 and 3: For Alternatives 2 and 3, in-water work would be limited to the location of an existing tide gate on East Riser Ditch and proposed shoreline public parks along the Hackensack River. Work that could introduce sediments into the water would follow applicable seasonal restrictions and other measures, such as fish and turbidity barriers.

With mitigation, Alternatives 2 and 3 would not adversely impact marine fisheries and would be consistent with this coastal policy.

Water Quality (7:7-16.3)

Alternatives 1, 2, and 3: During the permitting process, a water quality certificate would be obtained from the NJDEP. Applicable requirements under Federal, State, and local water quality requirements, as well as the New Jersey Water Pollution Control Act, would be adhered to throughout the duration of Alternative 1, 2, or 3. Only suitable materials would be used for construction. Appropriate erosion and

sediment control measures would be utilized during construction, consistent with an approved Soil Erosion and Sediment Control Plan and New Jersey Pollutant Discharge Elimination System permit to minimize construction-related impacts to water quality. Stormwater runoff would meet applicable standards.

Alternatives 1, 2, and 3 would be consistent with this coastal policy.

Stormwater Management (7:7-16.6)

The Proposed Project meets the definition of a major development and would comply with the Stormwater Management rules at NJAC 7:8. Design of the Proposed Project incorporates the use of both grey infrastructure (built infrastructure) and green infrastructure/environmental solutions.

Alternative 1: Grey infrastructure elements that would be incorporated under Alternative 1 include: floodwalls, tide gates, and a surge barrier with pump station. Green infrastructure elements that would be incorporated under Alternative 1 include: drainage swales, permeable pavement, wetland improvements, and the addition and/or improvement of parks and open spaces.

Alternative 1 would be consistent with this coastal policy.

Alternative 2: Alternative 2 would include both green and grey infrastructure measures that would improve overall stormwater management throughout Alternative 2's life. Grey infrastructure elements that would be incorporated under Alternative 2 include: pump stations and force mains and channel dredging. Green infrastructure elements that would be incorporated under Alternative 2 include: bioswales, rain gardens, storage trenches, permeable pavement, wetland improvements, and the addition and/or improvement of parks and open spaces.

Alternative 2 would be consistent with, and advance the goals of, this coastal policy.

Alternative 3: Alternative 3 would include both green and grey infrastructure measures that would improve overall stormwater management in the Project Area. Grey infrastructure elements that would be incorporated under Alternative 3 include: pump stations and force mains and channel dredging. Green infrastructure elements that would be incorporated under Alternative 3 include: bioswales, rain gardens, storage trenches, permeable pavement, wetland improvements, and the addition and/or improvement of parks and open spaces.

Alternative 3 would be consistent with, and advance the goals of, this coastal policy.

Vegetation (7:7-16.7)

To the extent practicable, the Proposed Project has been designed such that existing coastal vegetation would be preserved. Where vegetation disturbance is unavoidable, the area would be re-vegetated with appropriate coastal species native to New Jersey.

Alternative 1: Under Alternative 1, approximately 10.1 acres would be converted to accessible, public recreational land that includes native vegetation plantings. Approximately 147 acres of parks and other recreational fields/facilities exist currently; this would represent an increase of approximately 6 percent of recreational land within the Project Area.

Alternative 1 would result in an overall increase in vegetated areas and is consistent with, and advances the goals of, this coastal policy.

Alternative 2: Through the addition of five parks totaling approximately 20.0 acres, enhancements through native vegetation plantings at existing parks, and the creation of rain gardens and bioswales throughout the Project Area, Alternative 2 would result in an overall increase in vegetated areas and native vegetation.

Alternative 2 would be consistent with, and advance the goals of, this coastal policy.

Alternative 3: Through the addition of three parks totaling approximately 7.6 acres, enhancements through native vegetation plantings at existing parks, and the creation of rain gardens and bioswales throughout the Project Area, Alternative 3 would result in an overall increase in vegetated area and native vegetation.

Alternative 3 would be consistent with, and advance the goals of, this coastal policy.

Public Access to the Waterfront (7:7-16.9)

Alternative 1: Public access to the waterfront would be enhanced under Alternative 1 through the creation of four parks, new paths, and walkways. In addition, Alternative 1 would include construction of a boat dock/kayak launch at the northern end of the cantilever riverwalk. The parks would be developed within currently developed and undeveloped lands, as described above. Areas of the Project Area that currently do not allow access to the waterfront, such as lands within the BCUA, would continue to have access restrictions.

Alternative 1 would be consistent with, and advance the goals of, this coastal policy.

Alternative 2: Alternative 2 includes the creation of three waterfront parks, with a public boat launch and docks at the proposed Riverside Park and a kayak launch in the proposed Fluvial Park.

Alternative 2 would be consistent with, and advance the goals of, this coastal policy.

Alternative 3: Alternative 3 includes the creation of one waterfront park (the proposed Riverside Park) with a public boat launch and docks.

Alternative 3 would be consistent with, and somewhat advance the goals of, this coastal policy.

Scenic Resources and Design (7:7-16.10)

A description of the existing visual quality and character of the Project Area is presented in **Section 3.3** of the EIS; an analysis of potential impacts to these resources is presented in **Section 4.3** of the EIS. In general, the Project Area consists of a mix of residential and industrial/commercial land uses, separated by local streets, some recreational areas, and wetlands, with large wetland complexes in the southeastern portion of the Project Area.

Alternative 1: Context-sensitive design considerations have been incorporated in the Alternative 1 design to minimize visual impacts to viewers and to enhance the scenic resources of the area, where

feasible. The addition of the public parks and the waterfront walkways and paths would provide new waterfront access for the public and associated views of the river and coastal areas.

Alternative 1 would be consistent with, and advance the goals of, this coastal policy.

Alternatives 2 and 3: Above ground features associated with Alternatives 2 and 3 consist primarily of green infrastructure measures, proposed parks, and upland and wetland vegetation plantings; these features would enhance the scenic character of the Project Area. Context-sensitive design considerations would be incorporated into grey infrastructure included in Alternatives 2 and 3, as suitable and in consideration of the neighborhood character where the structures are located.

Alternatives 2 and 3 would be consistent with, and advance the goals of, this coastal policy.

Buffers and Compatibility of Uses (7:7-16.11)

Alternative 1: The various features of Alternative 1 have been designed to complement adjacent land uses. Where space permits, public open space and parks would be incorporated in residential areas to create compatible uses and land use buffers. Floodwalls would be constructed adjacent to industrial areas or where space constraints imposed by existing development does not allow more natural or creative aspects to be constructed. In addition to improving the human environment, the various natural and vegetated aspects of Alternative 1 and the proposed upland plantings, wetland creation, and riparian plantings would improve habitat buffers for wildlife.

Alternative 1 would be consistent with, and advance the goals of, this coastal policy.

Alternatives 2 and 3: Alternatives 2 and 3 have been designed to complement adjacent land uses and would incorporate public space and parks in residential areas. Alternatives 2 and 3 would create lawn areas, while also incorporating native vegetation through planting of trees, shrubs, and wetland species. Alternatives 2 and 3 would also convert existing asphalt areas to vegetated lawn for recreation or to pervious pavement areas. Through these improvements, buffers between land uses, as well as habitat buffers for wildlife, would be improved.

Alternatives 2 and 3 would be consistent with, and advance the goals of, this coastal policy.

Traffic (7:7-16.12)

A comprehensive assessment of potential impact to traffic and transportation can be found in **Section 4.7** of the EIS.

Alternative 1: The Alternative 1 alignment primarily follows the shoreline of the Hackensack River as well as low lying areas near Berry's Creek. This alignment minimizes crossings of public, as well as private, roads. Where road crossings cannot be avoided, closure gates would be constructed and would remain open under normal operating conditions to avoid traffic impacts. Implementation of Alternative 1 would require closure gates at the following locations:

- The lot located northeast of Industrial Avenue/Gates Road to maintain access to the existing boat dock;
- East of the access road for Popular Sales Inc. (and east of Gates Road) to maintain access to the existing boat dock;

- Doka USA Ltd parking lot to maintain access to the existing boat dock;
- The open lot northeast of the BCUA property to maintain traffic ingress/egress;
- BCUA property to maintain access to a gravel ramp that leads into the Hackensack River;
- BCUA property to maintain access to the dock for wastewater treatment; and
- South of the Losen Slote Tide Gate and Pump Station to maintain access to the Transco Gas Pipeline Road.

A Traffic Management Plan would be prepared to address temporary traffic impacts associated with lane closures and/or detours during construction activities. These impacts would be short-term and would affect different locations intermittently. Alternative 1 would not have permanent long term adverse impacts on traffic.

Alternative 1 would be consistent with, and advance the goals of, this coastal policy.

Alternatives 2 and 3: No significant traffic impacts are anticipated for either Alternatives 2 or 3. Temporary closure of sidewalks, parking lanes, driveways, and, in some cases, driving lanes, would be required; however, the duration of localized closures would be minimized to the extent practicable. No complete road closures would be required.

Alternatives 2 and 3 would be consistent with this coastal policy.

Solid and Hazardous Waste (7:7-16.14)

Several confirmed and potential sites with solid and hazardous waste have been identified within the Project Area. A complete discussion of these sites is provided in **Section 3.20** of the EIS; an analysis of potential impacts to these sites is presented in **Section 4.20** of the EIS.

Alternative 1: Alternative 1 would conform to applicable State and Federal regulations, standards, and guidelines for handling and disposal of solid and hazardous waste.

Alternative 1 would be consistent with this coastal policy.

Alternatives 2 and 3: None of the hazardous waste sites identified in the EIS would be present within the footprint of Alternatives 2 or 3. Any solid and hazardous waste management associated with Alternatives 2 and 3 would conform to applicable State and Federal Regulations, standards, and guidelines.

Alternatives 2 and 3 would be consistent with this coastal policy.

This Page has been Intentionally Left Blank.

Appendix N: Hazards and Hazardous Materials

This Page has been Intentionally Left Blank.

List of Tables

Table N-1: Summary of CEAs in the Project Area N-1
Table N-2: Summary of Recognized Environmental Conditions (RECs) in the Project Area with Potential Relevance to the Proposed Project N-4
Table N-3: Summary of USTs in the Project Area N-8
Table N-4: Summary of Automotive Service Stations in the Project Area N-9
Table N-5: Hazards and Hazardous Materials Study Areas for Contaminated Sites N-11

This Page has been Intentionally Left Blank.

Table N-1: Summary of CEAs in the Project Area

Name	PI Number	Address	Size (acres)	Depth (feet)	Year established	Duration (years)	Contaminants of Concern
Wella Corp.	009535	125 N St, Teterboro	3	NA	1996	30	VOCs
Atlantic Hoisting & Scaffolding	000601	700 Commercial Ave., Carlstadt	8.5	15	2015	Ind.	Metals and PAHs
Jake & Tom's Meadowland Service Station	026351	204 Washington Ave., Carlstadt	NA	10	2007	8	VOCs
Getty Service Station #56899	001629	123 NJ-17 S., Hasbrouck Heights	2	50	2002	Ind.	VOCs
Randolph Products Co.	132990	701 12th St., Carlstadt	3.6	30	2014	10	VOCs
Randolph Products Co.	132990	701 12th St., Carlstadt	3.5	30	2014	Ind.	Metals, VOCs, SVOCs, PAHs
Greif Bros Corp.	003114	10 Malcolm Ave., Teterboro	0.2	12	2014	19	VOCs
Merit Service Station	009116	NJ 17, Hasbrouck Heights	0.8	50	2008	22	VOCs
Applied Graphics Tech.	034018	463 Barell Ave., Carlstadt	3.5	50	2014	Ind.	Metals and PAHs
AGFA Photo Division	004995	195 N St., Teterboro	4.3	15	2015	Ind.	Metals and PAHs
Malcom Ave. Fuel Storage Facility	031865	Malcom Ave., Teterboro	1.1	50	2000	8	VOCs, SVOCs
Potdevin Machine Co.	032017	200 N Ave., Teterboro	4.1	5	2001	Ind.	Petroleum hydrocarbons
Meadowlands Toyota	013220	181-191 Broad St., Carlstadt	2.2	10	2013	Ind.	Metals and PAHs
Scientific Design Company	002846	59 Industrial Ave., Little Ferry	7.3	32	2011	Ind.	Metals and PAHs
R.A. Hamilton Corp.	006578	9 Bergen Tpke., Little Ferry	0.1	10	2001	29	VOCs
Acrow Corp.	493765	396 Washington Ave., Carlstadt	10	20	2012	Ind.	SVOCs, metals, PAHs
The New York Times Co.	004354	602 Washington Ave., Carlstadt	0.4	55	1997	25	VOCs, SVOCs

Name	PI Number	Address	Size (acres)	Depth (feet)	Year established	Duration (years)	Contaminants of Concern
J Landau Company Inc.	G000007492	665 Washington Ave., Carlstadt	1.1	11	2014	Ind.	VOCs
Meadowlands Toyota	013220	181-191 Broad St., Carlstadt	0.5	10	2005	10	VOCs
Richard Catena Auto Wholesalers	G000034525	430 Industrial Ave., Teterboro	1.4	45	2015	Ind.	VOCs
Richard Catena Auto Wholesalers	G000034525	430 Industrial Ave., Teterboro	0.1	45	2015	Ind.	SVOCs, PCBs
Photogravure & Color Co.	016123	100 Grand St. & 11 Barrett Ave., Moonachie	1.1	20	1998	Ind.	Metals
Bobker Bearings Inc.	189762	339 14th St., Carlstadt	0.9	30	2013	Ind.	Metals and PAHs
Safer Textiles Processing Facility	026381	7 Capitol Dr., Moonachie	7.2	30	2015	Ind.	VOCs
First Aviation Services, Inc.	021831	111 Industrial Ave., Teterboro	0.1	8	2006	13	VOCs
A&S Manufacturing Company	018314	8 Empire Blvd., Moonachie	3	12	2001	5	VOCs
Tunnel Barrel & Drum Co. Inc.	011126	85 Triangle Blvd., Carlstadt	0.8	35	2014	Ind.	VOCs
Diamond Shamrock Chemicals	015054	Berry Ave., Carlstadt	7	30	2003	Ind.	Pesticides and PCBs
UPS Ground Freight	010621	280 Moonachie Blvd., Moonachie	0.1	11	2006	28	VOCs
Mobil Service Station #15-K6H	007237	270 US-46, Little Ferry	2	50	2000	Ind.	VOCs
Schwarz Leather Co.	027273	400 Gotham Pkwy., Carlstadt	2.9	12	2015	Ind.	Metals and PAHs
AA Truck Renting	004668	319 13th St., Carlstadt	0.8	50	2015	Ind.	Metals and PAHs
Former Hess Service Station	003920	US-46/Bergen Tpke., Little Ferry	0.1	10	1994	24	VOCs
Melnor Industries	G000002238	1 Carol Pl., Moonachie	0.2	15	1997	18	VOCs

Name	PI Number	Address	Size (acres)	Depth (feet)	Year established	Duration (years)	Contaminants of Concern
Signature Flight Corp.	G000035601	401 Industrial Ave., Teterboro	0.2	50	1999	Ind.	VOCs and metals
Hasbrouck Heights Shell	003496	220 NJ-17 & Franklin Ave., Hasbrouck Heights	0.2	56	2015	Ind.	VOCs
Knickerbocker Bed Co	003970	770 Commercial Ave., Carlstadt	0.1	NA	2005	1.2	VOCs
99 Grand Street	G000036921	99 Grand St., Moonachie	2.9	30	2013	Ind.	Metals and PAHs
Deluxe International Trucks, Inc.	014062	600 S River St., Hackensack City	4.7	30	2003	4	VOCs
Coordinated Metals, Inc.	207123	100 Asia Pl., Carlstadt	1	20	2015	Ind.	Metals and PAHs

Table N-2: Summary of Recognized Environmental Conditions (RECs) in the Project Area with Potential Relevance to the Proposed Project

Name	PI Number	Address	Year	Contaminants of Concern	Other Notes
Recognized Environmental Conditions					
Caesar Palace Pump Station	19870	Caesar Pl. & Moonachie Ave., Moonachie	1995	Metals, PCBs, and pesticides	NA
Starke Road	G000029309	Starke Rd., Carlstadt	1999	VOCs and SVOCs	NA
Gates Construction	2823	208 Gates Rd., Little Ferry	1999	VOCs	Confirmed contamination, case pending
Scientific Chemical Processing	G000003575	216 Paterson Plank Rd., Carlstadt	1982	VOCs, SVOCs, PAHs, PCBs, and pesticides	NA
Technical Oil Products	2953	150 Grand St., Carlstadt	2001	Metals, VOCs, and SVOCs	NA
Signature Flight Support Corp.	G000035601	401 Industrial Ave., Teterboro	1999	VOCs and metals	NA
Borough Of Teterboro	G000033750	Vincent Pl. & Industrial Ave., Teterboro	2009	Metals, VOCs, SVOCs, and PAHs	NA
Gift Box Corporation	507884	305 Veterans Blvd., Carlstadt	2010	VOCs and SVOCs	NA
President Container	13804	200 W Commercial Ave., Moonachie	2011	Metals, PCBs, and pesticides	NA
Diamond Shamrock Chemicals	15054	Berry Ave., Carlstadt	2011	Pesticides and PCBs	NA
Aga Associates	22500	240 Paterson Plank Rd., Carlstadt	2008	Metals, VOCs, SVOCs, and PAHs	NA
Carlton Cooke Plating	24149	456 Washington Ave., Carlstadt	2011	VOCs	Groundwater contamination
Honeywell International	5851	699 E US-46, Teterboro	2010	VOCs and SVOCs	NA
Wastewater Treatment Facility	4970	Mehrhof Rd., Little Ferry	2010	VOCs and metals	Groundwater contamination
Malcolm Avenue Fuel Farm	1049	Malcolm Ave., Teterboro	2011	Metals, VOCs, SVOCs, and PAHs	NA

Name	PI Number	Address	Year	Contaminants of Concern	Other Notes
Tri Star Motors	499260	500-510 US-46 W., South Hackensack	2011	Metals	NA
Electromek Company	G000003390	20th St. & Broad St., Carlstadt	2011	VOCs and SVOCs	NA
Applied Printing Technologies	G000004165	77 Moonachie Ave., Moonachie	2011	NA	NA
Jet Aviation Teterboro	558658	112 Charles Ave. & Lindbergh Dr., Teterboro	2013	VOCs and SVOCs	NA
First Aviation Services	21831	111 Industrial Ave., Teterboro	2012	VOCs	NA
Sumitomo Machinery	23095	7 Malcolm Ave., Teterboro	2012	NA	NA
Catena Wholesale	G000034525	430 Industrial Ave., Teterboro	2012	VOCs, SVOCs, and PCBs	NA
Foot of Industrial Ave	G000043705	Foot of Industrial Ave., Little Ferry	2012	NA	Groundwater contamination
Safer Textiles Processing	26381	7 Capitol Dr., Moonachie	2012	VOCs	NA
Infiniti Color Graphics	G000035895	2 Anderson Ave., Moonachie	2012	NA	NA
254 Outwater Lane	483975	254 Outwater Ln., Carlstadt	2012	NA	Groundwater contamination
Elco Solvents Corp.	G000001197	30 Amor Ave., Carlstadt	2012	VOCs, SVOCs, and pesticides	NA
Greif Bros Corp	3114	10 Malcolm Ave., Teterboro	2012	VOCs	NA
Teterboro Airport	9924	485 Industrial Ave. & Charles Lindbergh Dr., Teterboro	2013	Metals, VOCs, SVOCs, and PAHs	NA
130 Grand Street	G000028352	130 Grand St., Carlstadt	1996	NA	NA
Department of Public Works	320	7 Willow St., Moonachie	2013	VOCs and SVOCs	NA
600 16th Street	G000008823	600 16th St., Carlstadt	NA	NA	NA
Water Jel Technologies	G000003981	50 Broad St., Carlstadt	2007	NA	NA
Schwarz Leather Co	27273	400 Gotham Pkwy., Carlstadt	2014	VOCs and SVOCs	NA
Yellow Transportation 126	9424	700 Dell Rd., Carlstadt	2011	NA	NA
Seagrave Coatings	167222	296 & 320 Paterson Plank Rd., Carlstadt	2013	VOCs and SVOCs	NA

Name	PI Number	Address	Year	Contaminants of Concern	Other Notes
Randolph Products Co	132990	701 12th St., Carlstadt	2010	VOCs, SVOCs, metals, pesticides	NA
745 Associates	1946	745 NJ-17 N., Carlstadt	2012	VOCs and SVOCs	NA
Texaco Refining & Marketing	31865	Malcolm Ave., Teterboro	2012	VOCs	NA
Controlled Recognized Environmental Conditions (CREC)					
Acrow Corp	493765	396 Washington Ave., Carlstadt	2012	SVOCs and metals	CEA in place
R A Hamilton Corp	6578	9 Bergen Tpke., Little Ferry	2012	Metals	CEA in place
J Landau Company	G000007492	665 Washington Ave., Carlstadt	2011	VOCs and SVOCs	CEA in place
Applied Graphics Technologies	34018	463 Barell Ave., Carlstadt	2012	Metals	CEA in place
Scientific Design Co	2846	59 Industrial Ave., Little Ferry	2014	Metals	CEA in place
Star Manufacturing	G000001246	101 Industrial Ave., Little Ferry	2011	VOCs and SVOCs	NFA-E (Restricted Use) as of 2011
495 Meadow Lane	G000042180	495 Meadow Ln., Carlstadt	2002	NA	NFA-E (Restricted Use) as of 2002
Pioneer Industries Division	G000002899	401 Washington Ave., Carlstadt	2003	Metals, VOCs, and SVOCs	NFA-E (Restricted Use) issued in 2003
City Theatrical, Inc.	289656	475 Barell Ave., Carlstadt	2012	SVOCs and PCBs	NFA-E (Restricted Use) issued in 2012
Morris Park Avenue Corp SLF	499089	Grand St. & Starke Rd., Carlstadt	2011	Metals, PCBs, and pesticides	NFA-E (Restricted Use) as of 2011
Historic Recognized Environmental Conditions (HREC)					
Amerada Hess	3920	US 46 & Bergen Tpke., Little Ferry	1994	VOCs	NFA-A (Unrestricted Use) as of 2003
Interchange 18W Toll Plaza	13309	I-95 Mile 113.8 W, Carlstadt	NA	VOCs and SVOCs	RAO-A (Unrestricted Use) issued as of 2012

Name	PI Number	Address	Year	Contaminants of Concern	Other Notes
Unimac Graphics	32842	350 Michele Pl., Carlstadt	1905	NA	NFA-A (Unrestricted Use) issued in 1999

Abbreviations:
CEA – Classification Exemption Area
Ind. – Indeterminate
NA – Not Available
NFA-A – No Further Action Area
NFA-E – No Further Action Entire Site
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyls
RAO – Response Action Outcome
SVOC – Semi-volatile Organic Compound
VOC – Volatile Organic Compound

Table N-3: Summary of USTs in the Project Area

Name	PI Number	Address
Atlantic Hoisting & Scaffolding LLC	000601	700 Commercial Ave., Carlstadt
745 Associates	001946	745 NJ 17 N., Carlstadt
Ryder Transportation Services 0842	002517	125 Commercial Ave., Carlstadt
Con-Way Central Express	002571	50 Moonachie Ave., Carlstadt
The New York Times	004354	602 Washington Ave., Carlstadt
Yrc Inc. Dba Yrc Freight	009424	700 Dell Rd., Carlstadt
Tunnel Barrel & Drum Co Inc.	011126	85 Triangle Blvd., Carlstadt
RJF Graphics	018839	171 Commerce Rd., Carlstadt
Thumann Inc.	022750	670 Dell Rd., Carlstadt
Ditobari And Co.	024868	217A Avenue A, Carlstadt
Auto-Chlor Systems Inc.	031660	685 Gotham Pkwy., Carlstadt
Prospect Transportation Inc.	032290	583 Industrial Rd., Carlstadt
Carretta Trucking	032777	130 Moonachie Ave., Carlstadt
Gift Box Corporation	507884	305 Veterans Blvd., Carlstadt
Kero Rd Property Assoc LLC	624704	85 Kero Rd., Carlstadt
Amoco Service Station 1827	001389	263 US 46 & Liberty St., Little Ferry
Gates Construction Corp	002823	208 Gates Rd., Little Ferry
Wastewater Treatment Facility	004970	Mehrhof Rd., Little Ferry
Rhodes Enterprises (Former)	006035	30 Bergen Tpke., Little Ferry
Gulf 121443	006324	269 US 46 & Liberty St., Little Ferry
Lukoil #57306	007237	270 US 46, Little Ferry
Little Ferry Rentals Inc.	007997	332 US 46, Little Ferry
Verizon Little Ferry Co 62043	008029	282 Main St., Little Ferry
Walker Poroswall Pipe Co	008845	110 Bergen Tpke., Little Ferry
Little Ferry Borough	011227	Mehrhof Rd. & Crescent St., Little Ferry
J S Popper Inc.	012006	200 Liberty St., Little Ferry
D&D Service Center & Towing Inc.	013996	46 Liberty St., Little Ferry
State Container Corp	000168	111 W Commercial Ave., Moonachie
Borough Of Moonachie	000319	70 Moonachie Rd., Moonachie
Department Of Public Works	000320	7 Willow St., Moonachie
A E&A Service Station Inc.	002679	270 Moonachie Ave., Moonachie
Terminal Construction Corp	007895	100 Anderson Ave., Moonachie
UPS Ground Freight	010621	280 Moonachie Blvd., Moonachie
92 Moonachie Avenue	495011	92 Moonachie Ave., Moonachie
Civilian One Jets	558658	113 Charles A Lindbergh Dr., Moonachie
S Hackensack Township	003157	79 Franklin St., South Hackensack

Name	PI Number	Address
Naturex Inc.	006473	379 Huyler St., South Hackensack
Seminara Construction	031971	260 Green St., South Hackensack
Tri Star Motors	499260	500-510 US 46 W., South Hackensack
Malcolm Avenue Fuel Farm	001049	Malcolm Ave., Teterboro
Teterboro Airport	009924	Industrial Ave., Teterboro
First Aviation Services Inc.	021831	111 Industrial Ave., Teterboro
Texaco Refining & Marketing Inc.	031865	Malcolm Ave., Teterboro

Table N-4: Summary of Automotive Service Stations in the Project Area

Name	Address
Northside Imports Inc.	131 Industrial Ave, Teterboro
U-Pack	256 Paterson Plank Rd, Carlstadt
Brake-O-Rama	240 Paterson Plank Rd, Carlstadt
Pauls Sunoco Service Station	688 Washington Ave, Carlstadt
Gulf Gas Station	20 Kaufman Ave, Little Ferry
Unknown Service Station	497 Washington Ave, Carlstadt
Unknown Service Station	310 16th St, Carlstadt
Quick Chek Service Station	720 Washington Ave, Carlstadt
Vanos Motorsport	369 Washington Ave, Carlstadt
Royal Touch Hand Car Wash	711 NJ-17, Carlstadt
Mario's Foreign Car World	262 Broad St, Carlstadt
Valero Fuels Gas Station	300 Washington Ave, Carlstadt
Unknown Service Station	144 Main St, Little Ferry
ANC Auto Repair LLC	386 Liberty St, Little Ferry
Mike Romano's Auto Body	10 John St, Little Ferry
Mab Cars	119 US 46, Little Ferry
Ten Hoeve Brothers Services Station	601 Commercial Ave, Carlstadt
Auto Repair Shop	650 Dell Rd, Carlstadt
Project M Motors	745 NJ-17, Carlstadt
Interstate Equipment Repair	690 Washington Ave, Carlstadt
Unknown Service Station	330 Washington Ave, Carlstadt
Sunoco Service Station #0374-6583	284 Washington Ave & Moonachie Ave, Carlstadt
Unknown Service Station	19 Mariani Dr, Little Ferry
Getty Service Station #57306	270 US 46 & Liberty St, Little Ferry
J&J Tires & Wheels	1 Bergen Turnpike, Little Ferry
Ashtin Truck Repair	100 Kero Rd, Carlstadt
Unknown Service Station	37 Center St, Little Ferry
Phil's Auto Repairs	411 Liberty St, Little Ferry

Name	Address
Shell Service Station #138404	179 US 46 & Frederick St, Little Ferry
Giant Fuel Stop Service Station	300-330 Washington Ave, Carlstadt
Hertz Corp Car Rental @ Teterboro Airport	125 Commercial Ave, Carlstadt
A&D Towing And Recovery	46 Liberty St, Little Ferry
Tonsa Automotive	6 Willow St, Moonachie
Unknown Service Station	101 Franklin St, Little Ferry
Unknown Service Station	21 Lafayette St, Little Ferry
Unknown Service Station	381 Liberty St, Little Ferry
Unknown Service Station	282 Main St, Little Ferry
Steve's Auto Sales	150 US 46, Little Ferry
Enrite Service Station	261 US 46 E, Little Ferry
Unknown Service Station	161 US 46, Little Ferry
Stallion Auto Services	9 Liberty St, Little Ferry
A&D Towing And Recovery	46 Liberty St, Little Ferry
Little Ferry Amoco Service Station	300 Bergen Tpke, Little Ferry
Unknown Service Station	50 Prospect Ave, Little Ferry
Advanced Auto Repair	39 Bergen Tpke, Little Ferry
Unknown Service Station	136 Eckel Rd, Little Ferry
CJ's Express Car Wash	108 US 46, Little Ferry
Little Ferry Boro Dpw Garage	179 Mehrhof Rd & Crescent St, Little Ferry
Unknown Service Station	11 Lincoln St, Little Ferry
Chizzy's Service Center	44 Bergen Tpke, Little Ferry
Unknown Service Station	39 Niehaus Ave, Little Ferry
Mayer's Auto Body	111 Main St, Little Ferry
Cumberland Farms Inc. Gulf Service Station #12144	269 US 46 & Liberty St, Little Ferry
Quality Transmission Service	435 US 46, Little Ferry
Kenny Auto	170 Bergen Turnpike, Little Ferry
A&V Automotive	41 Romeo St, Moonachie
Unknown Service Station	100 Carol Pl, Moonachie
Unknown Service Station	116 Moonachie Ave, Moonachie
Unknown Service Station	5 Caesar Pl, Moonachie
Unknown Service Station	270 Moonachie Ave, Moonachie
Unknown Service Station	375 North St, Teterboro
Richard Catena Auto Wholesalers	430 Industrial Ave, Teterboro
Mv Auto Repair Ii	350 Main St, Hackensack
Cash Your Car Inc.	346 Phillips Ave, South Hackensack
21St Century Car Wash	456 US 46, South Hackensack
Costco Gasoline Service Station	US 46 & Industrial Ave, Teterboro
Unknown Service Station	57 Grove St, South Hackensack

Name	Address
Tech Power Inc.	456 US 46, South Hackensack
Argent Motors	419 US 46, South Hackensack
J'S Auto Sales	344 Main St, South Hackensack
Unknown Service Station	600 Huyler St, South Hackensack

Table N-5: Hazards and Hazardous Materials Study Areas for Contaminated Sites

Category	ASTM Required Database?	ASTM Search Distance	Other Search Distance	Notes
Federal Contaminated Sites Databases				
Superfund/NPL Proposed NPL/ Delisted NPL	Yes	1 Mile	N/A	NPL sites assessed within 1 mile of Build Alternatives
CERCLIS/ CERCLIS NFRAP	Yes	½ Mile	N/A	CERCLA sites assessed within ½ mile of Build Alternatives
RCRA CORRACTS	Yes	1 Mile	N/A	RCRA Corrective Action sites assessed within 1 mile of Build Alternatives
RCRA TSD	Yes	½ Mile	N/A	RCRA Transfer, Storage and Disposal Facilities assessed within ½ mile of Build Alternatives
RCRA Gen	Yes	¼ Mile	N/A	RCRA hazardous waste generators without corrective actions assessed within ¼ mile of Build Alternatives
IC/EC	Yes	½ Mile	N/A	Sites with institutional and/or engineering controls assessed with ½ mile of Build Alternatives
ERNS	Yes	Site location only	N/A	Emergency Response Notification System sites assessed only if on Build Alternatives

Category	ASTM Required Database?	ASTM Search Distance	Other Search Distance	Notes
State Contaminated Sites Databases				
SHWS/KCS*	Yes	1 Mile	N/A	State Hazardous Waste Sites – in NJ – KCS, assessed within 1 mile of Build Alternatives
Landfills/Historic Landfills	Yes	½ Mile	HUD – 3,000 ft.	Landfills assessed within 3,000 feet of Build Alternatives, as specified in 24 CFR § 50.3(i) and 24 CFR § 58.5(i)(2) of Build Alternatives
LUSTs/ Historic LUSTs	Yes	½ Mile	N/A	Leaking Underground Storage Tank sites within ½ mile of Build Alternatives
USTs	Yes	¼ Mile	N/A	Sites with registered underground storage tanks within ¼ mile of Build Alternatives
IC/EC including CEAs	Yes	½ Mile	Within or adjacent to Build Alternative footprint(s)	CEAs that underlie Build Alternative footprints or could be affected by proximate footprints of Build Alternatives
EDR Proprietary and Local Contaminated Sites Databases				
NJ Spills, NJ Releases, Historic Gas Stations, Dry Cleaners	No	NA	Within footprint of Build Alternative and/or adjacent for impact evaluation	Sites more likely to be contaminated because of past incidents and/or land use of Build Alternatives

Appendix O: HUD Acceptable Separation Distance Technical Report

This Page has been Intentionally Left Blank

Table of Contents

1.0 Introduction O-1

2.0 Methods O-1

2.1 Desktop Study O-2
2.2 Field Investigation O-2
2.3 Evaluation of ASD O-2

3.0 Results and Discussion O-3

3.1 Results O-3
3.2 Discussion O-14
3.2.1 Alternative 1: Structural Flood Reduction Alternative O-14
3.2.2 Alternative 2: Stormwater Drainage Improvement Alternative O-14
3.2.3 Alternative 3: Hybrid Alternative O-14

4.0 Conclusions O-15

4.1 Alternative 1: Structural Flood Reduction Alternative O-15
4.2 Alternative 2: Stormwater Drainage Improvement Alternative O-15
4.3 Alternative 3: Hybrid Alternative O-15

5.0 References O-15

List of Figures

Figure O-1: ASTs within a 1-Mile Radius of the Proposed Public Features under Alternative 1 ..... O-9
Figure O-2: ASTs within a 1-Mile Radius of the Proposed Public Features under Alternative 2 ..... O-10
Figure O-3: ASTs within a 1-Mile Radius of the Proposed Public Features under Alternative 3 ..... O-11
Figure O-4: Riverwalk within ASD of AST 1 ..... O-12
Figure O-5: Caesar Place Park with ASD of AST 21 ..... O-13

List of Tables

Table O-1: ASTs within the 1-mile Radius of Proposed Public Features under the Build Alternatives O-5
Table O-2: ASTs with ASDs Intersecting Proposed Public Features under the Build Alternatives O-7
Table O-3: ASTs with Potential to Affect Proposed Build Alternatives O-14

Attachments

Attachment O-1: Photographic Log

Acronyms and Abbreviations

ASD	Acceptable Separation Distance
AST	Above-ground storage tank
CFR	Code of Federal Regulations
EIS	Environmental Impact Statement
GIS	Geographic information systems
HUD	Department of Housing and Urban Development
NJ	New Jersey
NJDCA	New Jersey Department of Community Affairs
NJDEP	New Jersey Department of Environmental Protection
RBDM	Rebuild by Design Meadowlands
US	United States

1.0 Introduction

The State of New Jersey Department of Environmental Protection (NJDEP) has prepared an Environmental Impact Statement (EIS) for the Rebuild by Design Meadowlands (RBDM) Flood Protection Project (the Proposed Project). On behalf of the State of New Jersey through its Department of Community Affairs (NJDCA), the recipient of United States (US) Department of Housing and Urban Development (HUD) grant funds, NJDEP is the "Responsible Entity," as defined by HUD regulations at 24 Code of Federal Regulations (CFR) § 58.2(a)(7)(i), for the Proposed Project.

HUD-assisted projects require an explosive and flammable operations evaluation of the area for public threat in accordance with 24 CFR Part 51C, which includes an assessment of Acceptable Separation Distances (ASDs). The ASD is the area beyond which the explosive or combustive hazard would not cause thermal radiation or blast-overpressure damage to buildings or individuals. This evaluation is needed if the components of a Proposed Project have the potential to increase the population density at a given location by creating a new place of gathering. The Proposed Project is funded by HUD and has the potential for people to congregate or engage in outdoor activities by creating recreational spaces or places of gathering (e.g., new open space, bench, walking trail, etc.). As such, an explosive and flammable operations evaluation of the area for public threat is required. This evaluation was performed in accordance with 24 CFR Part 51C and HUD's Acceptable Separation Distance Guidebook (2011).

The Project Area includes the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack. The Project Area has the following approximate boundaries: the Hackensack River to the east; Paterson Plank Road (State Route 120) and the southern boundary of Borough of Carlstadt to the south; State Route 17 to the west; and Interstate 80 and the northern boundary of the Borough of Little Ferry to the north. The northwest quadrant of the Project Area is dominated by the Teterboro Airport and some industrial areas, generally associated with airport operations; the northeast quadrant is comprised primarily of residential and commercial land use; the southeast quadrant consists of large wetland complexes; and the southwest quadrant consists mostly of industrial land use. Industrial uses in the Borough of Little Ferry are concentrated along the Hackensack River and include general equipment yards, storage facilities, metal fabricating establishments, petroleum tank farms, and other industrial uses.

2.0 Methods

The NJDEP identified three Build Alternatives for analysis within the EIS, which include numerous proposed recreational spaces and public gathering places. In accordance with 24 CFR Part 51, a desktop review was conducted to identify the facilities and properties located within a 1-mile radius of each of the proposed locations that may have above-ground storage tanks (ASTs) greater than 100 gallons in size, and containing explosive or flammable materials with the potential to harm the people associated with the Proposed Project. It should be noted that the 1-mile radius extended outside of the Project Area (described in **Section 1.0**) in some instances.

Upon completion of the desktop review, a confirmatory field survey was conducted to locate and confirm the locations of the ASTs to determine their location relative to the ASD. In accordance with the methodology in HUD's Acceptable Separation Distance Guidebook (2011), a list of commercial, industrial, and residential facilities/properties containing ASTs greater than 100 gallons within the lines of sight from the proposed open space elements was generated utilizing the information collected during the desktop survey, field reconnaissance, and supplemental information provided by NJDEP. The

following sections provide more detail on the methodology employed during desktop review, field investigation, and ASD evaluation for the Proposed Project.

2.1 Desktop Study

Commercial and industrial facilities that potentially contain ASTs and are within a 1-mile radius of the new and/or enhanced public gathering places proposed under any of the three Build Alternatives were identified using Google Earth. Aerial imagery from Google Earth and geographic information systems (GIS) was then further studied to identify any ASTs within those facilities. Tank sizes were estimated by measuring dimensions of tanks observed on aerial imagery, using GIS, and by contacting the local businesses and industries.

To identify ASTs on residential properties, each municipality was contacted to determine whether the communities are serviced by natural gas or heating oil/propane. Residential communities were grouped based on their respective service type. If serviced by natural gas, ASTs associated with residences were assumed absent. Within the Project Area, residences within each municipality are serviced by natural gas, and therefore were not investigated further for the presence of ASTs (PSE&G 2017).

2.2 Field Investigation

The presence, size, contents, and condition of the ASTs were confirmed during a site reconnaissance conducted on October 10 and 11, 2017. Additional information collected on site included whether the observed AST was under pressure, whether the tank was diked, the size of the diked area, and the volume of the tank. Due to limited site access, some tanks could only be viewed from a distance. Therefore, dimensions were approximated and capacities were converted using HUD's Acceptable Separation Distance Guidebook – Appendix C (2011). Additionally, the line-of-sight from each proposed park or public area to ASTs was evaluated. To evaluate the line-of-sight, a 360-degree visual assessment was performed from the edges of proposed recreational features for the three Build Alternatives to evaluate whether any ASTs were within clear view.

2.3 Evaluation of ASD

Since some of the facilities identified in the desktop study and field investigation contained multiple ASTs, the largest capacity AST closest to the Proposed Project and all pressurized containers at each facility were evaluated in the ASD analysis in accordance with HUD's Acceptable Separation Distance Guidebook (2011). The Proposed Project would create public open spaces (e.g., parks) where people would congregate; therefore, HUD's Thermal Radiation standard that is applicable to people (the ASD where the thermal radiation flux would not exceed 450 British thermal units per square feet-hour) was applied. The ASD for thermal radiation for people was calculated for each of the evaluated ASTs using HUD's online Acceptable Separation Distance Electronic Assessment Tool: https://www.hudexchange.info/environmental-review/asd-calculator/. The calculated ASD for thermal radiation for people was noted for each AST and plotted in GIS as a radius extending from the center of each tank. Using GIS, these ASDs were viewed relative to the locations of proposed recreational improvements for the three Build Alternatives. ASTs with ASDs that did not intersect with locations of proposed improvements were excluded from further analysis; ASDs that were found to intersect proposed build features were analyzed further for potential impacts. For these features (i.e., ASD not achieved), mitigation measures were proposed.

3.0 Results and Discussion

3.1 Results

A total of 43 potential AST facilities were identified during the desktop review, of which a total of 21 facilities with ASTs were confirmed during the site visit (see **Table O-1** and **Figure O-1** through **Figure O-3**). Field-assessed ASTs were photo-documented (see **Attachment 1**). The ASTs range in size from 275 gallons to 250,000 gallons. AST contents that are not under pressure included petroleum products (e.g., diesel, gasoline, heating oil, aviation gasoline, or waste oil), solvents (e.g., toluene, ethyl acetate, or normal butyl acetate), polyethylene resin, or chlorine. Pressurized AST contents included liquid oxygen, liquid nitrogen, or an unknown gas. The site investigation revealed that five of the facilities (i.e., AST 1, 6, 11, 14, and 15) have ASTs with secondary containment in the form of a fabricated containment wall.

Using the ASD calculator, 16 of the 21 facilities were found to be located beyond the calculated ASD from the proposed park and recreation features (see **Table O-2**). Two facilities had ASTs with ASDs intersecting proposed park features (i.e., AST 1 and 21) and were further assessed to determine whether or not mitigation would be required (see **Figure O-4** and **Figure O-5**). A visual observation was performed to determine if a clear line-of-sight was present from the proposed park/recreation features to the identified ASTs at the applicable facilities. Under the guidelines set forth by HUD, the two AST locations (ASTs 1 and 21) were identified as having potentially adverse effects due to a clear line-of-sight to proposed park/recreation features.

This Page has been Intentionally Left Blank.

Table O-1: ASTs within the 1-mile Radius of Proposed Public Features under the Build Alternatives

AST ID	Name	Address	Tax Parcel ID[1]	# of Tanks	Under Pressure (Y/N)	Dimensions (HxDia)	AST Shape / Orientation	AST Contents	Dike Area (LxW)	Line of Site (Y/N)	Volume (gal)	ASD Thermal Radiation for People (ft)	Distance from Closest Outdoor Public Feature (ft)	Nearest Public Feature	HUD ASD met (Y/N)
AST 1	Dowling Fuel Company	100 Industrial Ave, Ridgefield Park, NJ 07660	0250_151_2	9	N	250,000 gal (6), 15,000 gal (1), 2,000 gal (1), 1,000 gal (1)	cylindrical/ vertical (7), horizontal (2)	#2 Heating Oil (3/6), Empty (1), Diesel (1), Waste Oil (1)	165x110	Y	250,000***	503.13*	434	Riverwalk	N
AST 2	Crest Foam Industries Inc.	100 Carol Pl, Moonachie, NJ 07074	0237_38_5.02	2	Y	3,000 gal, 3,200 gal	cylindrical/ vertical	Liquid Oxygen (1), Liquid Nitrogen (1)	N/A	Y	3,200***	449	496	Avanti Park	Y
AST 3	Beta Plastics Corp.	120 Amor Ave, Carlstadt, NJ 07072	0205_123_24	12	N	5,700 cu ft	cylindrical/ vertical	Polyethylene Resin**	N/A	Y	42,639	NA	1,328	Caesar Place Park	Y**
AST 4	Scientific Design Co.	49 Industrial Ave, Little Ferry, NJ 07643	0230_108.03_6	2	Y	13,000 gal, 1,000 gal	cylindrical/ vertical	Liquid Nitrogen (1), Liquid Oxygen (1)	N/A	N	13,000***	805.14	907	Willow Lake Park	Y
AST 5	Ever Ready Oil Company	318 S River St, Hackensack, NJ 07601	0223_30.02_10	7	N	98,760 gal, 96,104 gal, 3,000 gal, 300 gal	cylindrical/ vertical	#2 Heating Oil (2/4), Diesel (1), Waste Oil (1)	200x100	N	98,760 ***	1,873.9	2,481	Riverwalk	Y
AST 6	AST along railroad	Industrial Ave, Ridgefield Park, NJ 07660	0250_153_2	1	N	40x15	cylindrical/ horizontal	Fuel	45x20	N	52,880	124.96*	579; 650; 976	Fluvial Park; Riverwalk/Cantilever ; K-town Park	Y
AST 7	SunGard Availability Services	777 Central Blvd, Carlstadt, NJ 07072	0205_131_9	2	N	40x10	cylindrical/ horizontal	Fuel	N/A	N	23,502	1,141	3,760	Avanti Park	Y
AST 8	Dr. Pepper Snapple Group	600 Commercial Ave, Carlstadt, NJ 07072	0205_126_61	2	Y	20x8	cylindrical/ vertical	Liquid Nitrogen	N/A	N	7,521	658	2,796	Caesar Place Park	Y
AST 9	State Container Corp.	111 W Commercial Ave, Moonachie, NJ 07074	0237_61_7	1	N	10,000 gal (1), 20x10 (1)	cylindrical/ horizontal (1), vertical (1)	Heating Oil (1), Empty (1)	N/A	N	10,000	722	1,183	Caesar Place Park	Y
AST 10	Global Plastics	80 Knickerbocker Rd, Moonachie, NJ 07074	0237_67_5	1	Y	30x10	cylindrical/ vertical	Liquid Nitrogen	N/A	N	17,627	963	1,498	Caesar Place Park	Y
AST 11	Houghton Chemical Corp.	30 Amor Ave, Carlstadt, NJ 07072	0205_123_28	14	N	12x6 (12) 8x4 (1) 10x8 (1)	cylindrical/ vertical	N/A	77.5x30	N	2,538	220.12*	1,543	Caesar Place Park	Y
AST 12	Auto Chlor	685 Gotham Pkwy, Carlstadt, NJ 07072	0205_126_70	2	N	15x6	cylindrical/ vertical	Liquid Chlorine	N/A	N	3,173	493	2,268	Caesar Place Park	Y
AST 13	Schweid and Sons	666 16th St, Carlstadt, NJ 07072	0205_84_8.02	1	Y	30x12	cylindrical/ vertical	Unknown Gas	N/A	N	25,382	1,141	3,772	Caesar Place Park	Y

AST ID	Name	Address	Tax Parcel ID[1]	# of Tanks	Under Pressure (Y/N)	Dimensions (HxDia)	AST Shape / Orientation	AST Contents	Dike Area (LxW)	Line of Site (Y/N)	Volume (gal)	ASD Thermal Radiation for People (ft)	Distance from Closest Outdoor Public Feature (ft)	Nearest Public Feature	HUD ASD met (Y/N)
AST 14	Hartin/ Cosmetic Coatings Corp.	208-216 Broad St, Carlstadt, NJ 07072	0205_114_2	2	N	20x10	cylindrical/ horizontal	Empty (1); Toluene/ Ethyl Acetate/ Normal Butyl Acetate (1)	50x30	N	11,751	183.28*	5,081	Caesar Place Park	Y
AST 15	Cosan Chemical Corp.	423 13th St, Carlstadt, NJ 07072	0205_98_1	1	N	15x12	cylindrical/ horizontal	N/A	20x15	N	12,691	93.53*	5,218	Caesar Place Park	Y
AST 16	XPO Logistics	50 Moonachie Ave, Carlstadt, NJ 07072	0205_127_18	1	N	10,000 gal	cylindrical/ horizontal	Diesel and Gasoline	N/A	N	10,000	722	1,437	Avanti Park	Y
AST 17	Bergen Recycle Center	198 E Broadway, Hackensack, NJ 07601	0223_61_1.01	1	N	25x8	cylindrical/ horizontal	Gasoline; Diesel Fuel	N/A	N	9,401	722	4656	Riverwalk	Y
AST 18	Massimo Zanetti Beverage	10 Empire Blvd, Moonachie, NJ 07074	0237_39_6.02	1	Y	20x8	cylindrical/ vertical	Unknown Gas	N/A	N	7,521	658	1,565	Avanti Park	Y
AST 19	Montena Taranto Foods Inc.	400 Victoria Terrace, Ridgefield, NJ 07657	0249_4014_1	2	Y	60x12	cylindrical/ vertical	Unknown Gas	N/A	N	50,765	1,523	4,103	DePeyster Creek Park	Y
AST 20	Signature TECHNICAir TEB - Teterboro Airport	101 Lindbergh Dr, Teterboro NJ, 07608	0237_76_1.02	2	N	18x8 (1), 20x8 (1)	cylindrical/ horizontal	Avgas	N/A	N	6,769	613.47	2,673	Caesar Place Park	Y
AST 21	Vanguard Associates – Manufactured Housing Community	113 Moonachie Ave, Moonachie, NJ 07074	0237_62_2	Multiple	N	275 gal	cylindrical/ horizontal	Heating Oil	N/A	Y	275***	161.52	136	Caesar Place Park	N

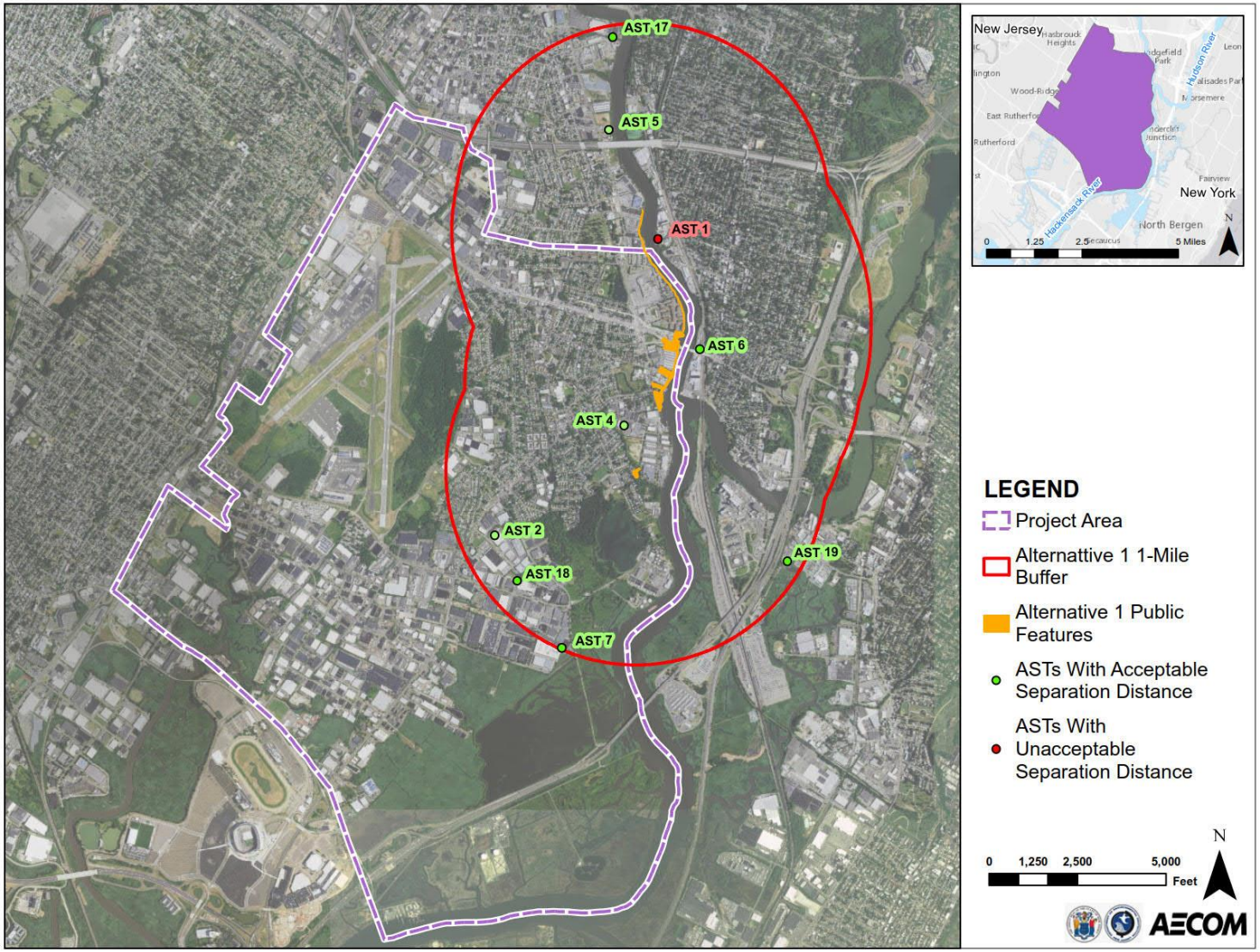
[1]Tax parcel IDs obtained from the Bergen County Parcel Viewer available at: http://bcgisweb.co.bergen.nj.us/parcelviewer/
*Calculation uses dike area.
**Contents not of a hazardous nature.
***Volume exact.

Table O-2: ASTs with ASDs Intersecting Proposed Public Features under the Build Alternatives

AST ID	Name	Address	Tax Parcel ID	# of Tanks	Under Pressure (Y/N)	Dimensions (HxDia)	AST Shape/ Orientation	AST Contents	Dike Area (LxW)	Line of Site (Y/N)	Volume (gal)	ASD for Thermal Radiation for People (ft)	Distance from Closest Outdoor Public Feature	Nearest Public Feature	HUD ASD met (Y/N)
AST 1	Dowling Fuel Company	100 Industrial Ave, Ridgefield Park, NJ 07660	0250_151_2	9	N	250,000 gal (6), 15,000 gal (1), 2,000 gal (1), 1,000 gal (1)	cylindrical/ vertical (7), horizontal (2)	#2 Heating Oil (3/6), Empty (1), Diesel (1), Waste Oil (1)	168x100	Y	250,000	503.13*	434	Riverwalk	N
AST 21	Vanguard Associates – Manufactured Housing Community	113 Moonachie Ave, Moonachie, NJ 07074	0237_62_2	Multiple	N	275 gal	cylindrical/ horizontal	Heating Oil	NA	Y	275	161.52	136	Caesar Place Park	N

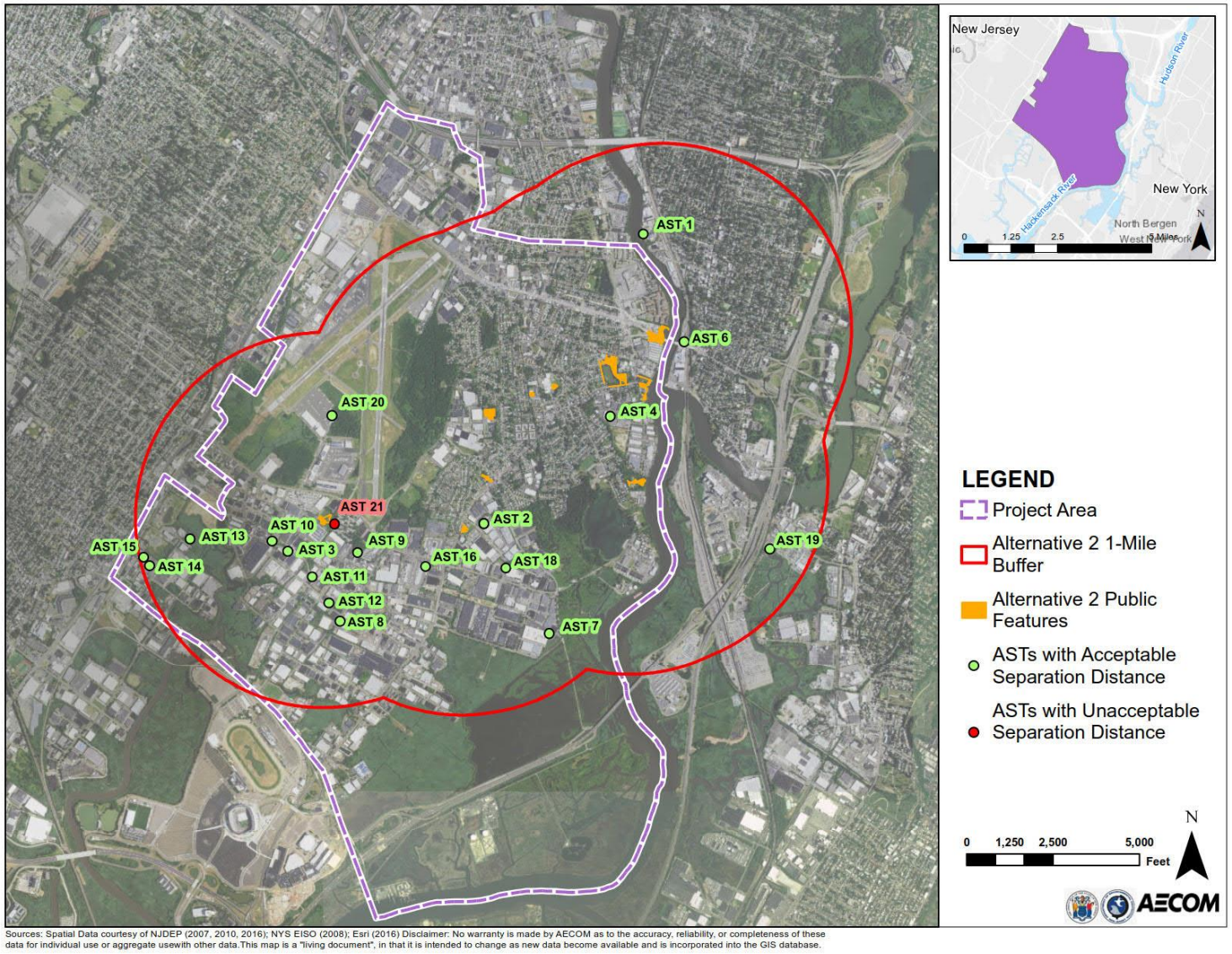
[1]Tax parcel IDs obtained from the Bergen County Parcel Viewer available at: http://bcgisweb.co.bergen.nj.us/parcelviewer/
* Calculation uses diked area

This Page has been Intentionally Left Blank.



Sources: Spatial Data courtesy of NJDEP (2007, 2010, 2016); NYS EISO (2008); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate usewith other data.This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Figure O-1: ASTs within a 1-Mile Radius of the Proposed Public Features under Alternative 1



Sources: Spatial Data courtesy of NJDEP (2007, 2010, 2016); NYS EISO (2008); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate usewith other data.This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Figure O-2: ASTs within a 1-Mile Radius of the Proposed Public Features under Alternative 2

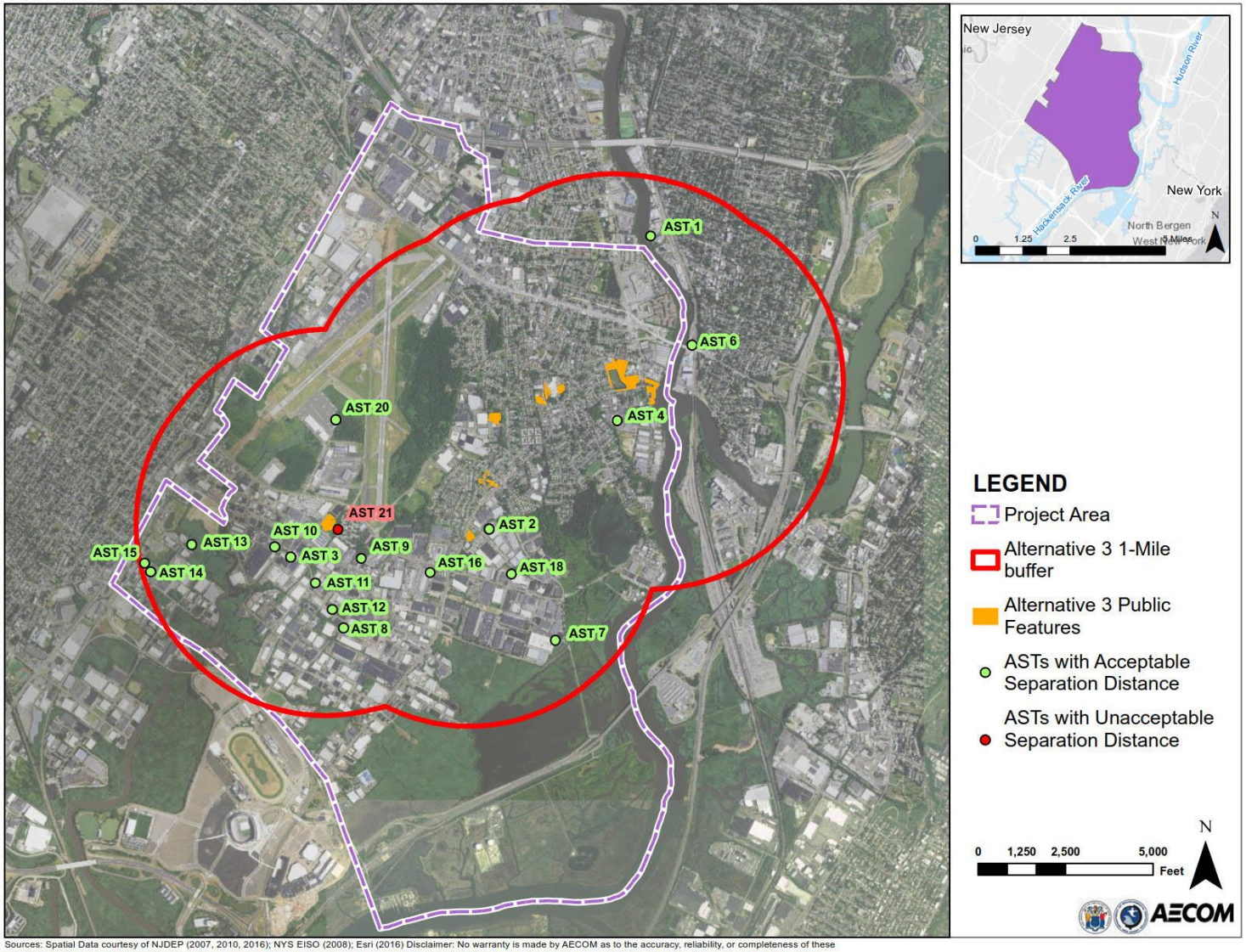
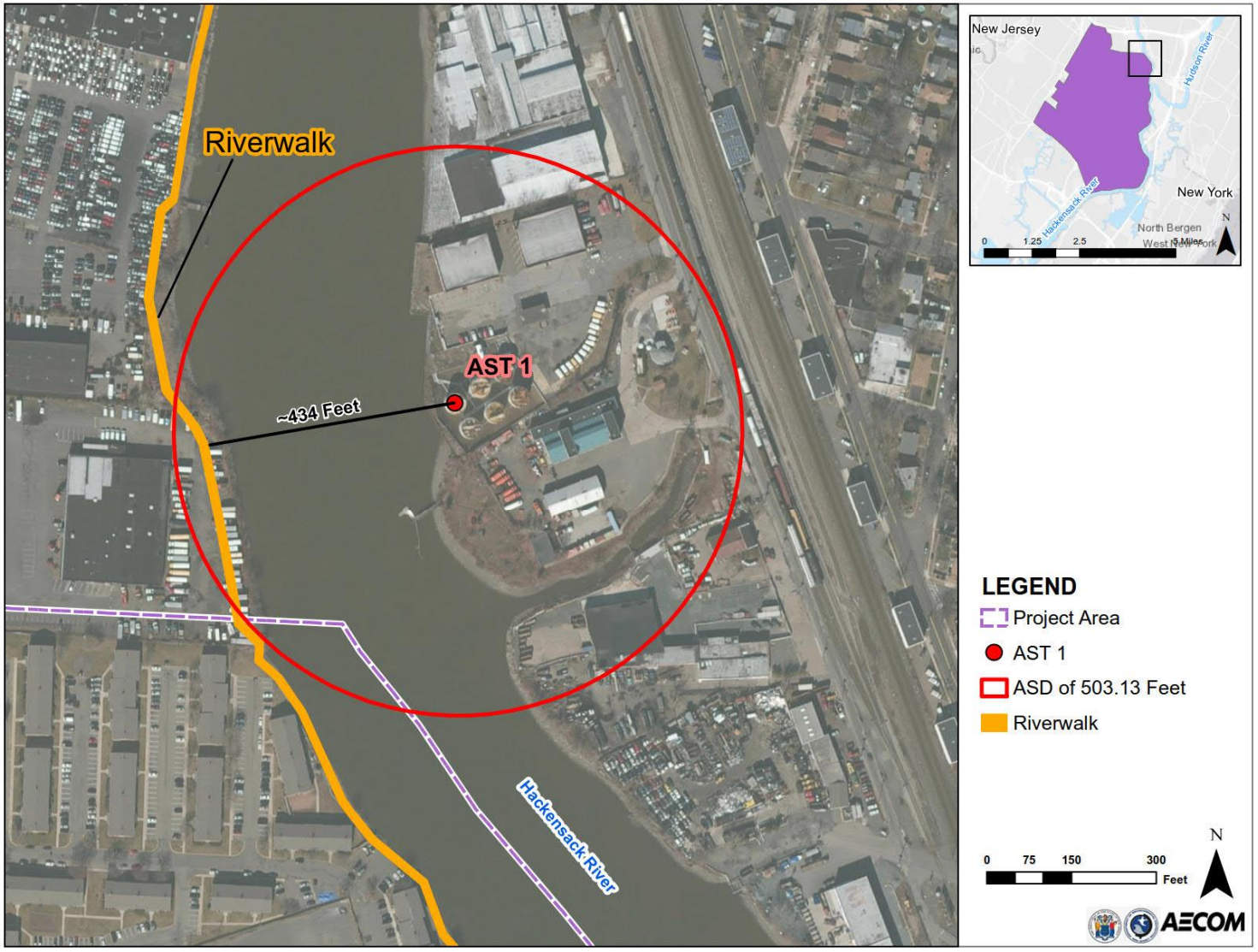
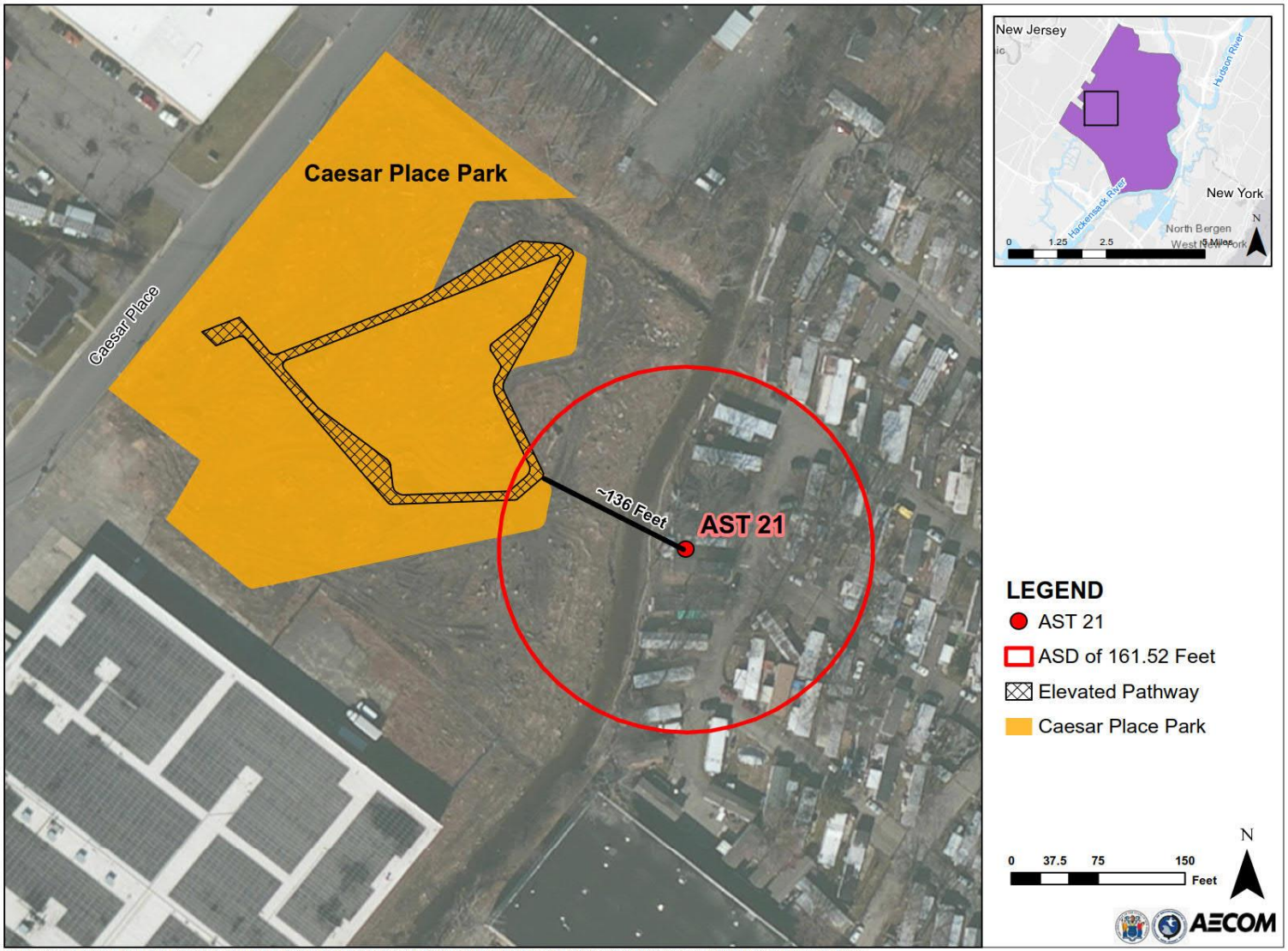


Figure O-3: ASTs within a 1-Mile Radius of the Proposed Public Features under Alternative 3



Sources: Spatial Data courtesy of NJDEP (2007, 2010, 2016); NYS EISO (2008); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate usewith other data.This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Figure O-4: Riverwalk within ASD of AST 1



Sources: Spatial Data courtesy of NJDEP (2007, 2010, 2016); NYS EISO (2008); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate usewith other data.This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Figure O-5: Caesar Place Park with ASD of AST 21

3.2 Discussion

As discussed in **Section 2.3**, the largest AST closest to the Proposed Project at each applicable facility was evaluated in the ASD analysis. Two ASTs were calculated as having ASDs intersecting proposed park features associated with the three Build Alternatives (**Table O-3**). These ASTS are discussed in greater detail below.

Table O-3: ASTs with Potential to Affect Proposed Build Alternatives

AST ID	Alternative 1	Alternative 2	Alternative 3
AST 1	Yes	No	No
AST 21	No	Yes	Yes

3.2.1 Alternative 1: Structural Flood Reduction Alternative

AST 1 is a 250,000-gallon tank of heating oil located on the south side of the Dowling Fuel Co. building at 100 Industrial Avenue, Ridgefield Park, NJ 07660. There are 9 ASTs present at this location, none of which are under pressure. These ASTs are diked (i.e., located within secondary containment), which was considered in the calculation of the ASD. According to HUD's Acceptable Separation Distance Guidebook (2011), ASDs for diked containers will be of a smaller numerical value due to the fact that the diked area defines the fire width, limiting the flames and heat dispersion and extension. The ASD for AST 1 was calculated to be 503 feet, which intersects the proposed location of the cantilever riverwalk structure under Alternative 1. AST 1 is 434 feet northeast of the proposed cantilever Riverwalk; it is located within clear line-of-sight across the Hackensack River. Therefore, Alternative 1 would require additional mitigation in order to achieve compliance with HUD's ASD requirements.

3.2.2 Alternative 2: Stormwater Drainage Improvement Alternative

AST 21 is a 275-gallon tank of heating oil located on the west side of the Vanguard Associates Manufactured Housing Community at 113 Moonachie Avenue, Moonachie, NJ 07074. There are multiple ASTs, of similar volume and content, present at this location to service the respective housing units. Communication with onsite staff confirmed there are currently no plans to convert the Vanguard Associates Manufactured Housing Community to natural gas in the immediate future (i.e., no plans to take ASTs out of service). The ASD for AST 21 was calculated to be 162 feet, which intersects the proposed location of Caesar Place Park under Alternative 2. AST 21 is located within 136 feet east and within clear line-of-sight of the proposed Caesar Place Park. Therefore, Alternative 2 would require additional mitigation in order to achieve compliance with HUD's ASD requirements.

3.2.3 Alternative 3: Hybrid Alternative

Alternative 3 is generally the same as Alternative 2, but includes a smaller footprint due to the exclusion of Fluvial Park, DePeyster Creek Park, and Losen Slote C pump station and force main. Alternative 3 would include the proposed Caesar Place Park. Alternative 3 does not propose any new features beyond those previously analyzed for Alternative 2. Therefore, the ASD evaluation for Alternative 3 is the same as Alternative 2.

4.0 Conclusions

4.1 Alternative 1: Structural Flood Reduction Alternative

The ASD of AST 1 was identified as intersecting with proposed park/recreation features associated with Alternative 1 (i.e., the cantilever riverwalk). A clear line-of-sight was observed between AST 1 and the proposed feature. Mitigation would be required to protect people where the ASD cannot be met between the specific stationary hazardous operation (i.e., AST) and the Proposed Project. Therefore, mitigation would be required in order to comply with HUD's ASD guidance. Potential mitigation measures include incorporating natural barriers (e.g., constructed hills, earthen elevations, etc.) into site design, constructing a barrier for thermal radiation, reconfiguring the site plan in order to increase the distance between the hazard and the project features, burying the existing ASTs, or diking the existing ASTs (if liquid contents).

4.2 Alternative 2: Stormwater Drainage Improvement Alternative

The ASD of AST 21 was identified as intersecting with proposed park/recreation features (i.e., Caesar Place Park). A clear line-of-sight was observed for AST 21.Since there is not a natural or man-made abatement between the proposed location of Caesar Place Park and AST 21, other mitigation would be required in order to comply with HUD's ASD guidance. Potential mitigation measures include incorporating natural barriers (e.g., constructed hills, earthen elevations, etc.) into site design, constructing a barrier for thermal radiation, reconfiguring the site plan in order to increase the distance between the hazard and the project features, burying the existing ASTs, or diking the existing ASTs (if liquid contents).

4.3 Alternative 3: Hybrid Alternative

Conclusions regarding Alternative 3 would be the same as those for Alternative 2.

5.0 References

Department of Housing and Urban Development. 2011. Acceptable Separation Distance Guidebook. Office of Community Planning and Development, Environmental Planning Division. October. https://www.hudexchange.info/resource/2762/acceptable-separation-distance-guidebook/

Public Service Electric & Gas. 2017. Gas Service Area. Public Service Enterprise Group, Public Service Electric & Gas Company. https://www.pseg.com/home/customer_service/gasservice_area.jsp (Accessed October 20, 2017).

This Page has been Intentionally Left Blank.

Attachment O-1: Photographic Log

This Page has been Intentionally Left Blank.

AST 1: Dowling Fuel Co. View of 250,000 gallon ASTs (6) within secondary containment containing heating oil.

AST 1: Dowling Fuel Co. View of 2,000 gallon AST (1) within secondary containment containing diesel; AST (1) with empty contents in background.

AST 1: Dowling Fuel Co. View of 1,000 gallon AST (1) within secondary containment containing waste oil.

AST 2: Crest Foam Industries. View of ASTs (2) containing liquid oxygen.

AST 3: Beta Plastics Corp. View of ASTs (12) containing polyethylene resin.

AST 4: Scientific Design Co. View of ASTs (2) containing liquid nitrogen.

AST 5: Ever Ready Oil Co. View of ASTs (7) containing heating oil.

AST 6: Railyard along Industrial Avenue. View of AST (1) containing fuel.

AST 7: SunGard Availability Services. View of double wall fireguard ASTs (2) containing fuel.

AST 8: Dr. Pepper Snapple Group. View of ASTs (2) containing liquid nitrogen.

AST 9: State Container Corp. View of 10,000 gallon AST (1) containing heating oil; AST with empty contents in foreground.

AST 10: Global Plastics. View of AST (1) containing liquid nitrogen.

AST 11: Houghton Chemical Corp. View of ASTs (14) within secondary containment with unknown contents.

AST 12: AutoChlor. View of ASTs (2) containing liquid chlorine.

AST 13: Schweid and Sons. View of AST (1) containing an unknown gas.

AST 14: Hartin/Cosmetic Coatings Corp. View of ASTs (2) within secondary containment – one containing toluene, ethyl acetate, and normal butyl acetate; and one contents empty.

AST 15: Cosan Chemical Co. View of AST (1) at abandoned site with unknown contents.

AST 17: Bergen County Recycle Center. View of AST (1) containing diesel and gasoline.

AST 18: Massimo Zanetti Beverage. View of AST (1) containing an unknown gas.

AST 19: Montena Taranto Foods Inc. View of ASTs (2) containing an unknown gas.

AST 21: Vanguard Associates Manufactured Housing Community. View of ASTs (2) containing heating oil.

This Page has been Intentionally Left Blank.

Appendix P: Public Comment Summary Report

This Page has been Intentionally Left Blank.

Public Comment Summary Report

For the Rebuild by Design Meadowlands Flood Protection Project

August 2018

Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro and the Township of South Hackensack, Bergen County, New Jersey

REBUILD BY DESIGN
MEADOWLANDS

Prepared by AECOM for the State of New Jersey Department of Environmental Protection

Español 中文:繁體版 Việt-ngữ 한국어 Tagalog
Português العربية Kreyòl ગુજરાતી Italiano Polski
www.renewjerseystronger.org

Table of Contents

1.0 Introduction 1

2.0 Public Comment Process 2

2.1 Comment Period 2

2.2 Public Comment Period Activities 2

2.2.1 DEIS Distribution and Availability 2

2.2.2 DEIS Notification Methods 3

2.2.3 DEIS Public Hearing 5

3.0 Comments Received 7

4.0 Next Steps 9

List of Appendices

Appendix A: Federal Register Notice of Availabilty

Appendix B: Newspaper Affidavits of Publication

Appendix C: Agency and Other Stakeholders DEIS Distribution List

Appendix D: Public Hearing Materials

Appendix E: Court Stenographer Transcript

Appendix F: DEIS Public Comment Matrix

List of Figures

Figure 1-1: Overview of the Environmental Impact Statement Process 1

List of Tables

Table 3-1: Summary of Comments Received by Main Topic of Concern 8

Acronyms and Abbreviations

CAG	Citizen Advisory Group
CDBG-DR	Community Development Block Grant – Disaster Recovery
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COP	Citizen Outreach Plan
DEIS	Draft Environmental Impact Statement
EO	Executive Order
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FTA	Federal Transit Administration
GPI	Guidance for Public Involvement
HUD	US Department of Housing and Urban Development
NEPA	National Environmental Policy Act
NJDCA	New Jersey Department of Community Affairs
NJDEP	New Jersey Department of Environmental Protection
NOA	Notice of Availability
NOI	Notice of Intent
PANYNJ	Port Authority of New York and New Jersey
RBD	Rebuild by Design
ROD	Record of Decision
US	United States
USACE	US Army Corps of Engineers
USC	US Code
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service

1.0 Introduction

This Public Comment Summary Report has been prepared to document the public comment process that was conducted by the New Jersey Department of Environmental Protection (NJDEP) for the Draft Environmental Impact Statement (DEIS) for the Rebuild by Design (RBD) Meadowlands Flood Protection Project (the Proposed Project). The DEIS was prepared in accordance with the National Environmental Policy Act (NEPA; 42 US Code [USC] §§ 4321 et seq.), Council on Environmental Quality (CEQ) Regulations Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508), and United States (US) Department of Housing and Urban Development (HUD) regulations (24 CFR Parts 51, 55, and 58).

The public comment period for this DEIS was formally initiated with publication of the Notice of Availability (NOA) for the DEIS in the *Federal Register* on June 1, 2018 in accordance with HUD and CEQ regulations. Following the publication of the NOA, there was a 45-day public review and comment period, during which the DEIS was made available to the general public for comment (including at a formal public hearing), and circulated to stakeholders, other relevant groups, and government agencies that have been identified as having particular interest in, or jurisdiction over, the Proposed Project. At the conclusion of the 45-day comment period for the DEIS, NJDEP incorporated substantive public comments into the document and compiled the Final EIS (FEIS). **Figure 1-1** provides an overview of the full EIS process; this Public Comment Summary Report represents the culmination of the Public Comment Review and Synthesis step.

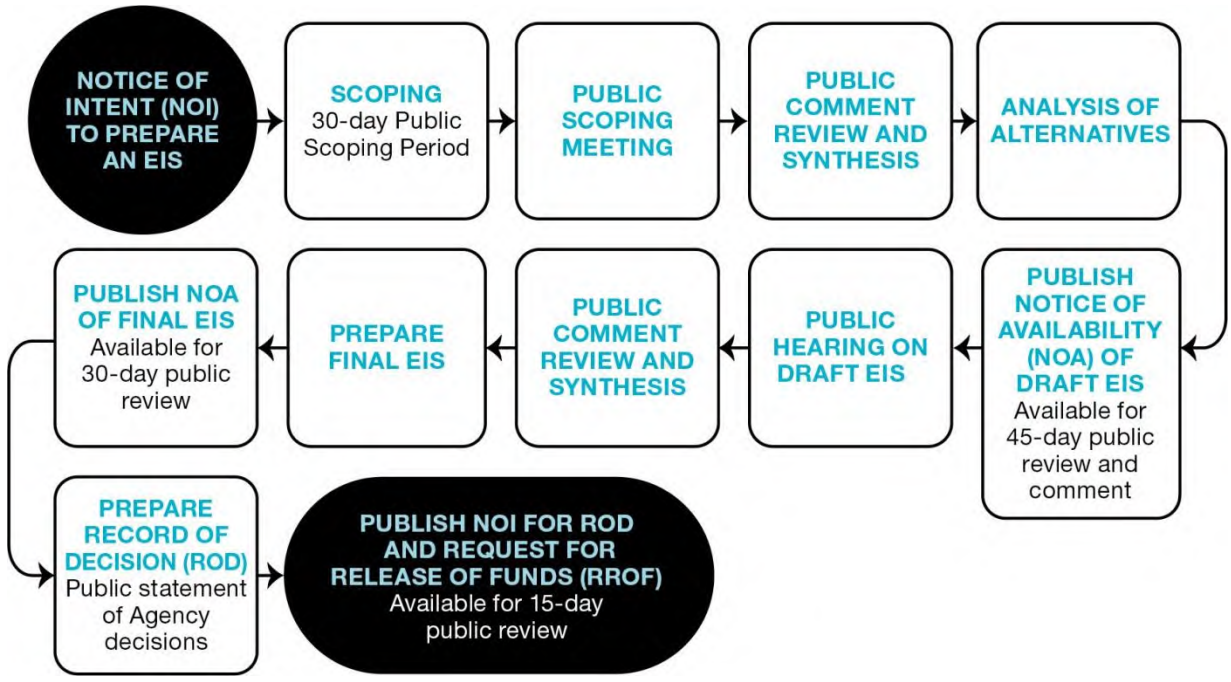


Figure 1-1: Overview of the Environmental Impact Statement Process

2.0 Public Comment Process

2.1 Comment Period

The public comment period for this DEIS, as required by the NEPA and outlined in 40 CFR § 1506.10, formally began with United States Environmental Protection Agency's (USEPA) publication of a NOA for the DEIS in the *Federal Register* on June 1, 2018. A copy of the *Federal Register* publication is available in **Appendix A**. A copy of the NOA published by local newspaper outlets is included in this document in **Appendix B**. The public comment period concluded after 45 days on July 15, 2018.

The NOA informed the public about the Proposed Project; announced the availability of the DEIS for public review; identified the available options and/or locations for DEIS review; invited the public to attend a Public Hearing on June 26, 2018; and solicited public comments for consideration, including identification of how public comments can be submitted to NJDEP. During the public comment period, NJDEP received comments via mail, email, and either orally or on a comment card at the public hearing.

2.2 Public Comment Period Activities

The following subsections provide an overview of the methods used by NJDEP to solicit public comments between June 1 and July 15, 2018. These efforts included the distribution of both paper and electronic copies of the DEIS to agencies and other stakeholders as well as to publicly accessible locations, public notification of availability of the DEIS through various forms of media, and a Public Hearing.

2.2.1 DEIS Distribution and Availability

Agencies and Other Stakeholders

During the Public Scoping Period, NJDEP invited several Federal and State agencies with jurisdiction by law or special expertise (42 USC §§ 4331(a) and 4332(2)) to participate in the NEPA process as Cooperating Agencies. The following agencies responded to NJDEP that they would participate in the NEPA process as Cooperating Agencies:

- Federal Emergency Management Agency (FEMA)
- Federal Aviation Administration (FAA)
- Federal Transit Administration, Region 2 (FTA)
- National Railroad Passenger Corporation (Amtrak)
- Port Authority of New York and New Jersey (PANYNJ)
- US Army Corps of Engineers (USACE), New York District
- USEPA, Region 2

The DEIS was distributed in both paper copy and electronic copy formats to these Cooperating Agencies, as well as a number of other agencies and special interest groups, for their review and comment prior to and during the 45-day public review period. A copy of the agency and other stakeholder distribution list for the DEIS is included in **Appendix C**.

General Public

Electronic copies of the DEIS were available for public review on the following websites: http://www.rbd-meadowlands.nj.gov and www.nj.gov/dca/divisions/sandyrecovery/review. A copy of the DEIS was also available for review at each of the locations below during regular business hours. Each of these locations maintained two electronic copies (i.e., CDs) and one paper copy of the DEIS during the public comment period.

- Little Ferry Free Public Library, 239 Liberty Street, Little Ferry, NJ 07643
- Moonachie Municipal Office at Port Authority, 90 Moonachie Avenue, Teterboro, NJ 07608
- Carlstadt Public Library, 420 Hackensack Street, Carlstadt, NJ 07072
- Teterboro Municipal Building, 510 US Route 46, Teterboro, NJ 07608
- South Hackensack Municipal Clerk, 227 Phillips Avenue, South Hackensack, NJ 07606

Additionally, the NJDEP Bureau of Flood Resilience maintained a paper copy of the DEIS for public review at 501 East State Street, Trenton, NJ 08625-0420. The document was available for inspection or copying at this location during regular business hours.

2.2.2 DEIS Notification Methods

Notification methods set forth in the Proposed Project's Citizen Outreach Plan (COP) and Guidance for Public Involvement (GPI) were used to solicit comments on the DEIS from Federal, State, and local stakeholders and private citizens, and to notify them of the Public Hearing held on June 26, 2018. NJDEP employed the following notification methods prior to and during the 45-day public comment period:

- **Federal Register**: The USEPA published a NOA of the DEIS in the *Federal Register* on June 1, 2018 (Volume 83, Number 106, pages 25451-25452). The NOA announced the availability of the DEIS for review and comment, and the time and location of the Public Hearing. A copy of the *Federal Register* publication is available in **Appendix A**.
- **Newspaper Publications:** The NOA was published in English, Spanish, and Korean in its entirety in three local newspapers: *The Record, El Diario,* and *Korea Central Daily News*. Affidavits of Publication from these newspapers are included in **Appendix B**.
- **Project Website:** The NJDEP has established a website for the Proposed Project at http://www.rbd-meadowlands.nj.gov. The DEIS was made available for download at this website and public comments on the DEIS could be submitted through the website. The Proposed Project website contains all informational and outreach materials (including Spanish and Korean translations), as well as notifications regarding Citizen Advisory Group (CAG) meetings and public meetings/hearings.
- **USEPA Website:** The USEPA maintains a database with the information and public review files for EISs prepared by federal agencies at https://cdxnodengn.epa.gov/cdx-enepa-public/action/eis/search.
- **NJDCA Website:** The NOA (including Spanish and Korean translations) and DEIS were made available for download on the New Jersey Department of Community Affairs (NJDCA) website at

http://www.nj.gov/dca/divisions/sandyrecovery/review/. Public comments could also be submitted though this website.

- **NJDEP Project Listserv:** NJDEP used the Listserv to notify area residents, businesses, civic associations, community groups, schools, health care facilities, and similar entities of the release of the NOA, initiation of the public comment period, availability of the DEIS for review and comment, and time/location of the Public Hearing.
- **Citizen Advisory Group:** The CAG, which consists of local residents and others familiar with the Project Area, was recruited to assist with publicizing the Public Hearing and encouraging public participation in the public comment process. Among other tasks, CAG members assisted with flyer distribution and word-of-mouth communications.
- **Public Hearing Flyers:** NJDEP used meeting flyers (see **Appendix D**) to publicize the Public Hearing. These flyers were emailed to the Listserv mailing list, distributed in bulk to a variety of public locations (e.g., libraries and community centers), and posted on the Proposed Project website. NJDEP made meeting flyers available in English, Spanish, and Korean. On June 22, 2018, a total of 98 flyers were distributed at the following locations:

  Borough of Little Ferry

  - Dunkin' Donuts, Bergen Turnpike – 2 flyers posted on entrance door
  - Early Bird Laundromat – 2 flyers posted on bulletin board
  - Family Success Center – 10 flyers left with staff
  - H-Mart – 2 flyers posted on entrance door
  - North Village Apartments – 5 flyers left in the Rental Office
  - Little Ferry Public Library – 10 flyers left with the Librarian
  - Little Ferry Town Hall – 15 flyers left with the Town Clerk

  Borough of Moonachie

  - Dunkin' Donuts, Washington Avenue – 2 flyers posted on the wall by the entrance/exit door
  - Metropolitan Mobile Home Park – 2 flyers distributed; one was left with the office receptionist and one was posted in the laundry room
  - Moonachie Town Hall – 6 flyers left with the Municipal Clerk
  - Vanguard Mobile Home Park – 2 flyers left with the office receptionist
  - Quick Check, Washington Avenue – 2 flyers posted on the wall next to the bulletin board

  Borough of Carlstadt

  - Carlstadt Library – 10 flyers left with the Librarian
  - Carlstadt Town Hall – 10 flyers left with the Municipal Clerk
  - Shop Rite of Hackensack – 2 flyers posted on bulletin board

Borough of Teterboro

- Teterboro Town Hall – 10 flyers left with the Municipal Clerk

Township of South Hackensack

- South Hackensack Borough Hall – 10 flyers left with the Municipal Clerk (a flyer was also already taped to the entrance door)

2.2.3 DEIS Public Hearing

The DEIS Public Hearing for the Proposed Project was held between 6:00 and 8:00 PM EDT on June 26, 2018 at the Robert L. Craig School in Moonachie, New Jersey. The purpose of the public hearing was for NJDEP to receive comments on the information provided in the DEIS. NJDEP did not respond to any of the comments or take action on the Proposed Project at the hearing. Comments and/or statements at the public hearing became part of the public record during the comment period and were subsequently considered during the preparation of the FEIS.

The meeting was attended by more than 40 people, including mayors and other government officials from the affected municipalities, NJDEP representatives, special interest groups, and residents of the Project Area. NJDEP provided each meeting participant with a meeting handout and a comment card. Meeting materials were made available in English, Spanish, and Korean at the Public Hearing. In addition, NJDEP provided translation and interpreter services at the Public Hearing, including Spanish, Korean, and American Sign Language.

The Public Hearing agenda included a formal slide presentation from 6:00 to 7:00 PM and an open comment period from 7:00 to 8:00 PM where attendees were encouraged to orally provide comments at a microphone, or provide a written comment via the provided comment card.

The Public Hearing began with an introduction of the NJDEP Team and a slide presentation providing an overview of the Proposed Project, its Purpose and Need, a discussion of the NEPA process, a list of key public involvement milestones, and an overview of the alternatives and environmental impacts identified in the DEIS.

At the conclusion of the presentation, NJDEP opened the floor to the public. The public was given an opportunity to provide oral comments on the DEIS. Oral comments from this 60-minute session were documented by the court stenographer and videographer in attendance at the meeting. Written comments were also able to be submitted at this hearing via a comment card.

The court stenographer was in attendance for the full 2-hour meeting. The stenographer documented the formal slide presentation and oral comment period. A copy of the complete court stenographer transcript is included in **Appendix E**. Additionally, for those who were unable to attend the meeting in person, a full video recording of the formal slide presentation and oral comment period was posted on the Proposed Project website at www.rbd-meadowlands.nj.gov.

A copy of the meeting handout and presentation slides is included in **Appendix D**. Copies of the Spanish and Korean versions are available on the Proposed Project website at www.rbd-meadowlands.nj.gov.

Key objectives accomplished at the Public Hearing are listed below:

- Refreshed the public on NEPA and the current NEPA process
- Reviewed key public involvement milestones in the NEPA process
- Provided the public with current Proposed Project information, including an explanation of each considered alternative in the DEIS
- Provided a summary of the environmental impacts identified in the DEIS, including an explanation of the cumulative impact analysis
- Fostered and stimulated meaningful public involvement
- Identified comment methods available and timelines
- Provided the public with an opportunity to submit oral or written comments on the DEIS

3.0 Comments Received

During the 45-day Public Comment Period, NJDEP sought and received comments on the DEIS from the public and relevant agencies both at the Public Hearing and via written submittals. NJDEP incorporated substantive comments received through this process into the FEIS document.

Comments received were organized by an alpha-numeric code based on the agency or stakeholder providing the comment, and the order in which the comments were received. Alpha-numeric codes were defined as follows: Public Hearing: PH-000, Federal Agency: FA-000, State Agency: SA-000, Private/Public Entity: PE-000 (includes organizations, groups, and/or businesses), and Private Citizen: PC-000.

NJDEP received a total of 88 comments from 27 commenters. Sources of comments included the Public Hearing (PH-000), as well as written comment letters and comment cards from Federal agencies (FA-000), private/public entities (PE-000), and private citizens (PC-000). Comments received during the Public Hearing were provided orally (and documented in the court stenographer transcript; see **Appendix E**) or in the Comment Box. These comments were given an alphanumeric code of PH-000, and were not differentiated by stakeholder type. A total of 6 comments from 6 commenters were received at the Public Hearing. The remaining 82 comments were from 21 commenters, which included 5 Federal agencies (USEPA, Federal Transit Administration, Federal Aviation Administration, US Department of the Interior, and National Oceanic and Atmospheric Administration), 5 private/public entities, and 11 private citizens. A copy of the Federal agency comment letters is included in **Appendix F**.

A complete summary of the 88 comments received and responses to substantive comments are compiled in the DEIS Public Comment Matrix, which is included in **Appendix F**. The Comment Matrix is organized by commenter and main topic, and includes each comment along with a response to substantive comments. Responses to comments are further organized and denoted in the matrix as follows.

- Green Cells – The comment was incorporated in the FEIS as suggested by the commenter.
- Blue Cells – No change was made in the FEIS in response to the comment.
- Purple Cells – The comment was incorporated in the FEIS in a different manner from that suggested by the commenter.

Of the 88 comments received on the DEIS, 26 comments were related to a specific technical resource area. Technical resource areas with the greatest number of comments received, in descending order, are as follows: Biological Resources (23); Hydrology and Flooding (1); Land Use and Land Use Planning (1); and Air Quality (1). The remaining comments included 13 comments on the Proposed Action, 12 comments on the Feasibility Study Report[1], 8 comments on Alternative 3 (the Preferred Alternative), 7 comments on Cumulative Effects, 4 comments on Alternative 1, 4 comments on the Public Input / Outreach Process, 4 comments on Agency Involvement / Coordination, 3 comments on

[1] Although the Feasibility Study Report was released for public review concurrently with the DEIS, it is not subject to a public comment period. Limited responses are provided for these comments (see **Appendix F**).

Permitting and Compliance, 2 comments on Funding, and 1 comment on Mitigation Measures and BMPs. Additionally, there were 4 comments that were editorial (i.e., involving clerical updates to the EIS text, such as the capitalization of a word, etc.). **Table 3-1** provides a summary of these comments by main topic of concern.

Table 3-1: Summary of Comments Received by Main Topic of Concern

Main Topic of Concern	Total Number of Comments Received	Public Hearing Comments	Federal Agency Comments	Private Citizen Comments	Private/Public Entity Comments
Biological Resources	23			1	22
Proposed Action	13	1	2	7	3
Feasibility Study Report	12			12	
Alternative 3 (Preferred Alternative)	8			8	
Cumulative Effects	7	2	1		4
Alternative 1	4	1		3	
Public Input / Outreach	4	1		3	
Agency Involvement / Coordination	4		3	1	
Editorial	4		2		2
Permitting and Compliance	3		1	2	
Funding	2			1	1
Mitigation Measures and BMPs	1		1		
Hydrology and Flooding	1	1			
Land Use and Land Use Planning	1			1	
Air Quality	1		1		
TOTALS	**88**	**6**	**11**	**39**	**32**

4.0 Next Steps

Substantive comments received during the 45-day public comment period were used to prepare the FEIS. The completed FEIS will be circulated in the same manner as the DEIS (including the publication of a NOA in the *Federal Register* and local media outlets) and has a review and comment period of 30 days.

Following completion of the FEIS comment period, NJDEP will prepare a Record of Decision (ROD) and Statement of Findings. If additional substantive comments are received during the FEIS comment period, NJDEP will address those comments in the ROD. The ROD will be available for a 15-day public review period following its publication.

This Page has been Intentionally Left Blank.

Appendix A: Federal Register Notice of Availability

This Page has been Intentionally Left Blank.

Issued in Washington, DC, on May 25, 2018.

Sean Oehlbert,

Acting Policy Director, Office of Nonproliferation and Arms Control, Department of Energy's National Nuclear Security Administration.

[FR Doc. 2018–11787 Filed 5–31–18; 8:45 am]

BILLING CODE 6450–01–P

ENVIRONMENTAL PROTECTION AGENCY

[FRL–9978–77–ORD]

Ambient Air Monitoring Reference and Equivalent Methods; Designation of One New Reference Method

AGENCY: Office of Research and Development; Environmental Protection Agency.

ACTION: Notice of the designation of a new reference method for monitoring ambient air quality.

SUMMARY: Notice is hereby given that the Environmental Protection Agency (EPA) has designated one new reference method for measuring concentrations of nitrogen dioxide (NO_2) in ambient air.

FOR FURTHER INFORMATION CONTACT: Robert Vanderpool, Exposure Methods and Measurement Division (MD–D205–03), National Exposure Research Laboratory, U.S. EPA, Research Triangle Park, North Carolina 27711. Phone: 919–541–7877. Email: *Vanderpool.Robert@epa.gov.*

SUPPLEMENTARY INFORMATION: In accordance with regulations at 40 CFR part 53, the EPA evaluates various methods for monitoring the concentrations of those ambient air pollutants for which EPA has established National Ambient Air Quality Standards (NAAQS) as set forth in 40 CFR part 50. Monitoring methods that are determined to meet specific requirements for adequacy are designated by the EPA as either reference or equivalent methods (as applicable), thereby permitting their use under 40 CFR part 58 by States and other agencies for determining compliance with the NAAQS. A list of all reference or equivalent methods that have been previously designated by EPA may be found at *http://www.epa.gov/ttn/amtic/criteria.html.*

The EPA hereby announces the designation of one new reference method for measuring concentrations of NO_2 in ambient air. This designation is made under the provisions of 40 CFR part 53, as amended on October 26, 2015(80 FR 65291–65468).

The new reference method for NO_2 is an automated method (analyzer) utilizing the measurement principle based on gas phase chemiluminescence. This newly designated reference method is identified as follows:

RFNA–0418–250, ''Sabio Model 6040 Ambient $NO/NO_2/NO_X$ Analyzer'', operated in the measurement range of 0–0.5 PPM, an any ambient temperature in the range of 5–40 °C, within a line voltage range determined by the selected optional pump [115 VAC external pump: 105–125 VAC (60 Hz); 230 VAC external pump: 210–250 VAC (50–60 Hz); 24 VDC internal pump: 90–260 VAC (50–60 Hz)], at any sample flow rate in the range of 0.50–0.75 L/min, in accordance with the ''Sabio Model 6040 Ambient $NO/NO_2/NO_X$ Analyzer Instruction Manual'', with or without optional zero/span ports for external calibration, and with or without an optional inlet filter.

This application for a reference method determination for this NO_2 method was received by the Office of Research and Development on March 28, 2018. This analyzer is commercially available from the applicant, Sutron Corporation, 21 Cypress Blvd., Suite 1130, Round Rock, TX 78665.

A representative test analyzer was tested in accordance with the applicable test procedures specified in 40 CFR part 53, as amended on October 26, 2015. After reviewing the results of those tests and other information submitted by the applicant, EPA has determined, in accordance with part 53, that this method should be designated as a reference method.

As a designated reference method, this method is acceptable for use by states and other air monitoring agencies under the requirements of 40 CFR part 58, Ambient Air Quality Surveillance. For such purposes, this method must be used in strict accordance with the operation or instruction manual associated with the method and subject to any specifications and limitations (*e.g.,* configuration or operational settings) specified in the designated method description (see the identification of the method above).

Use of the method also should be in general accordance with the guidance and recommendations of applicable sections of the ''Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I,'' EPA/600/R–94/038a and ''Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Quality Monitoring Program,'' EPA–454/B–13–003, (both available at *http://www.epa.gov/ttn/amtic/qalist.html*). Provisions concerning modification of such methods by users are specified under Section 2.8 (Modifications of Methods by Users) of Appendix C to 40 CFR part 58.

Consistent or repeated noncompliance with any of these conditions should be reported to: Director, Exposure Methods and Measurement Division (MD–E205–01), National Exposure Research Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

Designation of this reference method is intended to assist the States in establishing and operating their air quality surveillance systems under 40 CFR part 58. Questions concerning the commercial availability or technical aspects of the method should be directed to the applicant.

Dated: May 21, 2018.

Timothy Watkins,

Director, National Exposure Research Laboratory.

[FR Doc. 2018–11832 Filed 5–31–18; 8:45 am]

BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

[ER–FRL–9039–6]

Environmental Impact Statements; Notice of Availability

Responsible Agency: Office of Federal Activities, General Information (202) 564–7156 or *https://www2.epa.gov/nepa/.*

Weekly receipt of Environmental Impact Statements
Filed 05/21/2018 Through 05/25/2018
Pursuant to 40 CFR 1506.9.

Notice

Section 309(a) of the Clean Air Act requires that EPA make public its comments on EISs issued by other Federal agencies. EPA's comment letters on EISs are available at: *https://cdxnodengn.epa.gov/cdx-enepa-public/action/eis/search.*

EIS No. 20180111, Draft, NMFS, NAT, Draft Environmental Impact Statement for Issuing Annual Catch Limits to the Alaska Eskimo Whaling Commission for a Subsistence Hunt on Bowhead Whales for the Years 2019 and Beyond, Comment Period Ends: 07/24/2018, Contact: John Henderschedt, 301–427–8385.

EIS No. 20180112, Draft, FHWA, NY, Hunts Point Interstate Access Improvement Project, Comment Period Ends: 07/16/2018, Contact: Erik Koester, 718–482–4683.

EIS No. 20180113, Draft, CBP, ID, Bog Creek Road Project, Comment Period

Ends: 07/16/2018, Contact: Paul Enriquez 949–643–6365.
EIS No. 20180114, Final Supplement, USACE, LA, Integrated General Reevaluation Report & Supplement III to the Final Environmental Impact Statement, Mississippi River Ship Channel, Baton Rouge to the Gulf, Louisiana Project, Review Period Ends: 07/02/2018, Contact: Steve Roberts 504–862–2517.
EIS No. 20180115, Draft, USFS, WA, Sunrise Vegetation and Fuels Management, Comment Period Ends: 07/16/2018, Contact: Johnny Collin 509–843–4643.
EIS No. 20180116, Draft Supplement, FHWA, WI, WIS 23 Fond du Lac to Plymouth, 2018 Limited Scope Supplemental Draft Environmental Impact Statement, Comment Period Ends: 07/31/2018, Contact: Michael Davies 608–829–7500.
EIS No. 20180117, Draft, NJDEP, NJ, Rebuild by Design (RBD) Meadowlands Flood Protection Project, Comment Period Ends: 07/16/2018, Contact: Dennis Reinknecht 609–777–4152.
EIS No. 20180118, Final, USDA, TX, Cattle Fever Tick Eradication Program—Tick Control Barrier, Review Period Ends: 07/02/2018, Contact: Dr. Denise Bonilla 970–494–7317.

Dated: May 29, 2018.

Rob Tomiak,

Director, Office of Federal Activities.

[FR Doc. 2018–11773 Filed 5–31–18; 8:45 am]

BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

[EPA–HQ–OPP–2017–0440; FRL–9978–73–OEI]

Information Collection Request Submitted to OMB for Review and Approval; Comment Request; Plant-Incorporated Protectants; CBI Substantiation and Adverse Effects Reporting

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: The Environmental Protection Agency (EPA) has submitted the following information collection request (ICR) to the Office of Management and Budget (OMB) for review and approval in accordance with the Paperwork Reduction Act (PRA): ''Plant-Incorporated Protectants; CBI Substantiation and Adverse Effects Reporting'' (EPA ICR No. 1693.09, OMB Control No. 2070–0142). This is a request to renew the approval of an existing ICR, which is currently approved through May 31, 2018. EPA did not receive any public comments in response to the previously provided public review opportunity issued in the **Federal Register** of September 13, 2017. With this submission to OMB, EPA is providing an additional 30 days for public review and comment. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number.

DATES: Additional comments may be submitted on or before July 2, 2018.

ADDRESSES: Submit your comments, identified by Docket ID number EPA–HQ–OPP–2017–0440, to both EPA and OMB as follows:

- To EPA online using *http://www.regulations.gov* (our preferred method) or by mail to: EPA Docket Center, Environmental Protection Agency, Mail Code 28221T, 1200 Pennsylvania Ave. NW, Washington, DC 20460, and
- To OMB via email to *oira_submission@omb.eop.gov.* Address comments to the OMB Desk Officer for EPA.

EPA's policy is that all comments received will be included in the public docket without change including any personal information provided, unless the comment includes profanity, threats, information claimed to be Confidential Business Information (CBI) or other information whose disclosure is restricted by statute.

FOR FURTHER INFORMATION CONTACT: Ryne Yarger, Field and External Affairs Division, 7506P, Environmental Protection Agency, 1200 Pennsylvania Ave. NW, Washington, DC 20460; telephone number: 703–605–1193; fax number: 703–305–5884; email address: *yarger.ryne@epa.gov.*

SUPPLEMENTARY INFORMATION:

Docket: Supporting documents, including the ICR that explains in detail the information collection activities and the related burden and cost estimates that are summarized in this document, are available in the docket for this ICR. The docket can be viewed online at *http://www.regulations.gov* or in person at the EPA Docket Center, West William Jefferson Clinton Bldg., Rm. 3334, 1301 Constitution Ave. NW, Washington, DC. The telephone number for the Docket Center is (202) 566–1744. For additional information about EPA's public docket, visit *http://www.epa.gov/dockets.*

Abstract: This ICR addresses the two information collection requirements contained in the regulations codified in 40 CFR part 174 pertaining to pesticidal substances that are produced by plants (plant-incorporated protectants, or PIPs). A PIP is defined as ''the pesticidal substance that is intended to be produced and used in a living plant and the genetic material necessary for the production of such a substance.'' Many, but not all, PIPs are exempt from registration requirements under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

CBI is protected by FIFRA and generally cannot be released to the public. For most pesticide registration applications, the current CBI regulations at 40 CFR part 2 require that claimants substantiate their CBI claims for their own records when the claim is made, and subsequently provide the substantiation to EPA only if requested. However, under 40 CFR part 174, whenever a registrant claims that information submitted to EPA in support of a PIP registration application contains CBI, the registrant must substantiate such claims to EPA when they are made. In addition, 40 CFR part 174 also requires manufacturers of PIPs that are otherwise exempted from registration requirements to report any adverse effects of the PIP to the Agency within 30 days of when the information is first obtained. Such reporting will allow the Agency to determine whether further action is needed to prevent unreasonable adverse effects to human health or the environment.

Form Numbers: None.

Respondents/affected entities: Entities potentially affected by this ICR include producers and importers of PIPs. The North American Industrial Classification System (NAICS) codes for respondents under this ICR include: 325320 (Pesticide and other Agricultural Chemical Manufacturing), 325414 (Biological Products (except Diagnostic) Manufacturing), 422910 (Farm Supplies Wholesalers), 422930 (Flower, Nursery Stock, and Florist's Suppliers), 541710 (Research and Development in the Physical, Engineering, and Life Sciences), and 611310 (Colleges, Universities, and Professional Schools).

Respondent's obligation to respond: Mandatory.

Estimated number of respondents: 24 (total).

Frequency of response: On occasion.

Total estimated burden: 518 hours (per year). Burden is defined at 5 CFR 1320.03(b).

Total estimated cost: $41,892 (per year), includes $0 annualized capital or operation and maintenance costs.

Changes in the Estimates: There is an increase of 86 hours in the total

Appendix B: Newspaper Affidavits of Publication

This Page has been Intentionally Left Blank.

North Jersey Media Group

Public Notice Advertising
1 Garret Mountain Plaza
PO Box 471
Woodland Park, NJ 07424
973-569-7417

Remittance Address
PO Box 661
Milwaukee WI 53201

AECOM
AECOM
12420 Milestone Center Drive, Suite 150
Germantown, MD 20876
ATTN: Michael Busam, AWB®

Acct:2095589

Order #	Advertisement/Description	# Col x # Lines	Rate Per Line	Cost
0004264294	DEPARTMENT OF HOUSING AND URBAN DEVELO DEPARTMENTOFHOUSINGANDURBANDEVELOPM ENTNOTICEOFAVAILABILITYOFDRAFTENVIRONMI	2 col x 196 lines	$0.83	$294.00
		Affidavit of Publication Charge	1	$35.00
		Tearsheet Charge	0	$0.00
		Net Total Due:		**0.00**

Run Dates: 06/01/18

Check #: _____

Date: _____

CERTIFICATION BY RECEIVING AGENCY
I, HAVING KNOWLEDGE OF THE FACTS, CERTIFY AND DECLARE THAT THE GOODS HAVE BEEN RECEIVED OR THE SERVICES RENDERED AND ARE IN COMPLIANCE WITH THE SPECIFICATIONS OR OTHER REQUIREMENTS, AND SAID CERTIFICATION IS BASED ON SIGNED DELIVERY SLIPS OR OTHER REASONABLE PROCEDURES OR VERIFIABLE INFORMATION.

SIGNATURE: _____

TITLE: _____ DATE: _____

CERTIFICATION BY APPROVAL OFFICIAL
I CERTIFY AND DECLARE THAT THIS BILL OR INVOICE IS CORRECT, AND THAT SUFFICIENT FUNDS ARE AVAILABLE TO SATISFY THIS CLAIM. THE PAYMENT SHALL BE CHARGEABLE TO:

APPROPRIATION ACCOUNT(S) AND AMOUNTS CHARGED: P.O. #

_____

SIGNATURE: _____

TITLE: _____ DATE: _____

CLAIMANT'S CERTIFICATION AND DECLARATION:

I DO SOLEMNLY DECLARE AND CERTIFY UNDER THE PENALTIES OF THE LAW THAT THIS BILL OR INVOICE IS CORRECT IN ALL ITS PARTICULARS; THAT THE GOODS HAVE BEEN FURNISHED OR SERVICES HAVE BEEN RENDERED AS STATED HEREIN; THAT NO BONUS HAS BEEN GIVEN OR RECEIVED BY ANY PERSON OR PERSONS WITHIN THE KNOWLEDGE OF THIS CLAIMANT IN CONNECTION WITH THE ABOVE CLAIM; THAT THE AMOUNT HEREIN STATED IS JUSTLY DUE AND OWING; AND THAT THE AMOUNT CHARGED IS A REASONABLE ONE.

Date: 06/01/2018

Federal ID #: 061032273

Signature: _____

Official Position: Clerk

Kindly return a copy of this bill with your payment so that we can assure you proper credit.

Ad Number: 0004264294

The Record
NORTH JERSEY'S TRUSTED SOURCE

Ad Order Number
0004264294

STATE OF NEW JERSEY
COUNTY OF PASSAIC SS:

Of full age, being duly sworn according to law, on his/her oath says that he/she is employed at North Jersey Media Group publisher of the The Record. Included herewith is a true copy of the notice that was published on the following date(s):

06/01/18

in The Record, a newspaper of general circulation and published in Hackensack, in the County of Bergen and circulated in Bergen, Passaic, Hudson, Morris and Essex Counties. Said newspaper is published seven days a week.

Subscribed and sworn before me this 1 day of June, 2018 at Woodland Park, NJ

A Notary Public of New Jersey

Tiffany N Wright-Davis
Notary Public
New Jersey
My Commission Expires April 25, 2022
No. 50059414

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Notice of Availability of Draft Environmental Impact Statement and Announcement of Public Hearing for the Rebuild By Design Meadowlands Flood Protection Project located within the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack, Bergen County, New Jersey

AGENCY: Office of the Assistant Secretary for Community Planning and Development, Department of Housing and Urban Development.

ACTION: Notice of Availability and request for comments; Notice of public hearing.

SUMMARY: The New Jersey Department of Environmental Protection (NJDEP) announces the availability of a Draft Environmental Impact Statement (DEIS) and a public hearing at Robert L. Craig Elementary School in Bergen County, New Jersey (NJ) for the Rebuild by Design (RBD) Meadowlands Flood Protection Project (the Proposed Project). The Proposed Project was developed from a concept conceived through the Hurricane Sandy Rebuilding Task Force's RBD program, a design competition to promote the development of resiliency in the Sandy-affected region, and has been allocated United States (US) Department of Housing and Urban Development (HUD) Community Development Block Grant-Disaster Recovery (CDBG-DR) grant funds. The Proposed Project is a comprehensive urban water management project designed to reduce the risk of floods from coastal storm surges and/or systemic inland flooding from high-intensity rainfall events. The Proposed Project would be located in the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack, all in Bergen County, NJ. Further description of the Proposed Project and Project Area is provided in the **SUPPLEMENTARY INFORMATION** section. The DEIS includes a detailed project description and e description of environmental impacts, including direct, indirect and cumulative impacts, associated with three Build Alternatives as well as a No Action Alternative. We request your comments on the RBD Meadowlands Flood Protection Project DEIS.

AVAILABILITY OF THE DEIS: Electronic copies of the DEIS are available for public review on the following websites: http://www.rbd-meadowlands.nj.gov and www.nj.gov/dca/divisions/sandyrecovery/review. CDs and paper copies of the DEIS will also be available for review at the following locations during regular business hours:

· Little Ferry Free Public Library, 239 Liberty Street, Little Ferry, NJ, 07643
· Moonachie Municipal Office at Port Authority, 90 Moonachie Ave, Teterboro, NJ 07608
· Carlstadt Public Library, 420 Hackensack St, Carlstadt, NJ 07072
· Teterboro Municipal Building, 510 US Route 46, Teterboro, NJ 07608
· South Hackensack Municipal Clerk, 227 Phillips Ave, South Hackensack, NJ 07606

DATES AND PUBLIC COMMENT: The DEIS will be available at the locations identified in the **AVAILABILITY OF THE DEIS** section starting on June 1, 2018. This date will mark the beginning of the public comment period. The public comment period will be 45 days. Comments and related material must be submitted on or before July 15, 2018, using one of the methods in the ADDRESSES section of this NOA. A public hearing will be held on Tuesday, June 26, 2018, from 6:00 pm to 8:00 pm to provide an opportunity for oral comments. The public hearing will be held at Robert L. Craig Elementary School, 20 West Park Street, Moonachie, NJ, 07074. Additional details regarding the public hearing are provided in the **SUPPLEMENTARY INFORMATION** section. Any oral comments provided at the meeting will be transcribed and considered by the NJDEP. Please note that the hearing may close early if all business is finished. Written comments and related material for consideration in the FEIS may also be submitted to NJDEP at that meeting.

ADDRESSES: You may submit comments using any of the following methods:

(1) Email: rbd-meadowlands@dep.nj.gov
(2) Online to the NJDEP website at http://www.rbd-meadowlands.nj.gov or to the NJDCA website at www.nj.gov/dca/divisions/sandyrecovery/review/;
(3) Mail: New Jersey Department of Environmental Protection c/o Dennis Reinknecht, Program Manager, Bureau of Flood Resilience, 501 East State Street, Mail Code 501-01A, P.O. Box 420, Trenton, NJ, 08625-0420. OR
New Jersey Department of Community Affairs c/o Samuel Viavattine, Deputy Commissioner, New Jersey Department of Community Affairs, 101 South Broad Street, PO Box 800, Trenton, NJ 08625-0800.
(4) Hand delivery: Same as mail address above, between 9 a.m. and 5 p.m., Monday through Friday, except Federal and State holidays.

To avoid duplication, please use only one of these methods.

The NJDEP Bureau of Flood Resilience will maintain a paper copy of the DEIS for public review at 501 East State Street, Trenton, NJ 08625-0420. The document will be available for inspection or copying at this location between 9 a.m. and 5 p.m., Monday through Friday, except Federal and State holidays.

FOR FURTHER INFORMATION CONTACT: If you have questions regarding this notice or on the public hearing, please write to or e-mail Dennis Reinknecht, Program Manager, NJDEP Bureau of Flood Resilience, 501 East State Street, Mail Code 501-01A, P.O. Box 420, Trenton, NJ, 08625-0420, rbd-meadowlands@dep.nj.gov.

SUPPLEMENTARY INFORMATION:

Project Description:
The NJDEP has prepared a DEIS for the RBD Meadowlands Flood Protection

Project (the Proposed Project). The Proposed Project was selected by HUD through the RBD competition, and HUD CDBG–DR funds have been allocated for it. CDBG–DR funding requires compliance with NEPA as stated in HUD's regulations outlined in 24 CFR Part 58. The Proposed Project is also subject to the CEQ NEPA regulations at 40 CFR Parts 1500–1508. On behalf of the State of New Jersey through the NJDCA, the recipient of HUD grant funds, NJDEP is the "Responsible Entity," as defined by HUD regulations at 24 CFR § 58. 2(a)(7)(i), for the Proposed Project. In accordance with criteria in 40 CFR § 1501.5(c), NJDCA has designated NJDEP as the Lead Agency to prepare the DEIS for the Proposed Project in accordance with NEPA (42 USC §§ 4321 et seq.).

The Proposed Project would occur in the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack, all in Bergen County, New Jersey. The Project Area has the following approximate boundaries: the Hackensack River to the east; Paterson Plank Road (State Route 120) and the southern boundary of the Borough of Carlstadt to the south; State Route 17 to the west; and Interstate 80 (I-80) and the northern boundary of the Borough of Little Ferry to the north. In total, the Project Area encompasses approximately 5,405 acres, and is mostly located within the Meadowlands District. The Proposed Project was developed as a concept through the Hurricane Sandy Rebuilding Task Force's RBD program, a design competition to promote the development of resiliency in the Sandy-affected region. The Proposed Project includes the construction of flood risk reduction measures designed to address the impacts of inland and coastal flooding on the quality of the human environment due to both storm hazards and sea level rise within the Project Area. The purpose of the Proposed Project is to reduce flood risk in the Project Area, thereby protecting critical infrastructure and facilities, residences, and businesses from the more frequent and intense flood events anticipated in the future. The Proposed Project is needed to address: (1) systemic inland flooding from high-intensity rainfall/runoff events; and/or (2) coastal flooding from storm surges. In addition to reducing flooding in the Project Area, the Proposed Project is needed to directly protect life, public health, and property in the Project Area, reduce flood insurance claims from future events, and potentially restore property values to the extent possible with the available funding.

DEIS:
The DEIS has been prepared and is available for public comment. The DEIS is available for review on the project website at http://www.rbd-meadowlands.nj.gov or www.nj.gov/dca/divisions/sandyrecovery/review/ as well as at the locations listed above in ADDRESSES.

The DEIS includes a detailed project description and describes environmental impacts, including direct, indirect, and cumulative environmental impacts, associated with three Build Alternatives as well as a No Action Alternative. A range of reasonable alternatives (Alternatives 1, 2, and 3) was evaluated in the DEIS. Alternative 1 would include a structural line of protection (i.e., floodwalls, a surge barrier, etc.) to protect the Project Area against coastal storm surges. Alternative 2 would include stormwater drainage improvements (i.e., pump stations, channel dredging, new open space and green infrastructure systems, etc.) to reduce inland flooding in the Project Area during heavy rainfall events. Alternative 3 would consist of a hybrid of the coastal flood protection and stormwater drainage improvements included in Alternatives 1 and 2, and would provide the greatest level of flood protection to the Project Area. As such, the NJDEP is recommending that Alternative 3 be selected as the Preferred Alternative. However, due to funding and construction constraints associated with a project of this magnitude, the Alternative 3 features would be separated into two stages: a Build Plan, which includes all features to be constructed as part of the Proposed Project, and a Future Plan, which includes the remaining features that could be constructed over time by others as funding and construction feasibility permit.

The Alternative 3 Build Plan would consist of 41 green infrastructure systems (bioswales, storage trenches, and rain gardens) along roadways, three new parks (comprising approximately 7.6 acres in total), improvements to five existing open spaces/public amenities, two new pump stations, one new force main, and dredging of the lower East Riser Ditch. The Alternative 3 Future Plan would consist of three additional parks (approximately 5.7 additional acres of new park space), an additional pump station and force main, improvements to the upper East Riser Ditch, and a structural line of protection against coastal storm surges, including a surge barrier along Berry's Creek. Overall, the Alternative 3 Build Plan:

· Would provide approximately 50 years of inland flood reduction for portions of the Project Area; flood reduction would be greatest in the improved reach of East Riser Ditch, but also prominent in the Main Reach of Losen Slote and upper reach of East Riser Ditch;
· Would provide numerous co-benefits to the Project Area, including new recreational opportunities, water quality improvements, new and enhanced habitats, and aesthetic benefits; and
· Would have direct and indirect impacts to the physical, natural, cultural, and socioeconomic environment that are generally less than both
Alternatives 1 and 2

Public Hearing:
NJDEP will hold a public hearing from 6:00 pm to 8:00 pm on June 26, 2018. The hearing location is Robert L. Craig Elementary School, 20 West Park Street, Moonachie, NJ, 07074.

The purpose of the public hearing is for NJDEP to receive comments on the information provided in the DEIS. NJDEP will not respond to any of the comments or take action on the project at the hearing. Comments and/or statements at the public hearing will become part of the public record during the comment period and will also be considered during the preparation of the Final EIS. The meeting facility is accessible to those with disabilities. Any individual who requires special accommodations, such as a sign language interpreter, ac-

cessible seating, or documentation in alternative formats, is requested to contact Sandy Recovery Division (SRD) Constituent Services at (609) 292-3750 or (609) 633-1328 or email of sandy.recovery@dca.nj.gov.
June 1, 2018, Fee: $294.00 (392) 4264294

EL GAMPEON DE LOS HISPANOS

EL DIARIO

LA PRENSA WWW.ELDIARIONY.COM

AFFIDAVIT OF PUBLICATION

State of New York)

:

County of New York)

Ana Vera , Being duly sworn declares that she is

Senior Account Executive for the daily newspaper El Diario / La Prensa,

Published in the City, County and State of New York by CPK NYC, LLC.,

with main offices located at One Metro tech Center, 18th Floor, Brooklyn, NY 11201

And that Legal Notice

(Advertisement), a true copy of which is annexed, was published in the said Newspaper for

New Jersey Department of Environmental Protection on FRIDAY

June 1st Of the year 2018.

Ana Vera

Sworn to before me this 01 ST

Day of JUNE 2018

Notary Public

MARTHA CALDERON
NOTARY PUBLIC-STATE OF NEW YORK
No. 01CA6147323
Qualified in Queens County
Certificate Filed in New York County
My Commission Expires May 30, 2022

One Metrotech Center, 18th Fl, Brooklyn, NY 11201 Tel: 212-807-4632 Fax 212-807-4617

DEPARTAMENTO Y DESARROLLO URBANO

Aviso de Disponibilidad del Anteproyecto de Declaración de Impacto Ambiental y Anuncio de Audiencia Pública para el Proyecto de Protección contra Inundaciones Rebuild By Design Meadowlands ubicado dentro de los Distritos de Little Ferry, Moonachie, Carlstadt, y Teterboro, y el Municipio de South Hackensack, Condado de Bergen, Nueva Jersey

AGENCIA: Oficina del Subsecretario para la Planificación y Desarrollo Comunitario, Departamento de Vivienda y Desarrollo Urbano

ACCIÓN: Aviso de Disponibilidad y solicitud de comentarios; Aviso de audiencia pública.

RESUMEN: El Departamento de Protección Ambiental de New Jersey (NJDEP, por sus siglas en inglés) anuncia la disponibilidad de un Anteproyecto de Declaración de Impacto Ambiental (DEIS, por sus siglas en inglés) y una audiencia pública en la Escuela Primaria Robert L. Craig en el Condado de Bergen, New Jersey (NJ) para el Proyecto de Protección Contra Inundaciones Rebuild by Design (RBD) Meadowlands (el Proyecto Propuesto). El Proyecto Propuesto fue desarrollado a partir de un concepto concebido a través del programa RBD del Equipo Especial de Reconstrucción del Huracán Sandy, un concurso de diseño para promover el desarrollo de la resiliencia en la región afectada por Sandy, y ha sido asignada a los fondos de subvención de la Subvención en Bloque para Desarrollo Comunitario-Recuperación de Desastres (CDBG-DR, por sus siglas en inglés) del Departamento de Vivienda y Desarrollo Urbano (HUD, por sus siglas en inglés) de los Estados Unidos (US). El Proyecto Propuesto es un proyecto integral de gestión de agua urbana diseñado para reducir el riesgo de inundación por mareas de tormentas costeras y/o inundaciones sistémicas en tierra de eventos de lluvia de alta intensidad. El Proyecto Propuesto se ubicaría en los Distritos de Little Ferry, Moonachie, Carlstadt, y Teterboro, y el Municipio de South Hackensack, todos en el Condado de Bergen, NJ. Descripción adicional del Proyecto Propuesto y del Área del Proyecto es proporcionada en la sección de INFORMACIÓN COMPLEMENTARIA. El DEIS incluye una descripción detallada del proyecto y una descripción de los impactos ambientales, incluyendo los impactos directos, indirectos y acumulativos, asociados con las tres Alternativas de Construcción, así como la Alternativa de No Acción. Solicitamos sus comentarios sobre el DEIS del Proyecto de Protección Contra Inundaciones RBD Meadowlands.

DISPONIBILIDAD DEL DEIS: Copias electrónicas del DEIS están disponibles para revisión pública en los siguientes sitios de internet: http://www.rbd-meadowlands.nj.gov and www.nj.gov/dca/divisions/sandyrecovery/review. CDs y copias impresas del DEIS también estarán disponibles para revisión en las siguientes ubicaciones durante el horario de atención habitual:

Biblioteca Pública Gratuita de Little Ferry, 239 Liberty Street, Little Ferry, NJ, 07643

Oficina Municipal de Moonachie en la Autoridad Portuaria, 90 Moonachie Ave, Teterboro, NJ 07608

Biblioteca Pública de Carlstadt, 420 Hackensack St, Carlstadt, NJ 07072

Edificio Municipal de Teterboro, 510 US Route 46, Teterboro, NJ 07608

Secretario Municipal de South Hackensack, 227 Phillips Ave, South Hackensack, NJ 07606

FECHAS Y COMENTARIOS PÚBLICOS: El DEIS estará disponible en las ubicaciones identificadas en la sección DISPONIBILIDAD DEL DEIS a partir del 1 de junio de 2018. Esta fecha marcará el comienzo del periodo de comentarios públicos. El periodo de comentarios públicos será de 45 días. Los comentarios y material relacionado deben ser enviado en o antes del 15 de julio de 2018, utilizando uno de los métodos en la sección de DIRECCIONES de este NOA. Una audiencia pública se llevará a cabo el martes 26 de junio de 2018 de 6:00 pm a 8:00 pm para brindar la oportunidad de realizar comentarios orales. La audiencia pública se celebrará en la Escuela Primaria Robert L. Craig, 20 West Park Street, Moonachie, NJ, 07074. Detalles adicionales en relación a la audiencia pública serán proporcionados en la sección de INFORMACIÓN COMPLEMENTARIA. Cualquier comentario oral proporcionado en la reunión será transcrito y considerado por el NJDEP. Tenga en cuenta que la audiencia puede cerrar temprano concluidos todos los temas. Los comentarios escritos y material relacionado para consideración en el FEIS también pueden presentarse al NJDEP en esta reunión.

DIRECCIONES: Usted puede enviar comentarios utilizando cualquiera de los siguientes métodos:

Correo electrónico: rbd-meadowlands@dep.nj.gov

En línea en el sitio de internet de NJDEP en http://www.rbd-meadowlands.nj.gov o en el sitio de internet de NJDCA en www.nj.gov/dca/divisions/sandyrecovery/review/;

Correo: Departamento de Protección Ambiental de New Jersey c/o Dennis Reinknecht, Administrador del Programa, Agencia de Resiliencia Contra Inundaciones, 501 East State Street, Mail Code 501-01A, P.O. Box 420, Trenton, NJ, 08625-0420. O

Departamento de Asuntos Comunitarios de New Jersey c/o Samuel Viavattine, Comisionado Adjunto, Departamento de Asuntos Comunitarios de New Jersey, 101 South Broad Street, PO Box 800, Trenton, NJ 08625-0800.

Entrega en mano: Misma dirección de correo anterior, entre las 9 a.m. y las 5 p.m., de lunes a viernes, excepto festivos Federales y Estatales.

Para evitar la duplicación, por favor utilice sólo uno de estos métodos.

La Agencia de Resiliencia contra Inundaciones de NJDEP mantendrá una copia impresa del DEIS para revisión publica en 501 East State Street, Trenton, NJ 08625-0420. El documento estará disponible para inspección o copiado en esta ubicación entre las 9 a.m. y las 5 p.m., excepto festivos Federales y Estatales.

CONTACTO PARA MAYOR INFORMACIÓN: Si usted tiene preguntas concernientes a este aviso o en la audiencia pública, por favor escriba o envíe un correo electrónico a Dennis Reinknecht, Administradora del Programa, Agencia de Resiliencia Contra Inundaciones de NJDEP, 501 East State Street, Mail Code 501-01A, P.O. Box 420, Trenton, NJ, 08625-0420, rbd-meadowlands@dep.nj.gov.

INFORMACIÓN COMPLEMENTARIA:

Descripción del Proyecto:

El NJDEP ha preparado un DEIS para el Proyecto de Protección Contra Inundaciones RBD Meadowlands (el Proyecto Propuesto). El Proyecto Propuesto fue seleccionado por HUD a través de la competencia RBD, y los fondos de CDBG-DR de HUD han sido asignados para ello. El financiamiento de CDBG–DR requiere el cumplimiento de NEPA según lo establecido en las regulaciones de HUD descritas en el Título 24 de CFR Parte 58. El Proyecto Propuesto también está sujeto a las regulaciones de NEPA de CEQ en el Título 40 de CFR Partes 1500–1508. En nombre del Estado de New Jersey a través de NJDCA, el receptor de los fondos de HUD, NJDEP es la "Entidad Responsable", según lo definido por las regulaciones de HUD en el Título 24 de CFR § 58.2(a)(7)(i), para el Proyecto Propuesto. De conformidad con los criterios en el Título 40 de CFR § 1501.5(c), NJDCA ha designado al NJDEP como la Agencia Principal para preparar el DEIS para el Proyecto Propuesto de acuerdo con NEPA (42 USC §§ 4321 et seq.).

El Proyecto Propuesto ocurriría en los Distritos de Little Ferry, Moonachie, Carlstadt, y Teterboro, y el Municipio de South Hackensack, todos en el Condado de Bergen, New Jersey. El Área del Proyecto tiene los siguientes límites aproximados: el Río Hackensack al este; Paterson Plank Road (Ruta Estatal 120) y el límite del sur del Distrito de Carlstadt al sur; Ruta Estatal 17 al oeste; y la Interestatal 80 (I-80) y el límite del norte del Distrito de Little Ferry al norte. En total, el Área del Proyecto abraca aproximadamente 5,405 acres, y se encuentra en su mayoría dentro del Distrito de Meadowlands. El Proyecto Propuesto fue desarrollado como un concepto a través del programa RBD del Grupo de Trabajo de Reconstrucción del Huracán Sandy, un concurso de diseño para promover el desarrollo de la resiliencia en la región afectada por Sandy. El Proyecto Propuesto incluye la construcción de medidas de reducción de riesgo de inundación diseñadas para abordar los impactos de inundaciones tierra adentro y costeras sobre la calidad del medio ambiente humano debido a los peligros de tormentas y al aumento del nivel del mar dentro del Área del Proyecto. El propósito del Proyecto Propuesto es reducir el riesgo de inundación en el Área del Proyecto, protegiendo sí la infraestructura crítica e instalaciones, residencias, y negocios de los eventos de inundación más frecuentes e intensos anticipados en el futuro. El Proyecto Propuesto es necesario para abordar: (1) inundación sistémica tierra adentro desde los eventos de lluvia/escurrimiento de alta intensidad; y/o (2) inundaciones costeras de mareas de tormenta. Además, para reducir las inundaciones en el Área del Proyecto, el Proyecto Propuesto es necesario para proteger directamente la vida, la salud pública, y la propiedad en el Área del Proyecto, reducir las reclamaciones de seguro contra inundaciones de eventos futuros, y potencialmente restaurar en la medida de lo posible, los valores de propiedad con los fondos disponibles.

DEIS:

El DEIS ha sido preparado y está disponible para comentarios públicos. el DEIS está disponible para revisión en el sitio de internet del proyecto en http://www.rbd-meadowlands.nj.gov o www.nj.gov/dca/divisions/sandyrecovery/review/, así como en las ubicaciones listadas anteriormente en DIRECCIONES.

El DEIS incluye una descripción detallada del proyecto y describe los impactos ambientales, incluyendo los impactos ambientales directos, indirectos, y acumulativos, asociados con las tres Alternativas de Construcción, así como la Alternativa de No Acción. Un rango de alternativas razonables (Alternativas 1, 2, y 3) fue evaluada en el DEIS. La Alternativa 1 incluiría una línea estructural de protección (por ejemplo, muros de contención contra inundaciones, una barrera contra mareas, etc.) para proteger el Área del Proyecto contra las mareas de tormenta costeras. La Alternativa incluiría mejoras de drenaje de aguas pluviales (por ejemplo, estaciones de bombero, dragado de canales, nuevo espacio abierto y sistemas de infraestructura ecológicos, etc.) para reducir la inundación tierra adentro en el Área del Proyecto durante eventos de fuertes lluvias. La Alternativa 3 consistiría en un híbrido de la protección contra inundaciones costeras y mejoras al drenaje de agua de tormentas incluidas en las Alternativas 1 y 2, y proporcionaría el mayor nivel de protección contra inundaciones al Área del Proyecto. Como tal, el NJDEP está recomendando que la Alternativa 3 sea seleccionada como la Alternativa Preferida. Sin embargo, debido a restricciones de construcción y financiamiento asociadas con un proyecto de esta magnitud, las características de la Alternativa 3 sería separada en dos etapas: un Plan de Construcción, que incluye todas las características a ser construidas como parte del Proyecto Propuesto, y un Plan Futuro, que incluye las características restantes que podrían ser construidas con el tiempo por otros como financiamiento y permisos de viabilidad de construcción.

El Plan de Construcción de la Alternativa 3 consistiría en 41 sistemas de infraestructura ecológica (biofiltros, zanjas de almacenamiento, y jardines de lluvia) a lo largo de las carreteras, tres nuevos parques (que comprenden aproximadamente 76 acres en total), mejoras a cinco espacios abiertos/equipamientos públicos existentes, dos nuevas estaciones de bombeo, una nueva red de presión principal, y dragado de la Fosa East Riser más bajo. El Plan Futuro de la Alternativa 3 consistiría de tres parques adicionales (aproximadamente 5.7 acres adicionales de nuevo espacio de parques), una estación de bombeo adicional y sistema de presión, mejoras a la Fosa superior East Riser, y una línea de protección estructural contra las mareas de tormenta costera, incluyendo una barrera contra mareas a lo largo de Berry's Creek. En general, el Plan de Construcción de la Alternativa:

Proporcionaría aproximadamente 50 años de reducción de inundaciones tierra adentro para partes del Área del Proyecto; reducción de inundaciones sería mayor en el alcance mejorado de la Fosa East Riser, pero también prominente en al Tramo Principal de Losen Slote y el tramo superior de la Fosa East Riser;

Proporcionaría numerosos co-beneficios al Área del Proyecto, incluyendo nuevas oportunidades recreativas, mejoras a la calidad del agua, nuevos hábitats mejorados, y beneficios estéticos; y

Tendría impactos directos e indirectos al ambiente físico, natural, cultural, y socioeconómico que generalmente son mejores que las Alternativas 1 y 2.

Audiencia Pública:

NJDEP llevará a cabo una audiencia pública de 6:00 pm a 8:00 pm el 26 de junio de 2018. La ubicación de la audiencia es la Escuela Primaria Robert L. Craig, 20 West Park Street, Moonachie, NJ, 07074.

El propósito de la audiencia pública es para que NJDEP reciba comentarios sobre la información proporcionada en el DEIS. NJDEP no responderá a ningún comentario o tomará acción sobre el proyecto en la audiencia. Los comentarios y/o declaraciones en la audiencia pública serán parte del registro público durante el periodo de comentarios y también será considerado durante la preparación del EIS Final. La instalación del a reunión es accesible a aquellas personas con discapacidades. Cualquier persona que requiera adaptaciones especiales, tales como un intérprete de lenguaje a señas, asientos accesibles, o documentación en formatos alternativos, se le pide se comunique a los Servicios a Constituyentes de la División de Recuperación de Sandy (SRD, por sus siglas en inglés) al (609) 292-3750 o al (609) 633-1328 o al correo electrónico de sandy.recovery@dca.nj.gov.

KOREA DAILY
AFFIDAVIT OF PUBLICATION

AECOM
12420 MILESTONE CENTER DRIVE, SUITE 150
GERMANTOWN, MARYLAND 20876

STATE OF NEW YORK)
: SS.:
COUNTY OF NEW YORK)

Legal Notice No. 422

The undersigned is the Publisher of Korea Daily, a daily newspaper printed in the State of New York, and circulated in New York, Bronx, Richmond, Kings, Queens, Nassau, and Suffolk Counties.

A Legal Notice regarding **AECOM** was published in said newspaper June 1, 2018.

The text of the notice as published in said newspaper as set forth in the annexed exhibit A.

SWORN to before me this
4 Day of June, 2018

By: _____
Chansik Cho

LEONELA MARIANELA CALLE
Notary Public, State of New York
No. 01CA6288229
Qualified in Queens County
Commission Expires Sept. 3, 2021

Leonela M Calle
6/4/18

주택도시개발부

환경 영향 평가서 초안의 가용성에 대한 통지 및 뉴저지 주 버겐 카운티의 Little Ferry, Moonachie, Carlstadt, Teterboro의 자치구들과 남부 Hackensack의 타운십의 디자인에 의한 재건 메도우랜드 홍수 방지 프로젝트(Rebuild By Design Meadowlands Flood Protection Project) 관련 공청회 공고

기관 : 지역 재회 개발 담당 카운보실, 주택도시개발부

조치 : 가용성 알림 및 의견 요청; 공청회 통지

요약 : 뉴저지 환경 보호부 (NJDEP)는 디자인에 의한 재건(RBD) 메도우랜드 홍수 방지 프로젝트(제안 프로젝트)를 위해 환경 영향 평가서 초안의 가용성과 뉴저지 주 버겐 카운티 소재 로버트 크레이그 초등학교 (Robert L. Craig Elementary School)에서 개최되는 공청회에 대해 발표했습니다. 제안 프로젝트는 허리케인 샌디 재건 프로젝트 팀의 RBD 프로그램 (샌디 피해 지역의 복구 개발촉진을 위한 디자인 경연)을 통해 창안 된 개념을 바탕으로 개발되었으며, 미국 (US) 주택도시개발부(HUD) 지역 개발 구획 재해 복구(CDBG-DR)의 보조금을 할당 받았습니다. 제안 프로젝트는 고강도 강수량으로 인한 해안의 폭풍 해일 및 내륙 침투성 범람으로 인한 홍수의 위험을 줄이기 위해 고안된 종합적인 도시의 물 관리 프로젝트 입니다. 제안 프로젝트는 뉴저지 주 버겐 카운티의 Little Ferry, Moonachie, Carlstadt, Teterboro의 자치구들과 남부 Hackensack의 타운십에 반영됩니다. 제안 된 프로젝트와 해당지역에 대한 자세한 설명은 추가 정보(SUPPLEMENTARY INFORMATION) 섹션에 있습니다. DEIS에는 세가지 건설 대안 및 비조치 대안(No Action Alternative)에 관한 상세한 프로젝트 설명, 환경적 영향, 직접, 간접 및 누적 영향에 대한 상세한 설명들이 포함되어 있습니다. RBD Meadowlands 홍수 방지 프로젝트 DEIS에 대한 여러분들의 의견을 공유해 주시기 바랍니다.

EXHIBIT A

DEIS의 가용성 : DEIS의 전자 사본은 http://www.rbd-meadowlands.nj.gov 및 www.nj.gov/dca/divisions/sandyrecovery/rsview에서 공개 열람이 가능합니다. DEIS의 CD 및 종이 사본 또한 정규 업무 시간 중 다음 장소에서 검토 할 수 있습니다:

- Little Ferry Free Public Library: 239 Liberty Street, Little Ferry, NJ, 07643
- Moonachie Municipal Office at Port Authority, 90 Moonachie Ave, Teterboro, NJ 07608
- Carlstadt Public Library, 420 Hackensack St, Carlstadt, NJ 07072
- Teterboro Municipal Building, 510 US Route 46, Teterboro, NJ 07608
- South Hackensack Municipal Clerk, 227 Phillips Ave, South Hackensack, NJ 07606

일정 및 공개 논평 : DEIS는 2018 년 6 월 1 일부터AVAILABILITY OF THE DEIS섹션에 명시된 곳에서 열람 가능합니다. 위의 날짜에 공개 논평 기간이 시작되며 논평의 총 기간은 45 일입니다. 의견 및 관련 자료는 이 NOA의 ADDRESSES 섹션에 있는 방법들 중 하나를 사용하여 2018년 7월 15일 또는 그 이전에 제출되어야 합니다. 공청회는 2018 년 6 월 26 일 화요일 오후 6 시 부 터 오후 8 시 까지 토론 기회를 제공하기 위해 열릴 예정입니다. 공청회는 NJ, Moonachie, 20 West Park Street에 위치한 Robert L. Craig 초등학교에서 열립니다. 공청회에 관한 추가 세부 사항은 추가정보(SUPPLEMENTARY INFORMATION)섹션에서 제공됩니다. 회의에서 토론된 모든 의견들은 NJDEP에 의해 기록되고 검토 될 것입니다. 모든 일정이 끝나면 청문회가 일찍 종료 될 수도 있습니다. FEIS에서 고려해야 할 서면 의견 및 관련 자료는 해당 회의에서 NJDEP에 제출할 수 있습니다.

제출 : 다음 방법들 중 하나를 사용하여 의견을 제출할 수 있습니다:
(1) 이메일 : rbd-meadowlands@dep.nj.gov
(2) NJDEP 웹 사이트: http://www.rbd-meadowlands.nj.gov 또는 NJDCA 웹사이트www.nj.gov/dca/divisions/sandyrecovery/review/
(3) 우편 : New Jersey Department of Environmental Protection c/o Dennis Reinknecht, Program Manager, Bureau of Flood Resilience, 501 East State Street, Mail Code 501-01A, P.O. Box 420, Trenton, NJ, 08625-0420, 또는 New Jersey Department of Community Affairs c/o Samuel Viavattine, Deputy Commissioner, New Jersey Department of Community Affairs, 101 South Broad Street, PO Box 800, Trenton, NJ 08625-0800.

방문접수: 연방 및 주 휴일들을 제외한 월요일에서 금요일 오전 9 시부터 오후 5 시까지 위의 우편 주소에 접수

중복을 방지하기 위해 위의 방법들 중 하나의 경로로만 접수해 주시기 바랍니다.
NJDEP 홍수복구 지원처 (NJDEP Bureau of Flood Resilience)는 공개 열람을 위해 DEIS의 종이 사본을NJ 08625-0420, Trenton, 501 East State Street에 비치 할 것입니다. 이 서류는 연방 및 주 휴일을 제외한 월요일에서 금요일 오전 9 시부터 오후 5시 사이 이곳에서 열람 또는 복사 할 수 있습니다.
추가정보를 위한 연락처 : 위의 공고 또는 공청회와 관련하여 질문이 있으시면 NJDEP 프로그램 담당자인Dennis Reinknecht, Program Manager, NJDEP Bureau of Flood Resilience, 501 East State Street, Mail Coda 501-01A, P.O. Box 420, Trenton, NJ, 08625-0420로 편지를 보내시거나 rbd-meadowlands@dep.nj.gov로 이메일을 보내주시기 바랍니다.

추가 정보:

프로젝트 설명:
NJDEP는 RBD Meadowlands 홍수 방지 프로젝트 (제안 프로젝트)에 대한 DEIS를 준비했습니다. 제안 된 프로젝트는 RBD 경연을 통해 HUD에 의해 선택되었으며, HUD CDBG-DR 기금이 할당되었습니다. CDBG-DR 기금은 24 CFR Part 58에 명시된 HUD의 규정에 명시된 바와 같이 NEPA를 준수해야 합니다. 제안된 프로젝트는 40 CFR 파트 1500-1508의 CEQ NEPA 규정의 적용을 받습니다. NJDEP는 HUD 보조금 수혜자인 NJDCA를 통해 뉴저지 주를 대표하여 24 CFR § 58.2 (a) (7) (i)의 HUD 규정에 정의 된 바와 같이 "Responsible Entity"(책임이 주어지는 단체) 입니다. 게다, 40 CFR § 1501.5 (c)와 관련해 따라 NJDCA는 NEPA (42 USC § 4321 이하 참조)에 제안 프로젝트에 대한 DEIS를 준비하는 선도 기관으로 NJDEP을 지정했습니다.

제안 프로젝트는 뉴저지 주 버겐 카운티의 Little Ferry, Moonachie, Carlstadt, Teterboro의 자치구들과 남부 Hackensack의 타운십에 위치합니다. 프로젝트 지역은 대략 다음의 같은 경계를 가지고 있습니다 : Hackensack 강 동쪽; Paterson Plank Road (State Route 120)와 남부 Carlstadt 자치구의 남쪽 경계; 17 번 국도 서쪽; 80 번 주간 고속도로 (I-80)의 북부Little Ferry 자치구 북쪽 경계. 실제적으로 프로젝트 지역은 약 5,405 에이커에 이르며 대부분 Meadowlands 구역에 위치합니다. 제안 프로젝트는 허리케인 샌디 재건 프로젝트 팀의 RBD 프로그램 (샌디 피해 지역의 복구 개발촉진을 위한 디자인 경연)을 통해 창안 된 개념을 바탕으로 개발되었습니다. 제안 프로젝트에는 프로젝트 지역 내의 폭풍 위험과 해수면 상승으로 인한 내륙 및 해안 범람이 일간 환경에 미치는 영향을 다루기 위해 고안된 홍수 위험 감소 조직과 포함됩니다. 제안 프로젝트의 목적은 프로젝트 지역의 홍수 위험을 줄임으로써 미래에 예상되는 보다 빈번하고 강력한 홍수로부터 중요한 인프라와 시설, 주거 및 기업을 보호하는 것 입니다. 제안 프로젝트는 다음 상황들을 위하여 필요합니다 : (1) 고강도 강수량 / 폭풍해일로 인한 침투성 내륙 범람; 또는 (2) 폭풍 해일로 인한 연안 범람. 프로젝트 지역의 홍수 피해를 줄이는 것 외에도, 직접적인 이점, 공동 모험 및 생산을 직접 모르하고 미래의 홍수관련 보험 클레임들을 줄여여, 장재적으로 사용될 수 있는 기금으로 재산의 가치를 복구 할 수 있습니다.

DEIS : DEIS는 준비되었으며 대중의 의견을 기다리고 있습니다.
DEIS는 프로젝트 웹 사이트 (http://www.rbd-meadowlands.nj.gov 또는 www.nj.gov/dca/divisions/sandyrecovery/review/) 및 위의 ADDRESSES에 나열된 장소들에서 검토 할 수 있습니다.

DEIS에는 세가지 건설 대안 및 비조치 대안(No Action Alternative)에 관한 상세한 프로젝트 설명, 환경적 영향, 직접, 간접 및 누적 영향에 대한 상세한 설명들이 포함되어 있습니다. 합리적 대안의 범위(대안 1, 2, 3)가 DEIS에서 평가되었습니다. 대안 1은 일련의 폭풍 해일에 대비하여 프로젝트 구역을 보호하기 위한 구조적인 보호 라인 (예 : 범람원, 해일 장벽 등)을 포함한다. 대안 2는 복구 프로젝트 지역의 내륙 홍수를 줄이기 위해 우수 (stormwater drainage) 개선 (즉, 펌프 스테이션, 해일 문들, 새로운 개방 공간 및 녹색 인프라 시스템 등)을 포함 할 것 입니다. 대안 3은 대안 1과 2에 포함 된 해안 홍수 방지와 우수 배수 개선의 혼합으로 구성되며 프로젝트 지역에 가장 큰 수준의 홍수 피해 방지를 제공 할 것 입니다. 따라서 NJDEP는 대안 3을 우선 대안으로 추천 할 것을 권고하고 있습니다. 그러나 이 규모의 프로젝트와 관련된 재검 및 건설 제약으로 인해 대안 3 의 기능은 다음 두 단계로 구분됩니다. 전달 계획 (제안 된 프로젝트의 일부로 구축 될 모든 기능 포함) 및 향후 계획에는 기금 및 건설 타당성 허가로 다른 사업체이 시간이 지남에 따라 만들어 질 수 있는 나머지 기능들이 포함됩니다.

대안 3 건설 계획은 도로를 따라 설치된 44 개의 녹색 기반 저장 시스템 (생태수로, 저장 도랑 및 레인 가든), 3 개의 새로운 공원 (총 약 7.6 에이커 포함), 5 개의 기존 공공 장소 / 공공 시설 개선, 2 개의 새로운 펌프 스테이션, 하나의 새로운 주 파수관과 더 넓은East Riser Ditch의 준설프로필의 준설, 대안 3 미래 계획은 3 개의 추가 공원 (대략 5.7 에이커의 새로운 공원 공간), 추가 빌즈살과 주 하수관, 상부 East Riser Ditch개선 및Berry's Creek따라가는 해일 장벽을 포함하여 해안 복원 해안에 대한 구조적인 라인 방지로 구성됩니다. 대안 3 구축 계획 은 집만적으로 다음과 같습니다 :
- 프로젝트 지역 인부에 약 50 년간 내륙 홍수 침소를 주심 합니다. 홍수 감소는 East Riser Ditch의 지역에서 가장 큰 효과가 나타날 뿐 아니라 Losen Slote의 Main Reach와 East Riser Ditch의 상부 지역에서도 두드러질 것 입니다.
- 새로운 레크리에이션의 기회, 수질 개선, 새롭고 강화 된 주거지 및 비지적 이익을 포함하여 프로젝트 지역에 다수의 공동의 이익을 제공할 것 입니다.
- 대안 1과 대안 2보다 일반적으로 적은 물리적, 지역적, 문화적, 사회 경제적 환경에 직접적 적 영향을 미칠 수 있습니다.

공청회 : NJDEP는 2018 년 6 월 26 일 오후 6 시부터 오후 8 시까지 공청회를 개최 예정입니다. 청문회 장소는 뉴저지 모네코 크레이그 초등학교(Robert L. Craig Elementary School, 20 West Park Street, Moonachie, NJ, 07074)입니다.

공청회의 목적은 NJDEP가 DEIS에 제공된 정보에 대한 의견을 청취하는 것입니다. NJDEP는 공청회에서는 프로젝트에 대한 의견에 어떠한 유달이나 조치를 취하지 않을 것 입니다. 공청회에서의 의견 및 진술들은 의견 수렴 기간 동안 공개 기록의 일부가 될 것이며 최종 EIS 준비 중에도 고려 될 것입니다. 회의 시설은 장애인이 이용할 수 있습니다. 수화 통역사, 장애인석 또는 다른 형식의 문서와 같은 특별한 편의가 필요한 분들은 뱃디 복구부 (SBD) 구성 서비스 (609) 292-3750 또는 (609) 633-1328로 전화하시거나 sandy.recovery@dca.nj.gov로 이메일을 보내주십시오.

This Page has been Intentionally Left Blank.

Appendix C: Agency and Other Stakeholders DEIS Distribution List

This Page has been Intentionally Left Blank.

AGENCIES AND OTHER STAKEHOLDERS DEIS DISTRIBUTION LIST

FEDERAL

AMTRAK

National Railroad Passenger Corporation
39th Street Station 2955 Market Street
Philadelphia, PA 19104

POC: Stephen Gardner, EVP, Chief, NEC Business Development
POC: Petra Messick, Senior Officer of Outreach & Communications

FEDERAL AVIATION ADMINISTRATION

Eastern Regional Office 1
Aviation Plaza
Jamaica, NY 11434

POC: Andrew Brooks,
Environmental Program Manager
POC: Evelyn Martinez, Manager
POC: David Sanchez

FEDERAL EMERGENCY MANAGEMENT AGENCY

Region 2
26th Federal Plaza
13th Floor
New York, NY 10278-0002

POC: Emily Hodecker, Deputy EHP Supervisor, NJ Sandy
POC: Michael Audin, Deputy Regional Environmental Officer
POC: John Dawson, FEMA Region 2

FEDERAL TRANSIT ADMINISTRATION

Region 2
1 Bowling Green
Room 429
New York, NY 10004
POC: Dan Moser, Community Planner
POC: Donald Burns
POC: Stephen Goodman

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

National Marine Fisheries Service Greater Atlantic Regional Fisheries Office Habitat Conservation Division
James H. Howard Marine Science Laboratory
74 Magruder Road, Highlands, NJ 07732

POC: Karen Greene, Mid-Atlantic Field Offices Supervisor POC: Daniel Marrone POC: Ursula Howson

NATIONAL PARK SERVICE

143 South 3rd Street
Philadelphia, PA
19106

POC: Paul Kenney
POC: Sarah Killinger

PORT AUTHORITY OF NEW YORK & NEW JERSEY

4 World Trade Center
150 Greenwich Street, 15th Floor
New York, NY 10007

POC: Renee Spann
POC: Bernice R. Malione, Deputy Director, Office of Environment and Energy Program
POC: Joe Simenic

US ARMY CORPS OF ENGINEERS

New York District Public Affairs 26
Federal Plaza
Room 2113
New York, NY 10278

POC: James Cannon
POC: Chris Mallery
POC: Jodi M. Mcdonald
POC: Rosita Miranda
POC: Colonel Thomas D. Asbery, Commander & District Engineer
POC: Stephen Ryba

US DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Region II
26 Federal Plaza
New York, NY 10278

POC: Theresa Fretwell, Regional Environmental Officer
POC: Lynne Patton
POC: Tennille Parker
POC: Stephen Murphy

Newark Field Office
1085 Raymond Boulevard 12th Floor
Newark, NJ 07102-5260

POC: Donna Mahon, Region II DR Field Environmental Officer

US ENVIRONMENTAL PROTECTION AGENCY

26 Federal Plaza
New York, NY 10278

POC: Grace Musumeci
POC: Stephanie Lamster
POC: Walter Mugdan, Acting Regional Administrator
POC: Doug Tomchuk

US FISH AND WILDLIFE SERVICE

New Jersey Field Office Atlantic
Professional Park Unit 4
4 East Jimmie Leeds Road
Galloway, NJ 08205

POC: Eric Schrading
POC: Carlo Popolizio
POC: Ron Popowski
POC: Steve Mars

STATE

NEW JERSEY DEPARTMENT OF COMMUNITY AFFAIRS

Department of Community Affairs
101 S. Broad Street
PO Box 823
Trenton, NJ 08625

POC: Sam Viavattine, Deputy Commissioner, Sandy Recovery Division
POC: Nancy Diehl, Sandy Recovery Division
POC: Nicholas Smith-Herman, Program Specialist, Sandy Recovery Division

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Flood Resilience
Mail Code 501-01 PO Box 420
Trenton, NJ 08625
POC: Linda Fisher, Program Manager

NEW JERSEY TRANSIT

One Penn Plaza East
8th Floor
Newark, NJ 07105

POC: Eric Daleo, Manager, NJT Resilience Program
POC: Kevin S. Corbett, Executive Director

LOCAL

BERGEN COUNTY PLANNING AND ENGINEERING

One Bergen County Plaza 4th Floor
Hackensack, NJ 07601

POC: Joseph Femia, County Engineer
POC: Chris Kavvadas, Engineer's Office

BOROUGH OF CARLSTADT

500 Madison Street
Carlstadt, NJ 07072

POC: Craig Luhullier, Mayor
POC: Joe Crifasi, Director, Department of Public Works

BOROUGH OF LITTLE FERRY

215-217 Liberty Street
Little Ferry, NJ 07643

POC: Mauro Raguseo, Mayor
POC: Paula Cozzarelli, Administrator

BOROUGH OF MOONACHIE

90 Moonachie Avenue
Moonachie, NJ 07074

POC: Dennis Vaccaro, Mayor
POC: Mary Ellen Lyons, Superintendent, Department of Public Works

BOROUGH OF TETERBORO

510 Route 46 West
Teterboro, NJ 07608

POC: John Peter Watt, Mayor
POC: Nick Saros, Administrator

NEW JERSEY SPORTS AND EXPOSITION AUTHORITY

One DeKorte Park Plaza
PO Box 640
Lyndhurst, NJ 07071

POC: Cheryl Rezendes, NJSEA/Meadowlands Commission
POC: Sharon Mascaro, NJSEA/Meadowlands Commission

TOWNSHIP OF SOUTH HACKENSACK

227 Phillips Avenue
South Hackensack NJ, 07606

POC: Gary Brugger, Mayor
POC: Mary Ellen Lyons, Superintendent, Department of Public Works

This Page has been Intentionally Left Blank.

Appendix D: Public Hearing Materials

This Page has been Intentionally Left Blank.

REBUILD BY DESIGN

MEADOWLANDS

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) PUBLIC HEARING

JUNE 26, 2018

WELCOME / OPENING REMARKS

Dennis Reinknecht,
NJDEP Program Manager

AGENDA

Chris Benosky, AECOM

- NEPA Overview and Timeline
- Project Purpose and Need
- Summary of Build Alternatives
- Summary of Flood Reduction
- Summary of Environmental Impact Analysis
- Next Steps
- Public Comment Opportunity

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)
OVERVIEW

NATIONAL ENVIRONMENTAL POLICY ACT

- Ensures the Federal Government considers environmental effects of projects prior to implementation
- Applied to all projects with a Federal connection (e.g., funding)
- Requires an Environmental Impact Statement (EIS) for "major Federal actions significantly affecting the quality of the environment"

ENVIRONMENTAL IMPACT STATEMENT

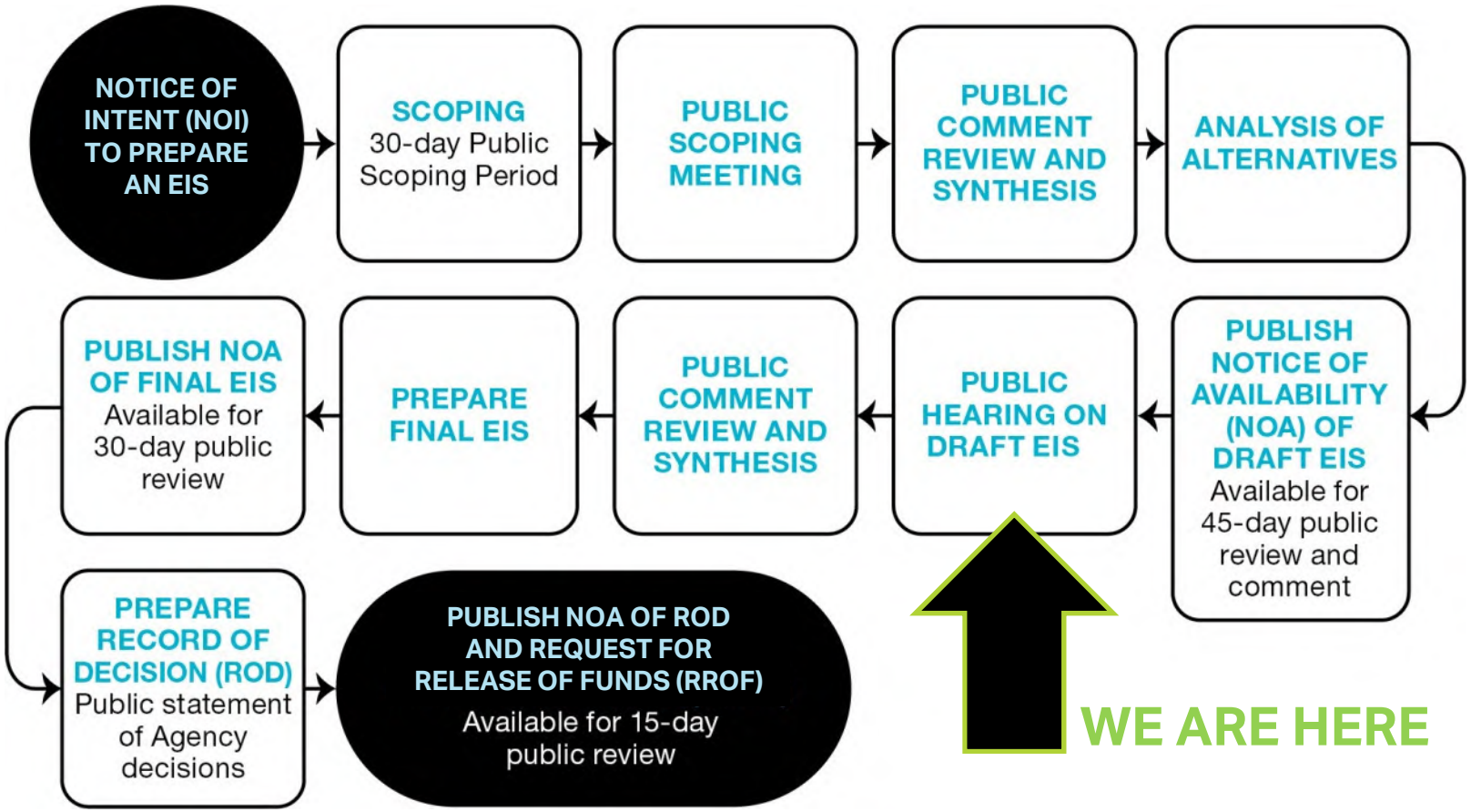
- EIS process has several procedural steps to ensure public input is obtained and considered

ENVIRONMENTAL IMPACT STATEMENT (EIS)
OVERVIEW

DRAFT ENVIRONMENTAL IMPACT STATEMENT

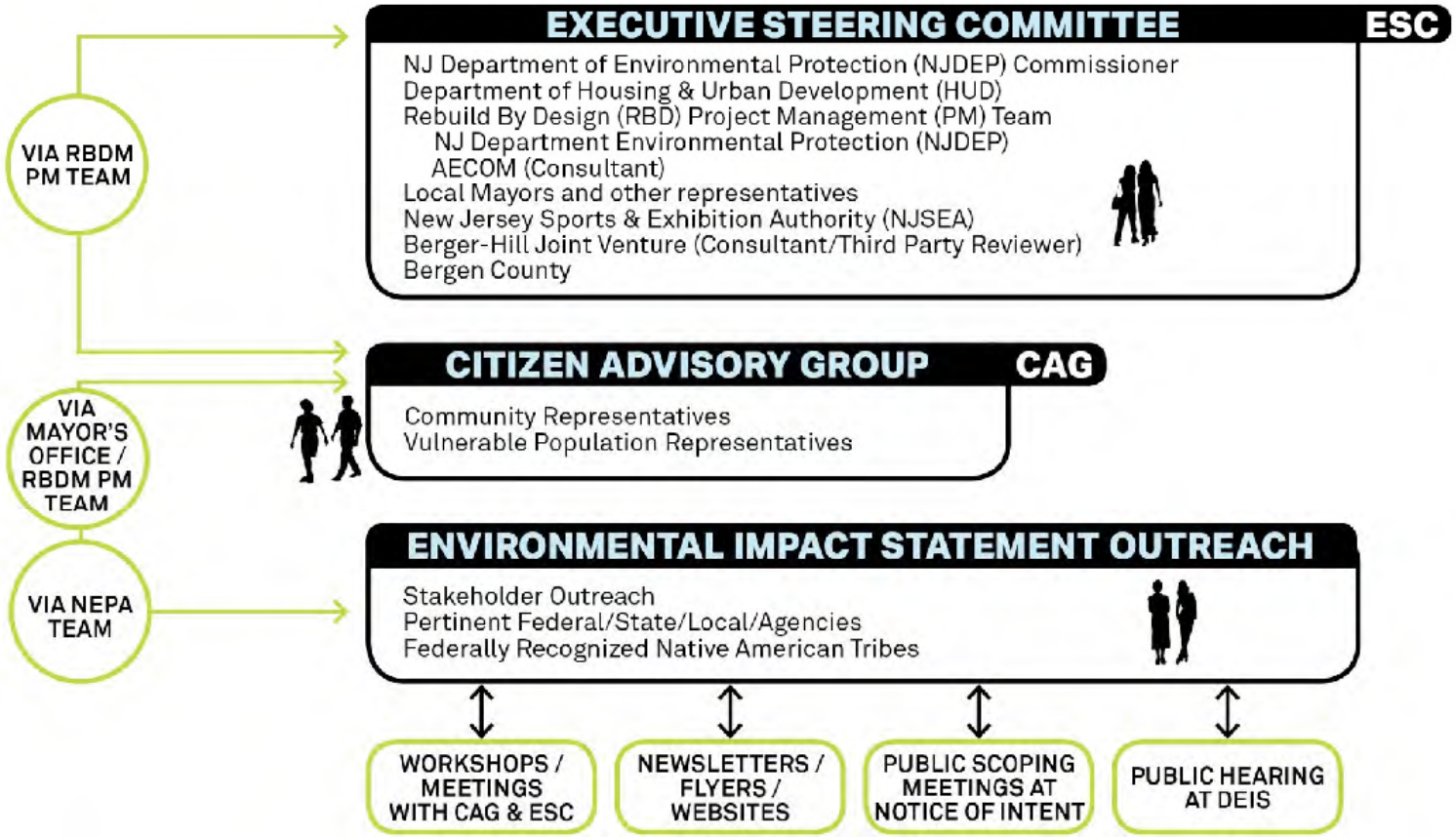
- **An EIS addresses the following related to a proposed Federal action:**
  - Purpose and Need
  - Description of Proposed Action and Alternatives
  - Consultation/Coordination Efforts
  - Existing Conditions of the Affected Environment
  - Environmental Consequences of the Considered Alternatives
    - Direct, Indirect, and Cumulative Impacts
    - Possible Best Management Practices (BMPs) and Mitigation Measures

NEPA TIMELINE



COMMUNITY ENGAGEMENT

EXECUTIVE STEERING COMMITTEE & CITIZENS ADVISORY GROUP



TONIGHT AND PUBLIC COMMENT PERIOD
WAYS TO COMMENT

- **Provide oral comments at tonight's meeting**
- **Complete and submit a written comment card**
- **Email: rbd-meadowlands@dep.nj.gov**
- **Mail comments to:**

  New Jersey Department of Environmental Protection
  c/o Dennis Reinknecht, Program Manager
  501 East State Street
  Mail Code 501-01A, PO Box 420
  Trenton, NJ 08625-0420

Comment Submission Deadline: July 15, 2018

PROJECT PURPOSE & NEED

CHRISTOPHER BENOSKY, AECOM

DEIS SECTION 1.4

THE PURPOSE

Reduce flood risk in the Project Area

Increase resiliency of the communities and ecosystems

Reduce impacts to critical infrastructure, residences, businesses, and ecological resources

DEIS SECTION 1.4.1

THE NEED

Address systemic **inland flooding** from heavy rainfall & **coastal** storm surges

Increase **community resiliency**

Reduce flood insurance **claims** from future events

Enhance water quality and protect ecological resources

Protect life, public health, and property

Incorporate flood hazard risk reduction strategy with **civic, cultural, & recreational values and amenities**

PROJECT GOALS

1. Create the **BEST POSSIBLE PROJECT** with the available funding

2. Meets the Project Mandate by providing **FLOOD REDUCTION & CO-BENEFITS** such as reducing sediment & improving water quality

3. Construct a project that provides **STORM PROTECTION** and allows for a **QUICKER RECOVERY**

PROJECT CONSTRAINTS

1. Construct a complete project that functions with **INDEPENDENT UTILITY** to meet purpose & need without relying on future projects

2. Use only **AVAILABLE FUNDS** without relying on future funding

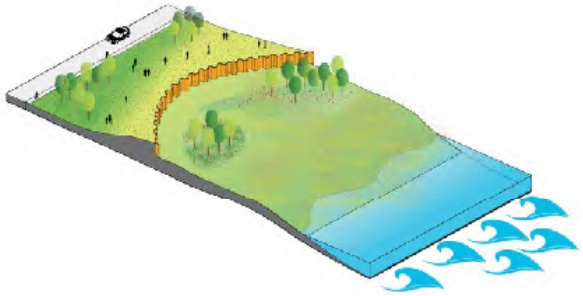
3. Construct a fully-functional project by **SEPTEMBER 2022**

4. Project must have a **POSITIVE BENEFIT COST RATIO**

5. **MINIMIZE ADVERSE** environmental **EFFECTS** to the extent possible

THE MEADOWLANDS - ALTERNATIVES

THREE BUILD ALTERNATIVES AND A NO ACTION ALTERNATIVE



Alternative 1:
Structural Flood Reduction

Alternative 2:
Stormwater Drainage Improvements

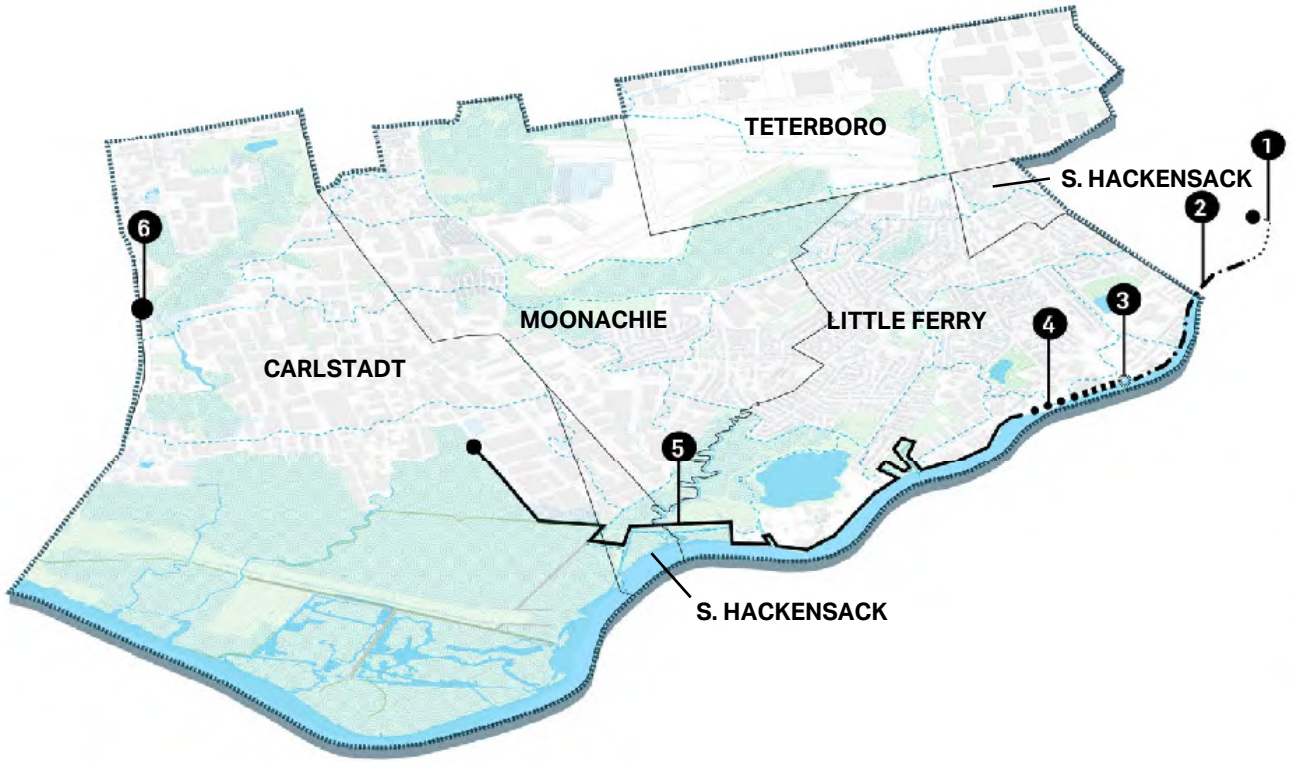
Alternative 3:
Hybrid Alternative (Preferred Alternative)

STRUCTURAL FLOOD REDUCTION

ALTERNATIVE 1 SUMMARY
LULU LOQUIDIS, AECOM

DEIS SECTION 2.5.2

ALTERNATIVE 1
STRUCTURAL FLOOD REDUCTION: PLAN



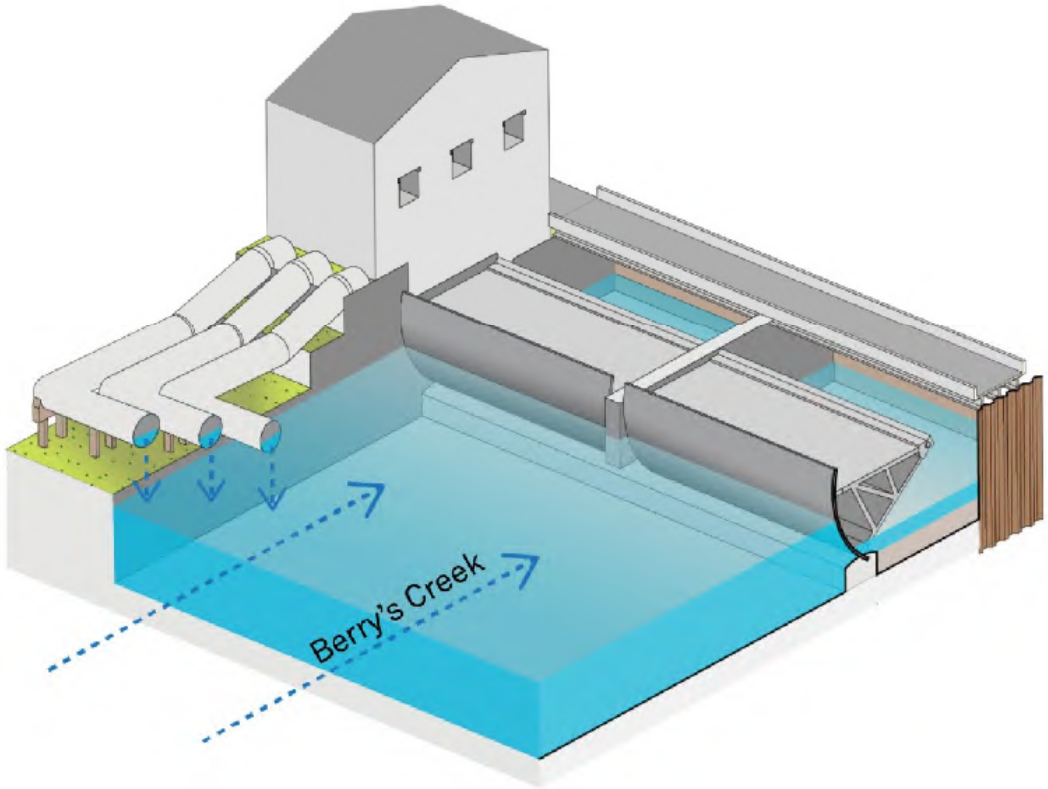
Provides a line of protection against storm surges to 7' NAVD88 (approximately a 50-year storm)

1. Existing Riverwalk
2. Sheet Pile Cantilever
3. Berms at Fluvial Park
4. Cantilever Walkway
5. Sheet Pile or Floodwall
6. Storm Surge Barrier

ALTERNATIVE 1
STRUCTURAL FLOOD REDUCTION: FEATURES

- ~19,700 linear feet (LF) of floodwalls
- ~900 LF of levees/berms
- 1 tide gate
- 8 closure gates

ALTERNATIVE 1
STRUCTURAL FLOOD REDUCTION: FEATURES



Berry's Creek storm surge barrier

- **1,000 cubic feet per second (CFS) pump station**
- **118 foot wide dual-gate opening with short t-wall and earthen berms to prevent flanking (water flowing around surge barrier)**

ALTERNATIVE 1
STRUCTURAL FLOOD REDUCTION: FEATURES

4 Proposed Parks (10.1 acres)

- **Riverside Park**
- **Fluvial Park**
- **K-Town Park**
- **DePeyster Creek Park**

Multiple open space features along the line of protection, including a continuous riverwalk from the Hackensack Riverwalk south to Riverside Park

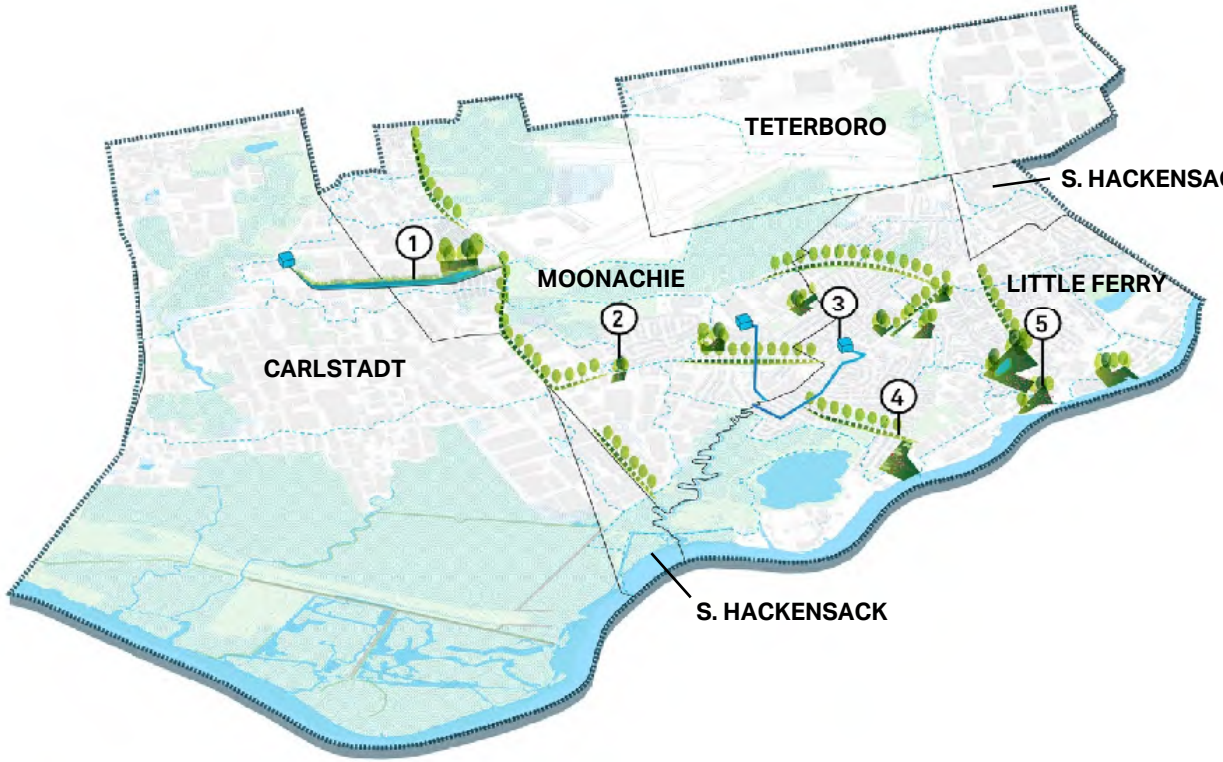
STORMWATER DRAINAGE IMPROVEMENTS

ALTERNATIVE 2 SUMMARY

LULU LOQUIDIS, AECOM

DEIS SECTION 2.5.3

ALTERNATIVE 2
STORMWATER DRAINAGE IMPROVEMENTS: PLAN



Provides improved stormwater drainage through construction of new and improved grey infrastructure and new green infrastructure throughout the Project Area

1. East Riser Channel Improvements + New Park
2. Green Infrastructure + New Park
3. Force Main + Public Facility Improvements
4. Green Infrastructure + New Park
5. Park Improvements + 3 New Parks + Green Infrastructure

ALTERNATIVE 2

STORMWATER DRAINAGE IMPROVEMENTS: FEATURES

3 New Pump Stations

- **(2) at Losen Slote**
- **(1) at East Riser Ditch**

2 New Force Mains

- **Both at Losen Slote**

ALTERNATIVE 2
STORMWATER DRAINAGE IMPROVEMENTS: FEATURES

East Riser Ditch Improvements

- Channel dredging between existing tide gate and Moonachie Avenue
- Culvert replacements at Amor Ave and West Commercial Ave
- Replacement of the railroad bridge

ALTERNATIVE 2

STORMWATER DRAINAGE IMPROVEMENTS: FEATURES

New Parks (20.0 acres)

- Fluvial Park
- Riverside Park
- Avanti Park
- DePeyster Creek Park
- Caesar Place Park

Improvements to 5 existing open spaces/public amenities

- Willow Lake Park
- Little Ferry Municipal Properties and Library
- Joseph Street Park
- Robert Craig School
- Little Ferry Public Schools

ALTERNATIVE 2

STORMWATER DRAINAGE IMPROVEMENTS: FEATURES

41 New Green Infrastructure Systems along Roadways

- **Bioswales**
- **Rain Gardens**
- **Storage/Tree Trenches**

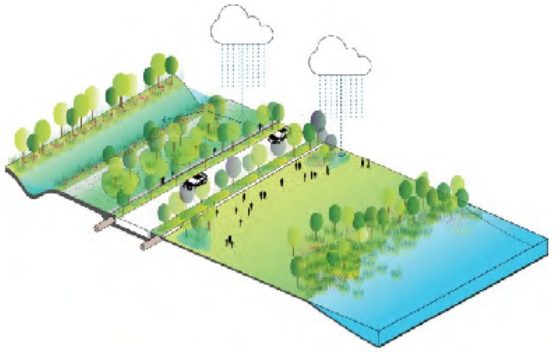
HYBRID ALTERNATIVE

ALTERNATIVE 3 SUMMARY
LULU LOQUIDIS, AECOM

DEIS SECTION 2.5.4 (BUILD PLAN) & DEIS SECTION 5.0 (FUTURE PLAN)

ALTERNATIVE 3 : PREFERRED ALTERNATIVE

HYBRID ALTERNATIVE: BUILD PLAN AND FUTURE PLAN



Build Plan

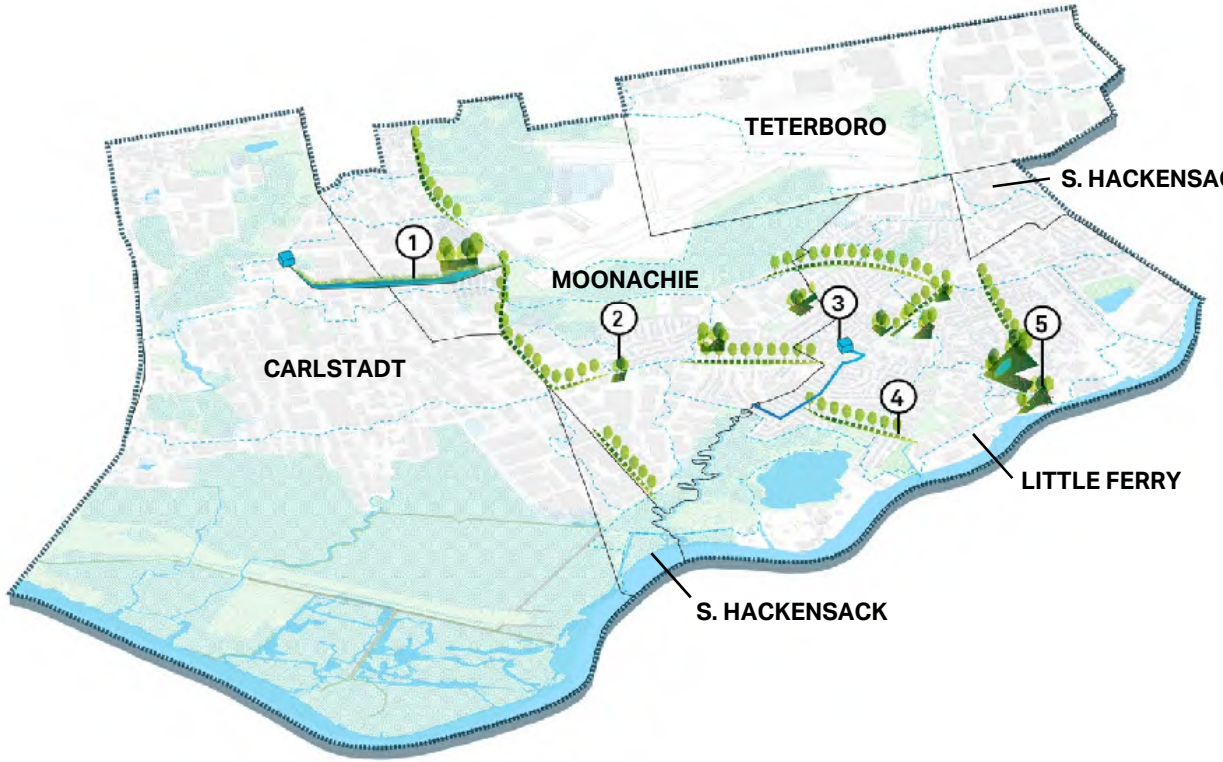
- The *Build Plan* represents a reasonable project with independent utility that can be **constructed by 2022.** Components include flood reduction strategies to address inland flooding (i.e., flooding)
- Analyzed in the DEIS (see Section 2.5.4)

Future Plan

- Additional flood reduction components, designed to provide both coastal and inland flood protection, became elements of a *Future Plan*. These elements could **be implemented** by others **over time** as new funding sources become available
- Analyzed in the Cumulative Impacts analysis in the DEIS (see Section 5.0)

ALTERNATIVE 3
BUILD PLAN

Provides improved stormwater drainage through construction of both grey infrastructure and green infrastructure similar to Alternative 2



Stormwater Management Features

1. East Riser: Channel Improvements + Enhanced Wetland Open Space
2. Avanti Park: Street Green Infrastructure + Enhanced Open Space
3. Losen Slote: Force Main + Public Facility Improvements
4. Green Infrastructure + Enhanced Wetland Open Space
5. GI Improvements to Willow Lake Park + 1 New Wetland / Open Space along Hackensack River

ALTERNATIVE 3
BUILD PLAN: FEATURES

2 New Pump Stations
- **(1) at Losen Slote**
- **(1) at East Riser Ditch**

1 New Force Main
- **At Losen Slote**

ALTERNATIVE 3
BUILD PLAN: FEATURES

East Riser Ditch Improvements

- **Channel dredging between existing tide gate and Moonachie Avenue**
- **Culvert replacements at Amor Ave and West Commercial Ave**
- **Replacement of the railroad bridge**

Proposed improvements are the same as Alternative 2

ALTERNATIVE 3
BUILD PLAN: FEATURES

New Parks (7.6 acres)

- **Riverside Park**
- **Avanti Park**
- **Caesar Place Park**

Improvements to 5 existing open spaces/public amenities

- **Willow Lake Park**
- **Little Ferry Municipal Properties and Library**
- **Joseph Street Park**
- **Robert Craig School**
- **Little Ferry Public Schools**

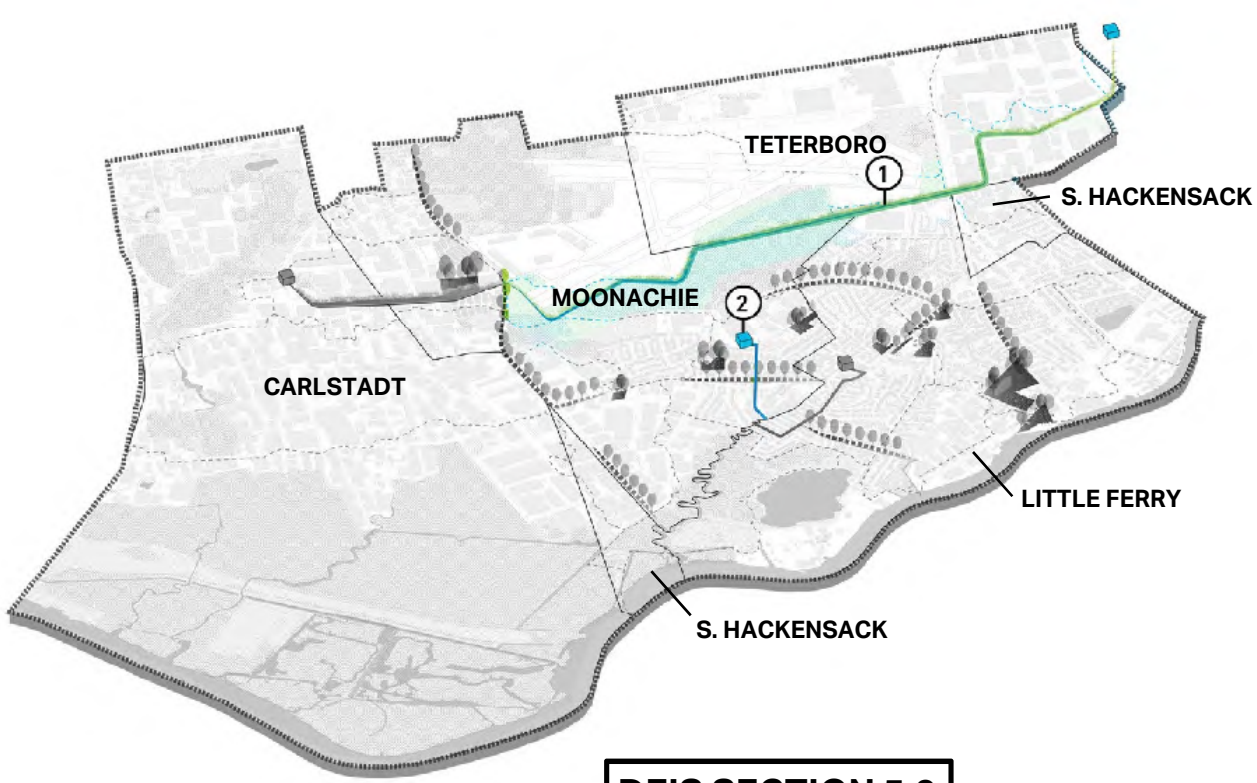
ALTERNATIVE 3
BUILD PLAN: FEATURES

41 New Green Infrastructure Systems along Roadways

- **Bioswales**
- **Rain Gardens**
- **Storage/Tree Trenches**

Proposed improvements are the same as Alternative 2

FUTURE PLAN
ADDITIONAL STORMWATER DRAINAGE IMPROVEMENTS



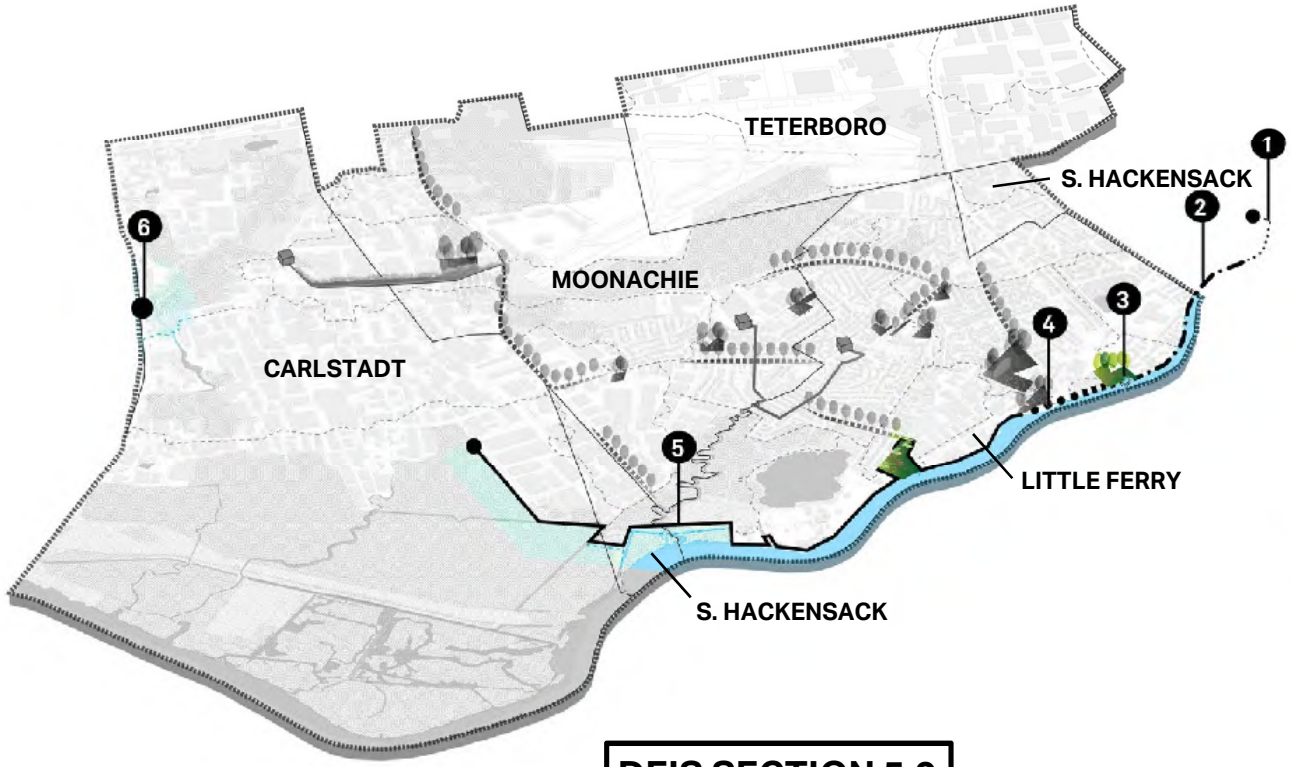
- These elements could **be implemented** by others **over time** as new funding sources become available
- Analyzed in the Cumulative Impacts analysis in the DEIS (see Section 5.0)

1. East Riser Channel Improvements Extension toward South Hackensack
2. A second Losen Slote Pump Station & Force Main (from Alternative 2)

DEIS SECTION 5.0

FUTURE PLAN

50-YEAR STORM SURGE PROTECTION FROM ALTERNATIVE 1



- These elements could **be implemented** by others **over time** as new funding sources become available
- Analyzed in the Cumulative Impacts analysis in the DEIS (see Section 5.0)

1. Existing Riverwalk
2. Sheet Pile Cantilever
3. Berms at Fluvial Park
4. Cantilever Walkway
5. Sheet pile or Floodwall
6. Storm Surge Barrier

DEIS SECTION 5.0

FLOOD REDUCTION SUMMARY

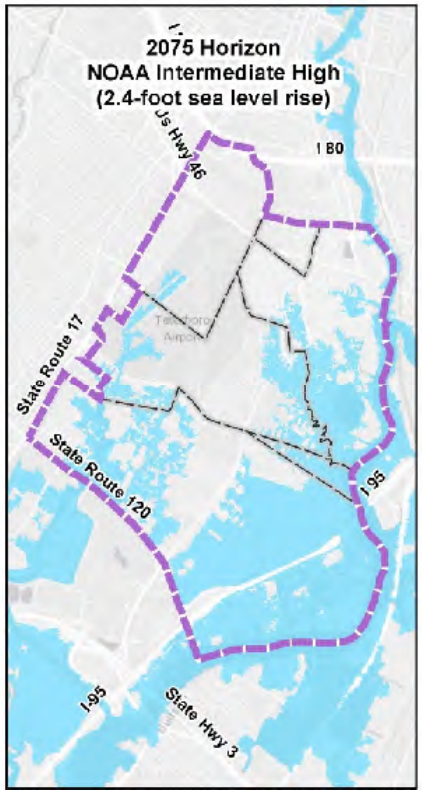
ALTERNATIVE 1

CHRISTOPHER BENOSKY, AECOM

DEIS SECTION 4.1.2

NO ACTION ALTERNATIVE

FLOODING DURING NORMAL TIDE



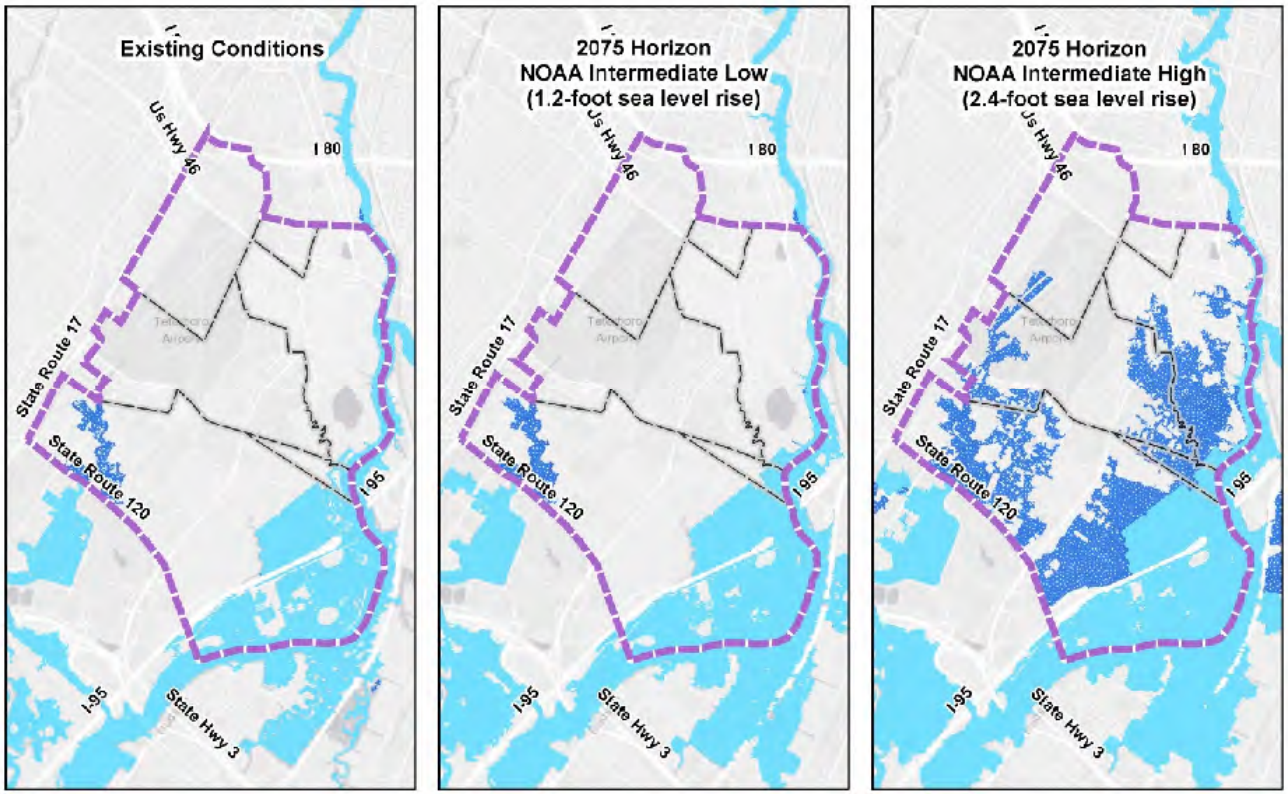
Anticipated flooding during a normal tide in the Project Area under the No Action Alternative

Two sea level rise scenarios (2075)

- Area at Risk of Flooding Under the No Action Alternative
- Project Area

ALTERNATIVE 1

COMPARISON OF FLOODING DURING NORMAL TIDE



Anticipated flooding during a normal tide in the Project Area with Alternative 1 compared to the No Action Alternative

Two sea level rise scenarios (2075)

- Area with Reduced Risk of Flooding under Alternative 1
- Area still at Risk of Flooding under Alternative 1
- Project Area

FLOOD REDUCTION SUMMARY

ALTERNATIVE 2

CHRISTOPHER BENOSKY, AECOM

DEIS SECTION 4.1.2

NO ACTION ALTERNATIVE

FLOODING IN EAST RISER DITCH SUB-WATERSHED

2-Year Storm (2023)

100-Year Storm (2023)

2-year and 100-year storm event projections

No Action Alternative

Area at Risk of Flooding Under the No Action Alternative

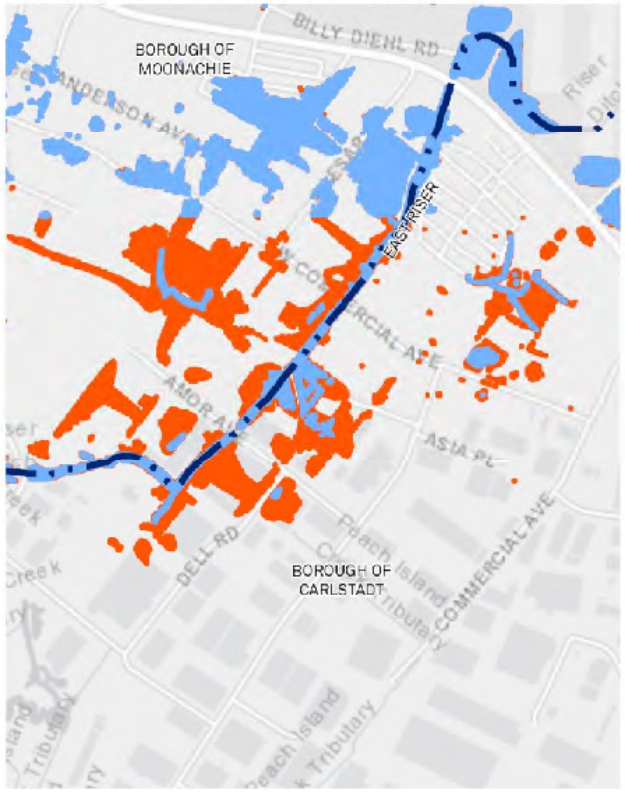
Channel Centerline

ALTERNATIVE 2

COMPARISON OF FLOODING IN EAST RISER DITCH SUB-WATERSHED

2-Year Storm (2023)

100-Year Storm (2023)



2-year and 100-year storm event projections

Each graphic compares the No Action Alternative to Alternative 2

- Area with Reduced Risk of Flooding under Alternative 2
- Area still at Risk of Flooding under Alternative 2
- Channel Centerline

NO ACTION ALTERNATIVE

FLOODING IN LOSEN SLOTE SUB-WATERSHED

2-Year Storm (2023)

100-Year Storm (2023)

2-year and 100-year storm event projections

No Action Alternative

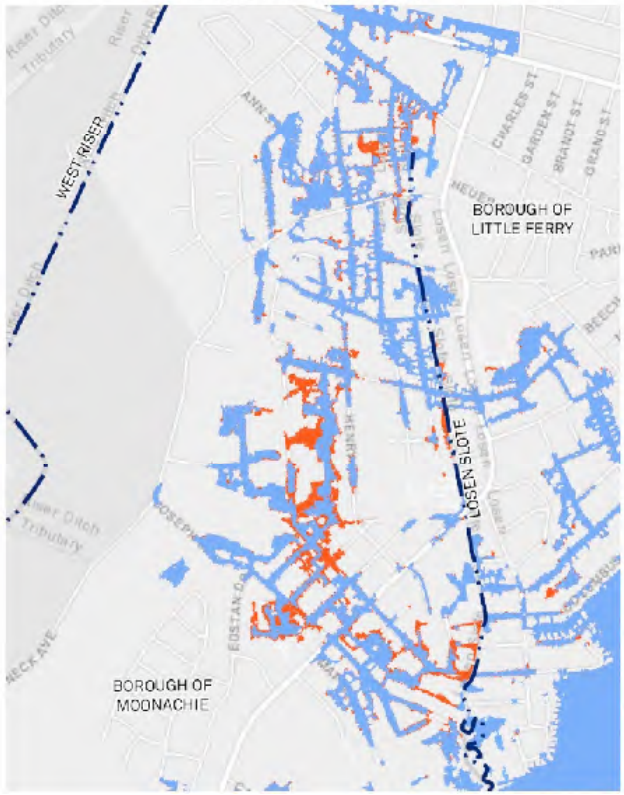
Area at Risk of Flooding Under the No Action Alternative

Channel Centerline

ALTERNATIVE 2

COMPARISON OF FLOODING IN LOSEN SLOTE SUB-WATERSHED

2-Year Storm (2023)



100-Year Storm (2023)

2-year and 100-year storm event projections

Each graphic compares the No Action Alternative to Alternative 2

- Area with Reduced Risk of Flooding under Alternative 2
- Area still at Risk of Flooding under Alternative 2
- Channel Centerline

FLOOD REDUCTION SUMMARY

ALTERNATIVE 3: BUILD PLAN

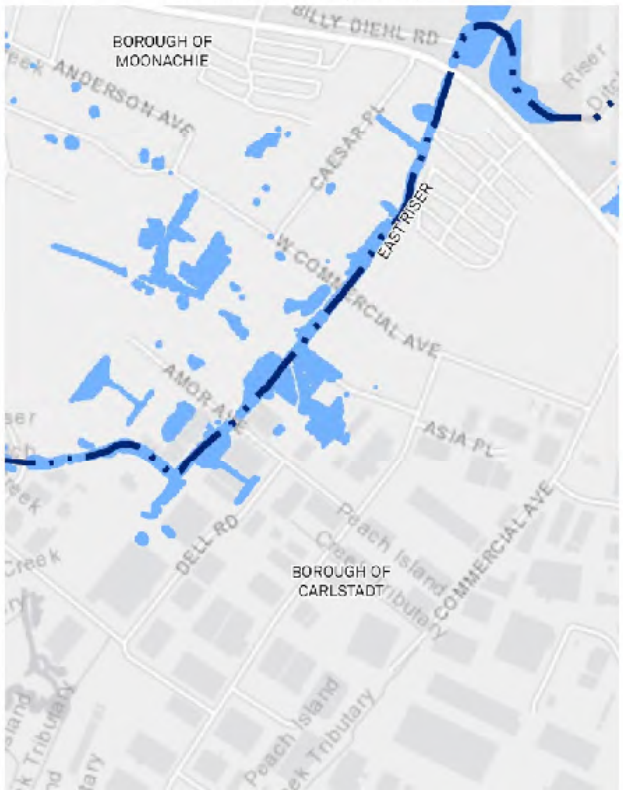
CHRISTOPHER BENOSKY, AECOM

DEIS SECTION 4.1.2

NO ACTION ALTERNATIVE

FLOODING IN EAST RISER DITCH SUB-WATERSHED: SAME AS ALT 2

2-Year Storm (2023)



100-Year Storm (2023)

2-year and 100-year storm event projections

No Action Alternative

Area at Risk of Flooding Under the No Action Alternative

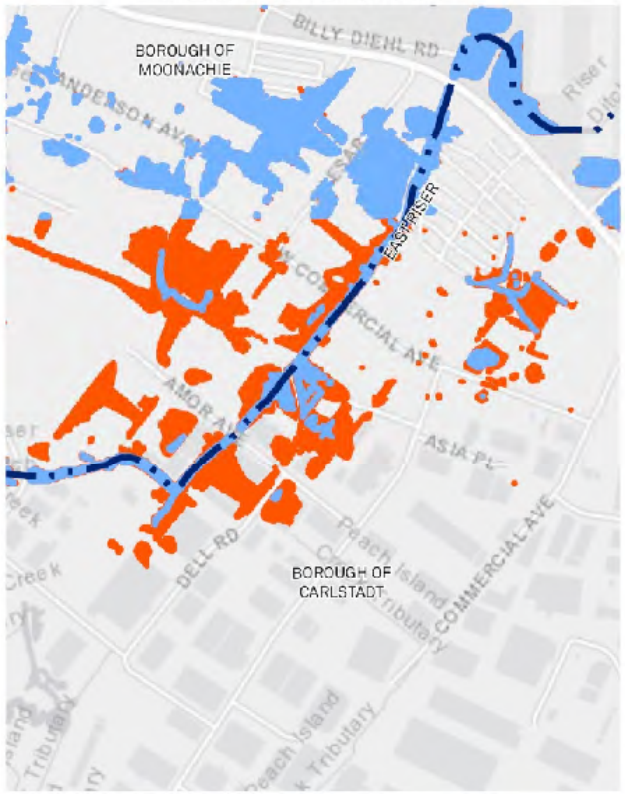
Channel Centerline

ALTERNATIVE 3: BUILD PLAN

EAST RISER DITCH SUB-WATERSHED FLOOD REDUCTION: SAME AS ALT 2

2-Year Storm (2023)

100-Year Storm (2023)



2-year and 100-year storm event projections

Each graphic compares the No Action Alternative to Alternative 3

- Area with Reduced Risk of Flooding under Alternative 3
- Area still at Risk of Flooding under Alternative 3
- Channel Centerline

NO ACTION ALTERNATIVE

FLOODING IN LOSEN SLOTE SUB-WATERSHED

2-Year Storm (2023)

100-Year Storm (2023)

2-year and 100-year storm event projections

No Action Alternative

Area at Risk of Flooding Under the No Action Alternative

Channel Centerline

ALTERNATIVE 3: BUILD PLAN

COMPARISON OF FLOODING: LOSEN SLOTE SUB-WATERSHED

2-Year Storm (2023)

100-Year Storm (2023)

2-year and 100-year storm event projections

Each graphic compares the No Action Alternative to Alternative 3

- Area with Reduced Risk of Flooding under Alternative 3
- Area still at Risk of Flooding under Alternative 3
- Channel Centerline

ENVIRONMENTAL IMPACT ANALYSIS

BRIAN BOOSE, AECOM

DEIS SECTIONS 4.0 & 5.0

21 TECHNICAL RESOURCE AREAS ANALYZED

- Land Use and Land Use Planning
- Visual Quality/Aesthetics
- Socioeconomics, Community/Populations, and Housing
- Environmental Justice
- Cultural and Historical Resources
- Transportation and Circulation
- Noise and Vibration
- Air Quality and Greenhouse Gas Emissions
- Global Climate Change and Sea Level Change
- Recreation
- Utilities and Service Systems
- Public Services
- Biological Resources
- Geology and Soils
- Water Resources, Water Quality, and Waters of the US
- Hydrology and Flooding
- Coastal Zone Management
- Sustainability & Green Infrastructure
- Hazards and Hazardous Materials
- Mineral and Energy Resources
- Agricultural Resources and Prime Farmlands

ENVIRONMENTAL IMPACT ANALYSIS PROCESS

STEP 1: DEFINE IMPACT SIGNIFICANCE CRITERIA

Impact Significance Criteria are based on CONTEXT and INTENSITY*

Context: portion of environment that could experience a meaningful change from the Proposed Project

- Local geographic area, society as a whole, etc.

Intensity: severity of the impact

- Based on type, quality, and duration (short-term vs. long-term) of impacts or the sensitivity of resources involved
- Often correlated with regulatory or permitting thresholds

Impact significance criteria are defined by Technical Resource Area in the DEIS

*(40 CFR § 1508.27)

DEIS SECTION 4.1.1

ENVIRONMENTAL IMPACT ANALYSIS PROCESS

STEP 2: UNDERSTAND AND ANALYZE TYPES OF IMPACTS

No Impact

- No potential for effect or negligible impact

Less-than-significant, adverse

- Impact **below significance threshold**
- Measureable change on a local or regional level
- Mitigation measures or BMPs may be recommended

Potentially significant, adverse

- Impact **exceeds significance threshold**
- Measurable change on a local or regional level. If regulatory standards apply, standards would be exceeded
- Mitigation and/or BMPs are required. May or may not be able to be mitigated to *less-than-significant* levels

Beneficial

- Would cause a **positive change or improvement** in the environment
- No mitigation measures or BMPs necessary

ENVIRONMENTAL IMPACT ANALYSIS PROCESS

STEP 3: IDENTIFY MITIGATION MEASURES AND BMPs

Design/Coordination/Pre-Construction

- Permitting and consultation/coordination with regulatory agencies and stakeholders
- Minimization through final design and construction planning

Construction

- Standard BMPs (stormwater, noise, dust, traffic, etc.)
- Compliance with applicable laws and regulations
- Continued coordination

Operation & Maintenance (O&M activities)

- Timing (e.g., outside peak traffic hours)
- Protocol (e.g., signage, types of vegetation, etc.)

A complete summary of Mitigation Measures and BMPs are included in Table 6.4-2 in the DEIS.

ALL BUILD ALTERNATIVES

LESS-THAN-SIGNIFICANT ADVERSE IMPACTS

18 RESOURCE AREAS

DEIS SECTION 4.0

LESS-THAN-SIGNIFICANT ADVERSE IMPACTS
ALTERNATIVES 1, 2, AND 3

SHORT-TERM CONSTRUCTION

- Noise / vibration
- Dust / emissions
- Traffic disruptions
- Property easement acquisitions
- Vegetation removal / soil disturbance
- In-water construction / wetland impacts
- Disturbance to contaminated sites
- Temporary upland and wetland habitat disturbance
- BMPs would be implemented during construction

A complete summary of Mitigation Measures and BMPs are included in Table 6.4-2 in the DEIS.

LESS-THAN-SIGNIFICANT ADVERSE IMPACTS
ALTERNATIVES 1, 2, AND 3

LONG-TERM OPERATIONS & MAINTENANCE

- Noise (pump station testing)
- Sediment transport (improved stormwater conveyance)
- Utility use
- Periodic maintenance / temporary road closures
- BMPs would be implemented during construction

A complete summary of Mitigation Measures and BMPs are included in Table 6.4-2 in the DEIS.

ALL BUILD ALTERNATIVES

POTENTIALLY SIGNIFICANT IMPACTS

POTENTIALLY SIGNIFICANT IMPACTS

UP TO 7 RESOURCE AREAS WITH POTENTIALLY SIGNIFICANT IMPACTS

- Land Use and Land Use Planning
- Cultural and Historical Resources
- Noise and Vibration
- Hydrology and Flooding
- Biological Resources
- Water Resources, Water Quality, and Waters of the US
- Hazards & Hazardous Material

DEIS SECTION 4.0

LAND USE AND LAND USE PLANNING
POTENTIALLY SIGNIFICANT ADVERSE IMPACTS

Potential Impact	Alternative 1	Alternative 2	Alternative 3
• One (1) anticipated business displacement for the Berry's Creek storm surge barrier	**Yes**	No	No

Mitigation Measures

✓ **During Design/Coordination/Pre-Construction**, the affected property owners would be coordinated with to obtain mutually agreeable settlements.

DEIS SECTION 4.2

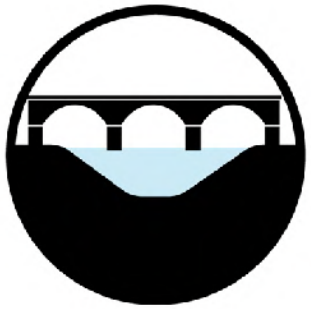
CULTURAL AND HISTORICAL RESOURCES

POTENTIALLY SIGNIFICANT ADVERSE IMPACTS

Potential Impact	Alternative 1	Alternative 2	Alternative 3
• Possible physical alteration and/or viewshed impacts to US Route 46 Bridge from Fluvial Park	**Yes**	**Yes**	No
• Possible disturbance to archaeological resources during construction (areas of high sensitivity)	**Yes** 5 Areas	**Yes** 3 Areas	**Yes** 2 Areas

Mitigation Measures

- ✓ **During Design/Coordination/Pre-Construction**, NJDEP would continue to consult with the New Jersey Historic Preservation Office (NJHPO) and implement mitigation measures in accordance with Section 106 of the National Historic Preservation Act.
- ✓ **During Construction**, archaeological monitoring may be necessary in high sensitivity areas.



DEIS SECTION 4.6

NOISE AND VIBRATION

POTENTIALLY SIGNIFICANT ADVERSE IMPACTS

Potential Impact	Alternative 1	Alternative 2	Alternative 3
• Impacts to properties/buildings during construction activities (e.g., pile driving)	Yes	Yes	Yes

Mitigation Measures

- ✓ **During Design/Coordination/Pre-Construction**, a noise mitigation plan and vibration monitoring plan would be developed.
- ✓ **During Construction**, the above listed plans would be implemented and noise reducing and/or the quietest practicable construction methods and equipment would be used.
- ✓ **During Operation**, stationary equipment (e.g., generators) would be enclosed and would use sound attenuators in these enclosures.

DEIS SECTION 4.8

BIOLOGICAL RESOURCES

POTENTIALLY SIGNIFICANT ADVERSE IMPACTS

Potential Impact	Alternative 1	Alternative 2	Alternative 3
• Aquatic habitat loss from dredge and fill activities associated with the Line of Protection and Berry's Creek storm surge barrier	**Yes**	No	No

Mitigation Measures

✓ **During Design/Coordination/Pre-Construction**

- ❖ Develop a compensatory mitigation plan to compensate for long-term unavoidable impacts to regulated wetlands and other Waters of the US.
- ❖ Coordinate with US Fish and Wildlife Service, NJDEP, Army Corps of Engineers (USACE), National Oceanic and Atmospheric Administration (NOAA), and others applicable regulatory agencies and obtain necessary permits.

DEIS SECTION 4.14

WATER RESOURCES

POTENTIALLY SIGNIFICANT ADVERSE IMPACTS

Potential Impact	Alternative 1	Alternative 2	Alternative 3
• Impacts to surface water quality, quantity, or flow from installation of pilings within and walkways over the Hackensack River	**Yes**	**Yes**	**Yes**
• Impacts to surface water quality, quantity, or flow from installation of floodwalls, a tide gate, and the Berry's Creek storm surge barrier in surface waters	**Yes**	No	No
• Localized sediment /contaminant transport from Losen Slote and East Riser Ditch pump stations	No	**Yes**	**Yes**
• Impacts to wetlands, open waters, and riparian zones from the placement of permanent fill	**Yes**	**Yes**	**Yes**

DEIS SECTION 4.16

WATER RESOURCES
POTENTIALLY SIGNIFICANT ADVERSE IMPACTS

Impacted Resources	Alternative 1	Alternative 2	Alternative 3
	Permanent Impacts (Approx. Acres)		
Wetlands	1.2	0.3	0.3
Open Water	1.0	0.3	0.3
Riparian Zone	8.8	1.4	0.8

DEIS SECTION 4.16

WATER RESOURCES
POTENTIALLY SIGNIFICANT ADVERSE IMPACTS

Mitigation Measures

- ✓ **During Design/Coordination/Pre-Construction**
  - ❖ Coordinate with USACE, US Coast Guard, NOAA, and other applicable regulatory agencies and obtain necessary permits.
  - ❖ Coordinate with the US Environmental Protection Agency (USEPA) and Berry's Creek Study Area (BCSA) Cooperating Potentially Responsible Parties (PRP) Group during the final design process.
  - ❖ Incorporate energy dissipation structures into the design at the Losen Slote and East Riser Ditch pump station discharge locations **(only applies to Alternatives 2 & 3)**
  - ❖ Develop compensatory mitigation plan for long-term unavoidable impacts to regulated wetlands, open waters, and riparian zones .
- ✓ **During Construction**, compensatory mitigation plan would be implemented.

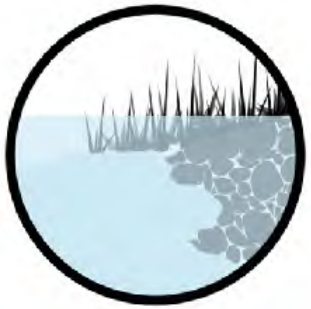
DEIS SECTION 4.16

HYDROLOGY AND FLOODING
POTENTIALLY SIGNIFICANT ADVERSE IMPACTS

Potential Impact	Alternative 1	Alternative 2	Alternative 3
• Potential for induced flooding outside the Project Area in industrial areas downstream of Berry's Creek during coastal flood events	**Yes**	No	No

Mitigation Measures

✓ **During Design/Coordination/Pre-Construction Phase**, the design would be further refined to eliminate induced flooding or to reduce it to less-than-significant levels in accordance with regulatory requirements.



DEIS SECTION 4.17

HAZARDS AND HAZARDOUS MATERIALS
POTENTIALLY SIGNIFICANT ADVERSE IMPACTS

Potential Impact	Alternative 1	Alternative 2	Alternative 3
• Potential for direct and indirect impacts to contaminated sites	**Yes** 11 sites	**Yes** 20 sites	**Yes** 19 sites
• Potential disturbance to previously unknown hazardous materials during construction	**Yes**	**Yes**	**Yes**
• Potential mobilization of contaminants in soil or groundwater during construction, or from increased stormwater infiltration during operation	**Yes**	**Yes**	**Yes**
• Proximity to one aboveground storage tank	**Yes**	**Yes**	**Yes**
• Possible interference with future remedial investigations	**Yes**	**Yes**	**Yes**

DEIS SECTION 4.20

HAZARDS AND HAZARDOUS MATERIALS
POTENTIALLY SIGNIFICANT ADVERSE IMPACTS

Mitigation Measures

- ✓ **During Design/Coordination/Pre-Construction**
  - ❖ Consult with HUD to ensure compliance with acceptable separation distance standards.
  - ❖ Notify parties responsible for completing remediation of properties adjacent to, or within 200 feet of, the Proposed Project footprint of the design/schedule.
  - ❖ Coordinate with the USEPA and BCSA Cooperating PRP Group during the final design process.
- ✓ **During Construction,** implement BMPs to ensure mitigation, if not prevention, of the release and spread of contamination.
- ✓ **During Operation,** O&M activities would comply with NJ Site Remediation and Reform Act requirements for contaminated sites.

DEIS SECTION 4.20

POTENTIALLY SIGNIFICANT ADVERSE IMPACTS
COMPARATIVE TABLE

Technical Resources Areas	Alternative 1	Alternative 2	Alternative 3
• Land Use and Land Use Planning	**Yes**	No	No
• Cultural and Historical Resources	**Yes**	**Yes**	**Yes**
• Noise and Vibration	**Yes**	**Yes**	**Yes**
• Biological Resources	**Yes**	No	No
• Water Resources, Water Quality, and Waters of the US	**Yes**	**Yes**	**Yes**
• Hydrology and Flooding	**Yes**	No	No
• Hazards and Hazardous Materials	**Yes**	**Yes**	**Yes**

ALL BUILD ALTERNATIVES

BENEFICIAL IMPACTS

DEIS SECTION 4.0

BENEFICIAL IMPACTS

19 RESOURCE AREAS HAVE BENEFICIAL IMPACTS

- Land Use and Land Use Planning
- Visual Quality/Aesthetics
- Socioeconomics, Community/Populations, and Housing
- Environmental Justice
- Cultural and Historical Resources
- Transportation and Circulation
- Global Climate Change and Sea Level Change
- Recreation
- Utilities and Service Systems
- Public Services
- Biological Resources
- Geology and Soils
- Water Resources, Water Quality, and Waters of the US
- Hydrology and Flooding
- Coastal Zone Management
- Sustainability & Green Infrastructure
- Hazards and Hazardous Materials
- Mineral and Energy Resources
- Agricultural Resources and Prime Farmlands

DEIS SECTION 4.0

ALTERNATIVE 1

BENEFICIAL IMPACTS

19 RESOURCE AREAS

DEIS SECTION 4.0

BENEFICIAL IMPACTS
ALTERNATIVE 1

Increased coastal flood protection (50-year storm surge)

- Between 12 and 21% of Project Area, depending on future sea level rise

Creation of 4 new parks/open space (10.1 acres in total)

- Wide variety of park types and **amenities**
- New public **river access** and boating opportunities
- 1.8 miles of new **pedestrian paths**
- 1.1 acres of **wetland creation/enhancement**, plus other habitat enhancements
- 0.8 acre **decrease in impervious** surfaces
- 3.2M gallons **stormwater runoff reduction** per year

New jobs

- 990 construction job-years and 20 annual O&M **jobs**

ALTERNATIVE 2

BENEFICIAL IMPACTS

19 RESOURCE AREAS

DEIS SECTION 4.0

BENEFICIAL IMPACTS
ALTERNATIVE 2

Increased inland flood protection in East Riser Ditch and Losen Slote drainage basins

- East Riser Ditch: Approximately **182 buildings** would be protected during 100-year storm, totaling **$7.8M** in avoided damages
- Losen Slote: Approximately **60 buildings** would be protected during a 100-year storm, totaling **$1.1M** in avoided damages

Localized stormwater management improvements

- 41 new **green infrastructure** systems
- 3.4 acres of **impervious surface reductions**
- 24.9M gallons of **stormwater runoff reduction** per year
- **Water quality** benefits from total suspended solid and nutrient removal

BENEFICIAL IMPACTS
ALTERNATIVE 2

Creation of 5 new parks (20.0 acres in total) and improvement of 5 existing open space areas/public amenities

- Wide variety of park types and **amenities**
- **New public access** to the Hackensack River with viewing & boating opportunities
- 1.9 miles of new **pedestrian paths**
- 7.2 acres of **wetland creation/enhancement**, plus other habitat enhancements
- **Water quality** benefits from total suspended solid and nutrient removal

New jobs

- 1,000 construction job-years and 22 annual O&M **jobs**

ALTERNATIVE 3

BENEFICIAL IMPACTS

19 RESOURCE AREAS

DEIS SECTION 4.0

BENEFICIAL IMPACTS
ALTERNATIVE 3

Increased inland flood protection in East Riser Ditch and Losen Slote drainage basins

- East Riser Ditch: Approximately **182 buildings** would be protected during 100-year storm, totaling **$7.8M** in avoided damages
- Losen Slote: Approximately **44 buildings** would be protected during a 100-year storm, totaling **$0.6M** in avoided damages

Localized stormwater management improvements

- 41 new **green infrastructure** systems
- 3.7 acres of **impervious surface reductions**
- 9.0M gallons of **stormwater runoff reduction** per year
- **Water quality** benefits from total suspended solid and nutrient removal

BENEFICIAL IMPACTS
ALTERNATIVE 3

Creation of 3 new parks (7.6 acres in total) and improvement of 5 existing open spaces/public amenities

- Wide variety of park types and **amenities**
- New public **river access** and boating opportunities
- 1.2 miles of new **pedestrian paths**
- 3.5 acres of **wetland creation/enhancement**, plus other habitat enhancements

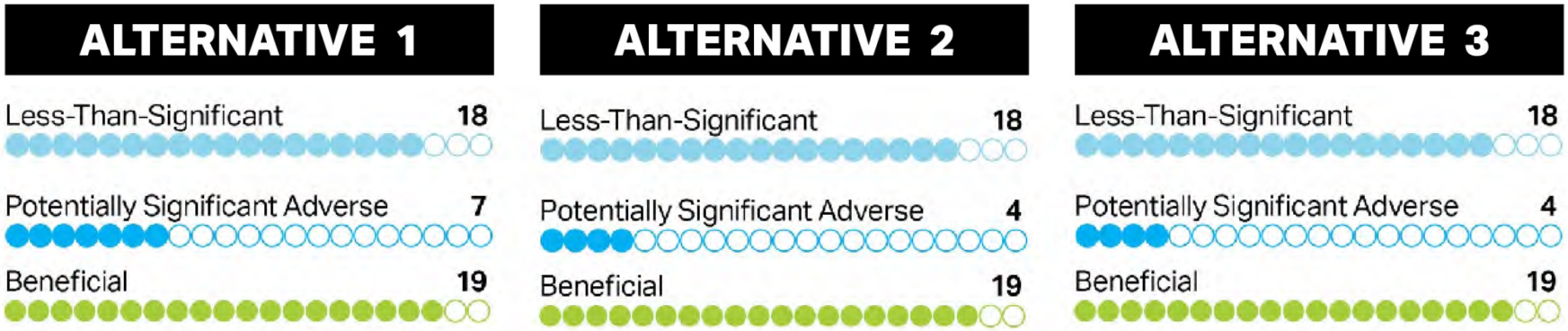
New jobs

- 640 construction job-years and 16 annual O&M **jobs**

SUMMARY OF IMPACTS BY ALTERNATIVE

Summary of Impacts

- Alternative 1 would generally result in greater adverse impacts than Alternatives 2 or 3.
- Alternatives 2 and 3 would result in approximately equivalent impacts. However, impacts would be slightly greater under Alternative 2 in some instances.
- Some resource areas would experience a range of effects from various Proposed Project components.



ALL BUILD ALTERNATIVES

CUMULATIVE IMPACTS

DEIS SECTION 5.0

CUMULATIVE IMPACTS ANALYSIS
METHODOLOGY

What are Cumulative Impacts?

"The impact on the environment which results from the incremental impact of a Proposed Project when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions." (40 CFR § 1508.7)

Past, present, and reasonably foreseeable future projects within the Proposed Project's Region of Influence (ROI) were identified through:

- Review of numerous sources (e.g., news articles, local master plans, redevelopment plans, other publicly available planning data, etc.)
- Conversations with local government officials
- Information available from NJDEP
- Input from the Citizen Advisory Group (CAG) members

Over 120 relevant projects were identified as a result of this comprehensive effort (see **Appendix C** in the DEIS)

DEIS SECTION 5.0

CUMULATIVE IMPACTS ANALYSIS
METHODOLOGY

Past and present projects were assessed in the environmental baseline (i.e., Affected Environment) presented in **Section 3.0** of the DEIS.

Reasonably Foreseeable Future (RFF) projects were identified geographically and mapped.

- If a RFF project's effects would overlap with the ROI of the Proposed Project (under any Build Alternative) within the same timeframe, further analysis was conducted.
- If a RFF project's effects have no spatial or temporal overlap with the ROI of the Proposed Project, there would be no cumulative impact for that resource area because the effects would not occur within the same context (40 CFR § 1508.27(a)).

CUMULATIVE IMPACTS ANALYSIS

SUMMARY

Potentially significant cumulative impacts could occur during the **construction phase** of the Proposed Project for up to **4 technical resource areas**.

- Transportation and Circulation
- Noise and Vibration
- Biological Resources
- Water Resources, Water Quality, and Waters of the U.S.

No potentially significant cumulative impacts would be anticipated during the **O&M phase** of the Proposed Project

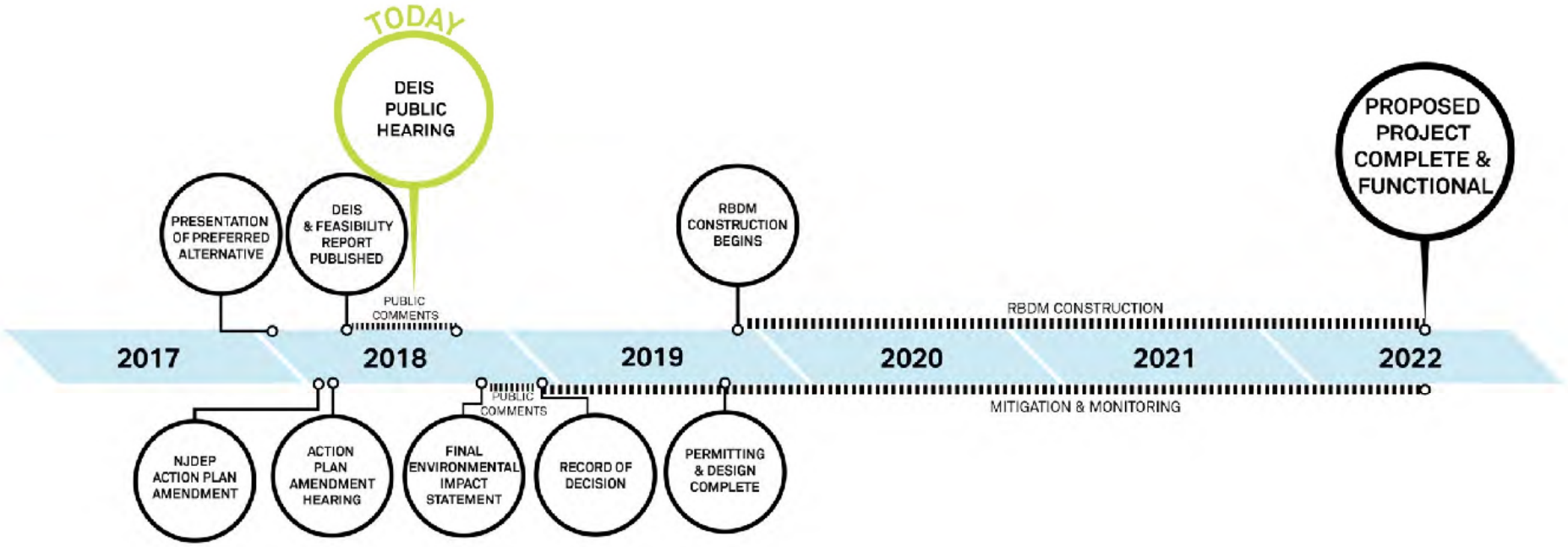
Mitigation Measures

- ✓ NJDEP and RFF project sponsors would proactively coordinate with local municipalities, service providers, planning boards, the Meadowlands Interagency Mitigation Advisory Committee (MIMAC), and others, as appropriate.
- ✓ Community stakeholders would be engaged during all phases of the Proposed Project in accordance with the Citizen Outreach Plan.

NEXT STEPS

CHRISTOPHER BENOSKY, AECOM

UPCOMING SCHEDULE + NEXT STEPS



AREAS OF ONGOING COORDINATION

NJDEP UPCOMING ACTIVITIES

- 45-Day DEIS public comment period: Ends July 15th
- Publish Final EIS: October
- Prepare ROD, Publish NOA, and Request Release of Funds: November
- Continue consulting with the USEPA and BCSA PRP Group, NJHPO, and other regulatory agencies
- Develop O&M Plan that identifies the entities performing routine, on-going maintenance

PUBLIC COMMENT PERIOD
WAYS TO COMMENT

- Provide oral comments at tonight's meeting
- Complete and submit a written comment card
- Email: rbd-meadowlands@dep.nj.gov
- Mail comments to:

  New Jersey Department of Environmental Protection
  c/o Dennis Reinknecht, Program Manager
  501 East State Street
  Mail Code 501-01A, PO Box 420
  Trenton, NJ 08625-0420

Comment Submission Deadline: July 15, 2018

OPEN COMMENT PERIOD
HOW TO PROVIDE ORAL COMMENTS

- **Open Comment Period:** ends at 8pm
- **Commenter Time Limit :** 3 Minutes

Your comments and questions are both sought and appreciated by NJDEP!

- **We ask that your comments be presented in a way that allows us to *consider, incorporate, and/or address* them fully and accurately – the following provides some guidance:**
  - State your Name and Affiliation
  - Be Clear and Concise
  - Be Constructive

Impact Definitions

Less-Than-Significant

- Impact **BELOW** significance threshold
- Measurable change on local or regional level
- Mitigation measures or best management practices (BMPs) may be recommended

Potentially Significant Adverse

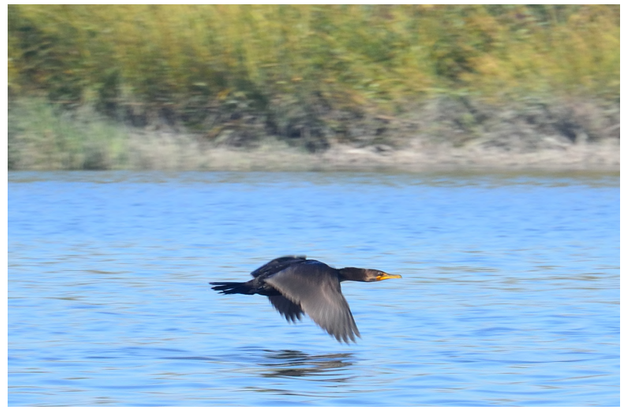
- Impact **EXCEEDS** significance threshold
- Measurable change on local or regional level. If regulatory standards apply, standards would not be met
- Mitigation measures and BMPs are required. May or may not be able to be mitigated to less-than-significant levels

Beneficial

- Would cause a positive change or improvement in the environment
- No mitigation measures or BMPs necessary

21 Technical Resource Areas Analyzed

LAND USE + LAND USE PLANNING
Visual Quality/Aesthetics
Socioeconomics, Community/Populations, and Housing
Air Quality and GHG Emissions
Recreation
NOISE + VIBRATION
Environmental Justice
Geology and Soils
CULTURAL RESOURCES
Global Climate Change and Sea Level Change
BIOLOGICAL RESOURCES
Public Services
Coastal Zone Management
Sustainability/Green Infrastructure
Utilities and Service Systems
WATER RESOURCES
HYDROLOGY + FLOODING
Mineral and Energy Resources
Agricultural Resources and Prime Farmlands
HAZARDS + HAZARDOUS MATERIALS
Transportation and Circulation



Environmental Impact Analysis

The following impacts could occur as a result of the Proposed Project under Alternatives 1, 2, and 3.

Beneficial Impacts

- Increased Flood Protection
- Improved Stormwater Conveyance
- New Green Infrastructure
- Improved Water Quality
- New Public Access to Hackensack River
- New Parks and Recreation
- More Pedestrian Pathways
- Upland Habitat Enhancements
- Wetland Creation / Enhancement
- New Construction and Operations & Maintenance (O&M) Jobs

Short-term Impacts (Construction)

- Noise / Vibration
- Dust / Air Emissions
- Traffic Disruption
- Property Easement Acquisitions
- Vegetation Removal / Soil Disturbance
- In-water Construction / Wetland Impacts
- Disruption of Contaminated Sites
- Temporary Upland and Wetland Habitat Disturbance

Long-term Impacts (O&M)

- Noise (Pump Stations)
- Sediment Transport (Improved Stormwater Conveyance)
- Utility Use
- Periodic Maintenance / Temporary Road Closures

AECOM

REBUILD BY DESIGN
MEADOWLANDS

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) PUBLIC HEARING

TUESDAY, JUNE 26, 2018

Robert L. Craig Elementary School
20 West Park Street
Moonachie, New Jersey, 07074

What's the Story?

The Rebuild By Design Meadowlands (RBDM) Flood Protection Project (Proposed Project) is a comprehensive urban water management project designed to reduce the risk of floods from coastal storm surges and/or systemic inland flooding from high-intensity rainfall events in the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack, all in Bergen County, NJ.

This Proposed Project was developed from a concept conceived through the Hurricane Sandy Rebuilding Task Force's RBD program, a design competition to promote the development of resiliency in the Sandy-affected region, and has been allocated $150 million in grant funds from the United States (US) Department of Housing and Urban Development (HUD) for design and construction. In accordance with the conditions of this funding, the Proposed Project must have independent utility and be fully implemented by September 2022.

The DEIS describes three Build Alternatives to implement the Proposed Project, as well as a No Action Alternative, and analyzes the anticipated environmental impacts of each. The Build Alternatives are illustrated on the following pages.

To submit comments on the DEIS at this meeting:

- Provide oral comments during the open comment session
- Fill out a Comment Card and place it in the Comment Box, located at the stenographer station

To submit comments on the DEIS after this meeting:
Submit comments and questions directly to the New Jersey Department of Environmental Protection (NJDEP) by July 15, 2018, via one of the following two methods:

Email: rdb-meadowlands@dep.nj.gov

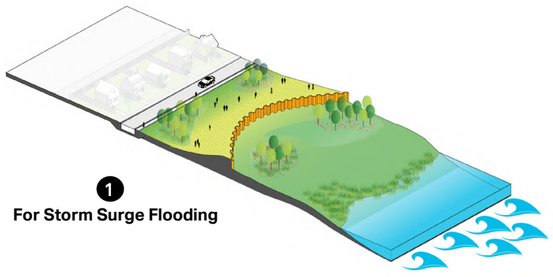
Mail:
New Jersey Department of Environmental Protection
c/o Dennis Reinknecht, Program Manager
Bureau of Flood Resilience
501 East State Street
Mail Code 501-01A, PO Box 420
Trenton, NJ 08625-0420

WHERE TO FIND ADDITIONAL INFORMATION

For further information, or to read the DEIS, please visit the Proposed Project's website:
www.rbd-meadowlands.nj.gov

Alternative 1:
Structural Flood Reduction

Alternative 1 would implement a line of protection around the Project Area that would guard against flooding from the Hackensack River and Berry's Creek during coastal storm surges. Alternative 1 would be designed to provide flood protection up to an elevation of 7 feet (NAVD 88). This height would provide protection against approximately the present-day 50-year storm surge. Public realm and ecological benefits would also be incorporated.



1
For Storm Surge Flooding

Features Include:

- ~19,700 linear feet (LF) of floodwalls
- ~900 LF of levees/berms
- a tide gate
- 8 closure gates
- a surge barrier & pump station
- 4 new parks and a riverwalk

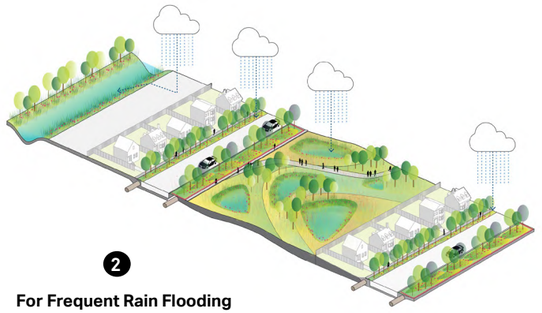
Technical Resource Impacts

21 Technical Resource Areas were evaluated.
Below are the results for Alternative 1:

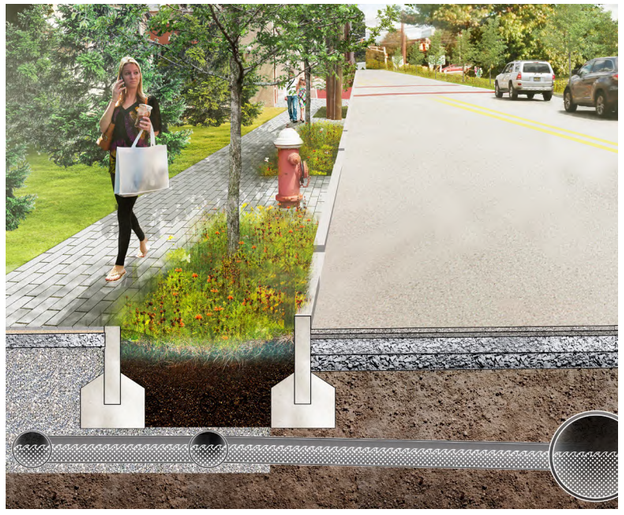
Less-Than-Significant Adverse Impacts	18
Potentially Significant Adverse Impacts	7
Beneficial Impacts	19

Alternative 2:
Stormwater Drainage Improvements

Alternative 2 would reduce inland flooding in the Project Area that results from high-intensity rainfall events. This would be accomplished through new construction of both grey and green infrastructure in key locations throughout the Project Area to improve stormwater drainage.



2
For Frequent Rain Flooding



Features Include:

- 41 green infrastructure systems
- 5 new parks
- improvements to existing parks
- 3 pump stations
- 2 force mains
- East Riser Ditch improvements

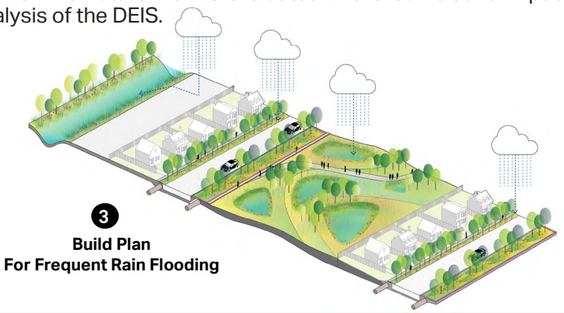
Technical Resource Impacts

21 Technical Resource Areas were evaluated.
Below are the results for Alternative 2:

Less-Than-Significant Adverse Impacts	18
Potentially Significant Adverse Impacts	4
Beneficial Impacts	19

Alternative 3:
Hybrid Alternative (Build Plan)

Alternative 3 was separated into two stages: a *Build Plan* and *Future Plan*. The *Build Plan*, which could be implemented as part of the Proposed Project and is analyzed in detail in the DEIS, would reduce inland flooding in the Project Area, similar to Alternative 2. The *Future Plan*, which would include additional inland flood protection and the Alternative 1 coastal flood protection in the Project Area, could be constructed by others over time as funding sources become available and construction feasibility allows. The *Future Plan* is evaluated in the Cumulative Impacts analysis of the DEIS.



3
Build Plan
For Frequent Rain Flooding

Features Include:

- 41 green infrastructure systems
- 3 new parks
- improvements to existing parks
- 2 pump stations
- 1 force main
- East Riser Ditch improvements

Technical Resource Impacts

21 Technical Resource Areas were evaluated.
Below are the results for the Alternative 3 Build Plan:

Less-Than-Significant Adverse Impacts	18
Potentially Significant Adverse Impacts	4
Beneficial Impacts	19

Appendix E: Court Stenographer Transcript

This Page has been Intentionally Left Blank.

STATE OF NEW JERSEY

DEPARTMENT OF ENVIRONMENTAL PROTECTION

PUBLIC HEARING

IN RE: Rebuild By Design * JUNE 26, 2018
Meadowlands Draft *
Environmental Impact*
Statement (DEIS) *
- - - - - - - - - -*

JERSEY SHORE REPORTING
1561 517A PASSAIC AVENUE
SPRING LAKE, NEW JERSEY 07762
732-282-0704

T R A N S C R I P T of the stenographic notes of the proceedings in the above-entitled matter as taken by and before LATITISA RUSSELL, CCR #30XI00234100, RPR and Notary Public of the State of New Jersey, held at the Robert L. Craig Elementary School, 20 West Park Street, Moonachie, New Jersey, June 26, 2018 commencing at 6:00 p.m.

- - -

I N D E X

- - -

SPEAKERS:	PAGE
Dennis Reinknecht	4, 5, 38 41, 42, 46
Mayor Dennis Vaccaro	4
Karlito Almeda	4
Christopher Benosky	8, 20, 36
Lulu Loquidis	12
Brian Boose	22

PUBLIC SPEAKERS	PAGE
Bernie Sobolewski	39
Don Torino	40
Leslie Gottlieb	41
Regina Helou	43
Alex Tuason	44
DeeAnn Ipp	45

- - -

MR. REINKNECHT: I'm Dennis Reinknecht from the Bureau of Flood Resilience. Before we start this evening, I would like to introduce our host, Mayor Vaccaro.

MAYOR VACCARO: Good evening. Thank you, Dennis. This project we've been working on for the last couple years. I just want to recognize some of the people. I'm going to mention them by their first names because they are like friends, the DEP personnel, Dennis, Kim, Bob and Alexa. And from AECOM, Chris, Lulu, Brian and Jen and also, Mayor Gary Brugger from South Hackensack and Mayor Raguseo from Little Ferry. I want to thank them for the work that they've put in.

Tonight's event is something that needs to be done. It's a mandate as part of what we're doing here. So we'll see the presentation night on the environmental impact on how it's going to affect all three of the projects. So again, I just want to welcome everybody here to Moonachie.

MR. REINKNECHT: We also have another special guest. Karlito Almeda is here on behalf of the Office of Congressman Bill Pascrell.

MR. ALMEDA: I'd like to read a short

statement from Congressman Bill Pascrell. The devastating impacts of Superstorm Sandy are still being felt in homes, businesses and communities across our state. I remain worried about the potential damage if another storm were to hit our shores. That is why I was proud to fight with my colleagues in the New Jersey delegation for every recovery dollar we received.

The rebuild by design composition project before us today was created because of the Sandy supplemental funding, I am pleased to learn we are making progress in using these funds to protect the Meadowlands to reduce flood risk.

I encourage my constituents and all stakeholders to review the preferred alternatives being presented this evening, so they can communicate their priorities to protect the Meadowlands and our communities. Thank you.

MR. REINKNECHT:I want to thank you very, very much. I thank you, Mayor, for hosting us tonight. Does everybody have this? This is our roadmap for tonight. We're going to be using it throughout the evening for some of the things we mentioned. There may be an idea or we talk about an alternative. Use it as a resource throughout the

evening.

I want to thank everyone for taking time to participate and as we move our Meadowlands Flood Resiliency Project forward, I see a lot of familiar faces here. This is a public hearing. This hearing may feel more formal than some of our earlier workshops and public meetings. You will notice the stenographer off to my left, who is dutifully recording every word so we have a transcript of tonight's proceedings. The hearing is also being videotaped tonight, as well. We will post a copy of the PowerPoint presentation tomorrow on our website. In your pamphlet, the website address is on there, if you don't have it already and we'll be posting the video of tonight's presentation when it becomes available in the coming weeks.

Following the presentation, we'll open up the microphone for the public comment portion of the hearing. Anyone wishing to make a comment will have an opportunity to speak. We'll have a slide about that later in the evening. I'm not going to go into it right now.

And we're going to begin with a presentation by AECOM giving a high-level overview of the Draft Environmental Impact Statement. That's why

we're here tonight. It's a large document. So the 45-miniute presentation cannot cover the entire document, but some of the slides will direct you to chapters where you can find more information.

Public participation is an integral part of the National Environmental Policy Act procedural requirements. Sometimes you may hear members at the podium talk about NEPA. That's what it means, National Environmental Policy Act.

Some of you may know public input has played a critical role in shaping the direction of this project. From the purpose and need we did together to the recommendation of the preferred alternatives in January, your input has been considered at every step and will continue to be an integral part of the design phase as we move forward.

This hearing does not mark the end of the opportunity to comment on the DEIS. You will have until July 15, 2018 to submit comments through e-mail, through the mail. Tonight, you can do it by microphone or you can drop a card in the box that's by our transcriptionist.

Keep in mind this project is over 5,000 acres. Because it's such a large project area, we took a holistic approach to evaluate flood and flood

risk. Rather than town by town, we've looked at the project area as it is an interconnected watershed. Our strategy is to unplug the major drainage checkpoints at East Riser Ditch and Losen Slote. It made sense to start with downstream in the watershed to create additional capacity and see the benefits to the upstream communities.

Like Mayor Vaccaro, I want to thank the Executive Steering Committee, Community Advisory Group and the Mayors of Moonachie, South Hackensack, Little Ferry, Carlstadt and Teterboro. You've been instrumental in moving this project forward and I want to recognize some people who are here tonight. Actually, I recognized them already, but I'd also like to thank Dr. Ponds for allowing us to use his school tonight and with that, I'd like to turn it over to Chris Benosky from AECOM to begin our presentation. Thank you so much.

MR. BENOSKY: Good evening. We're happy to be here tonight to walk you through the draft EIS. We're going to go through the NEPA overview and the timeline. We're going to look at the purpose and need of the project. We're going to take a look at some of the summaries of the build alternatives and show some of the benefits of the project. Then Brian

is going to take us through a summary of the DEIS, itself. Then you'll have an opportunity for public comment.

What is NEPA? National Environmental Policy Act. It applies to all projects with Federal funding and this project is one of those projects. It ensures that the Federal government considers environmental effects prior to the implementation of a project and it requires DEIS, as we're going to talk about tonight.

The draft EIS goes through the purpose and need as a description of the proposed actions and alternatives. It talks about the coordination efforts and the existing conditions of the affected environment. It also talks about the consequences of the alternatives.

This is a timeline of the NEPA process. You can see the black arrow. That's where we are today. We were here almost two years ago, July 6, 2016, where we did the public scoping meeting right in this room. Some of you were here. After the public hearing tonight, you will be able to provide your comments. There is a 45-day comment period, which we are in the middle of right now. Once we get the public comments, we'll address them in the final EIS

and we go through ultimately to a record of decision, which allows us to move forward with the design.

Throughout the process and again, a lot of you have been involved, this is a pretty robust public engagement. One is the Executive Steering Committee, which the mayors of five towns are involved with, some of the major stakeholders, including NJSEA, New Jersey Sports and Exposition Authority and Bergen County. There is a Citizen Advisory Group, a CAG group that was meeting monthly and we would walk them through the design process, a feasibility process and what we were looking at for these alternatives and then there is the Federal outreach, which is the part of this hearing tonight.

Again, Dennis said there is a way to provide public comment. Tonight, you can step up to the microphone. You can provide an oral comment. You can provide written comments on the cards we have in front of you. You can also e-mail your comments to DEP to the e-mail address above or you can mail your comments to Dennis in the back. The comments submission deadline is July 15th. So it's coming close.

Let's start with the purpose and need. The purpose may seem obvious, but it's to reduce flood

risk and increase resilience in the five town areas and reduce the impact to current infrastructure due to flood.

The need, I think you guys are probably all aware of the need. You have a low-lying area that's impacted by storm surge and rainfall. We want to promote community resilience, reduce flood insurance claims, enhance water quality and protect public health and property.

Our project goals were to provide the best possible project that provides flood reduction and part of the co-benefits for the community. So it's storm protection and potentially quicker recovery times post storm event.

There are some constraints under the funding. One of the constraints is, it has to be independent utility. What does that mean? That means that the project can't rely on additional funding or an additional project that allows it to function as designed. It needs to be built with the available funds. That's all the money there is to the project and it needs to be fully functional by September 20, 2022. Because it's a Federally-funded project it needs to have a positive benefit cost ratio. What that means is, that for every dollar we put in, you

need to get more than a dollar back. We need to minimize the adverse effects. That's a lot of what we'll talk about tonight.

These are the three alternatives that we put forward. Alternative 1 is the structural flood reduction. It needs to be protecting against storm surge.

Alternative 2, we'll call stormwater drainage improvements, which addresses the rainfall flooding.

And Alternative 3, which is the preferred alternative is combination of the two. It protects against the storm surge, as well as the rainfall flooding.

I'm going to bring up Lulu Loquidis, one of our lead designers and she's going to walk us through the different alternatives.

MS. LOQUIDIS: Good evening, everyone. As Chris mentioned, I'm going to quickly take us through a brief synopsis of all of the features under each alternative starting with Alternative 1. So Alternative 1 is a structural flood reduction plan and just a reminder, this is a plan that, basically, looks at providing protection for coastal storm surge in the community. The image that you're seeing up on the

screen is the final concept that was produced for the Alternative 1 storms for surge plan. And, basically, the concept ended up consisting of a line of protection that will provide protection for, approximately, 50-year storm today and that level of protection would sit at a seven-foot elevation, which is, basically, a seven-foot downpour, the NAVD88.

And the team looked at multiple strategies and we presented this in the past. These ideas are incorporating potential ground benefits, looking at cost-effective solutions and then ultimately, putting forth a design proposal for a new surge barrier. So I'm going to walk through those elements in a little bit more detail.

So under Alternative 1, under this plan we are looking at, approximately, 19,700 linear feet of floodwalls; approximately, 900 linear feet of levees and berms and then incorporated into the line of protection, the series of gates.

So one tide gate and a tide gate helps control water during tidal fluctuation and then closure gates. Closure gates are really necessary to maintain access. So they are used specifically for roads if there is road access or boat access needed.

As I mentioned, under Alternative 1 we

would also be constructing a surge barrier at Berry's Creek and as part of the surge barrier construction, it would be a new pump station. So 1,000 cubic feet per second pump station and then a gate system. There's two gates, an east and west gate that would total 118 feet and ultimately, the construction of this surge barrier will protect things from flooding during a large storm event.

As Chris mentioned, we also looked at creative ways to fold in this idea of co-benefits into the project. So Alternative 1 we've found four potential opportunities to incorporate new public open space and work with engineers to ensure that it was part of the design, but provided places for new community access to Hackensack River, recreation potential and also, habitat enhancement.

So this graphic that you are seeing here was an example of an idea that we had called Cantilever Walkway and ultimately, it raised the flood elevation to that seven foot and also created a walkway. That was a brief synopsis of Alternative 1.

And now we're going to move into Alternative 2, which is the stormwater drainage improvements concept. Under this concept, we were looking at strategies to help with more frequent

flooding that the community faces. So under this alternative we were looking at ways to provide new and improved grey infrastructure and then also, a green infrastructure network, which was a combination of thinking about how this infrastructure and parks and open spaces could complement the stormwater design.

Under Alternative 2, we looked at creating three new pump stations. Two pump stations at Losen Slote that would include connection by a force main and basically, a force main is a pressurized pipe to move water from one location to another location and under this scenario, we'll be looking at moving water from the upper reaches of Losen Slote discharge to the lower regions and then also, a new pump station at the East Riser Ditch and it would be connected to the drainage improvements.

So speaking of drainage improvements, we've talked about these in the past. Under the Alternative 2 concept, we would be looking at channel dredging and improvements, basically, for Berry's Creek up to Moonachie Avenue. Also, included in the improvements would be replacement of the culverts and the railroad bridge and then in addition, we would look at restabilizing the channel edge with native vegetation and ultimately, all of these improvements would help

increase conveyance capacity. It also provides new opportunity for habitat.

Alternative 2 also looks at new park systems in the community. We were looking at five parks total, three waterfront parks and two interior parks, totaling, approximately, 20 acres and then also, improvements to five existing open spaces and public amenities within the community.

This is an example of the improvements that could happen potentially at Cesar Place Park and it's a combination of wetland creation and grey infrastructure, which would help slow the flow of water. It would also provide water quality benefits and then an additional opportunity to provide some sort of recreation and education.

As I mentioned with green infrastructure, not only are we looking to implement green infrastructure in the open spaces, but also along roadways in the communities. So some of the systems and strategies that we're looking at are bioswales, rain gardens and storage/tree trenches and basically, these elements would be designed to filter 1.2 inches of water in a two-hour event and the systems are also designed to tieback into the stormwater system in the event that the capacity

reaches its full capacity, infiltration at full capacity.

Alternative 3 is the hybrid concept. So Alternative 3 has been identified as the preferred alternative, the hybrid concept and the reason why it's been identified as the preferred alternative because it's the only alternative that meets both of the challenges that the community faces. So challenges of coastal storm surge flooding and also interior stormwater drainage issues and because we've been up against so many constraints with this project with timeline, funding and budget, we have broken the hybrid design down into two different plans, the build plan and the future plan.

So the build plan ultimately represents a reasonable plan that's being constructed within the timeline within the permitting constraints by 2022 and it's quite similar to what was just presented in Alternative 2. It would be inland flood reduction strategies and I'll talk a little bit about that in a moment.

The future plan would have additional elements from Alternative 2 and then would also include the full complement of Alternative 1 to be the full coastal storm surge plan and the idea is that

these elements would build off of the build plan. It can be implemented over time in the community when future funding becomes available.

Just a quick recap on the build plan. As you can see from this image, it's quite similar to that of Alternative 2. It's a stormwater drainage project that looks at improvements and new grey infrastructure and green infrastructure for the community. We'll talk about the distinction.

Under Alternative 3 build plan would be constructing two pump stations. So, basically, all of the improvements to East Riser Channel, the pump station and the channel improvements remain the same as I already discussed in Alternative 2 and then Losen Slote would be constructing one pump station and one set of force main improvements. So again channel improvements remain the same for the build plan as Alternative 2.

As far as the open space features go, you will be looking at three parks and open spaces, one waterfront park and two interior parks, which is, approximately, 7.6 acres. Still considering the improvements to five existing open space and public amenities, which has the same type of benefits for recreation and habitat as I discussed in Alt 2.

Again, for the build plan, it's green infrastructure systems, which is the same as Alt 2 would remain the same.

Then we're just going to quickly touch on the elements that could be incorporated in the future when additional funding becomes available and the idea is that you can build off of the build plan and so this graphic represents elements from Alternative 2, so stormwater drainage elements that can potentially be incorporated later.

So you'll see that number two represents the second pump station in the Losen Slote drainage area and then one is showing a potential idea to continue the drainage improvements up East Riser Channel to the upper reaches, so including the dredging, increasing conveyance capacity, providing habitat improvements and then also, a new pump station and then looking at the potential to add in Alternative 1, which would be the storm surge concept in the later day.

So that concludes the recap of the three alternatives and if you would like more information, more detailed information, all the sections have been listed at the bottom of the slide, so just refer to the draft EIS. So I'll invite Chris

back up to talk a little bit about flood reduction.

MR. BENOSKY: We'll talk a little about what the benefits are for each of the individual alternatives. What you see up here is the no-action alternative. The purple dashed line represents the project boundary to the left, lists existing conditions. The center graphic is 2075 horizon using the NOAA intermediate, low 1.2 feet of sea level rise over that period.

Then the one to the right is the 2075 horizon with the NOAA intermediate high, which is 2.4 feet of sea level rise. This is a normal tide condition. The existing condition to the left is showing you the existing condition in the light blue. As you work across the 2075 time horizon, you see the increase in flooding at your normal tide condition. This is under Alternative 1.

So the darker blue area shows the areas that these are areas that were flooded under the normal tide condition under the no-action alternative that are no longer flooded, would no longer be flooded under the Alternative 1 scenario. So you can see the area has increases as sea level rises.

So for Alternative 2, which is the sub-watershed component of it, this is the East Riser

Ditch sub-watershed. The plan to the left is the two-year storm in 2023, which is when the project would be completed and 100-year storm 2023 to the right and again, no-action alternative. So what you see here is a comparison of the flooding under Alternative 2 implementation. So the left is the two-year storm 2023. The right 100-storm. The areas of origin you're seeing benefit from the implementation of Alternative 2 in this drainage area.

Similar graphic for Losen Slote. Again, two-year to the left and 100-year storm to the right and there is the no-action existing conditions and again, we're seeing a benefit of the project implementation for Alternative 2.

For the hybrid, same graphic, no-action alternative for flooding East Riser a two-year storm is the same as Alternative 2 and then the benefit and this is the same as Alternative 2 because it's the same interventions that are occurring in the hybrid in East Riser that are occurring in Alternative 2.

Then in the Losen Slote watershed again two-year storm and 100-year storm 2023 and then the benefit. This is a slightly reduced benefit because as you remember, we only talked about only one pump station being included in the build plan. So it's a

little different than Alternative 2.

That sums up the benefits and the summary of the alternatives. Now I'm going to bring up Mr. Boose, who is going to talk about the environmental impact analysis.

MR. BOOSE: How is everyone? Are you overwhelmed by the information? I'm here to overwhelm you more. As you can see by what Chris and Lulu presented, it's amazing what was accomplished with a lot of your help in the room here tonight in the form of ESC and the CAG. It took two years to get us from the time we were here July 6, 2016 to today from initial scoping to that document sitting on the table. How many of you have read the draft EIS? Excellent. How many of you are telling the truth? Okay. Most of you. Very good. It's been a process. I've been doing this 30 years and this is the most challenging project that I've had the privilege of working on, simply because we're trying to adapt the project to come up with a comprehensive solution within a short period of time for a limited amount of money with a lot of different variables going on.

So what did the EIS look at and I apologize if I overwhelm you. I'm going to try to go through this as high a level as possible, but

meaningful. EIS had to take that purpose and need that Chris discussed, those action alternatives that Lulu discussed and overlay them in time and space on a 5500 acre project area that many of you call home.

Last two years about 100 subject matter experts and our team became very familiar with the place you know and love and we had a lot of handlers working on this. We were doing the environmental impact analysis concurrent with doing the feasibility study, the hydrologic modeling, project cost analysis and all of those components to try to develop a solution that would work.

In the EIS we analyze these 21 resource areas. They cover the full spectrum of the natural, cultural human environment. So it was truly comprehensive and not only did we cover those areas for the, approximately, 5500 acre project area, but the area of influence that each of those alternatives that may be included.

So the first DEIS we identified what the effect of the environment was. Once we did that, we overlaid each of those build alternatives. One, the wall; two, stormwater improvements and three, a modified stormwater improvement onto that environment to see what the changes would be over time.

In doing so, the first step we had to take was to identify, okay, what would we consider significant effect. What would be something that would cross that threshold? So within each resource area in our impact analysis and the boxes on the slides cross-reference back to the sections back to those documents, where you can find more information.

We took the NEPA definition in terms of context, how large an area is affected in intensity, how much will that affect that specific complex and we set forth the clear, definitive screening criteria to determine what impact would be considered significant and what would not.

After doing that, we came up with four basic buckets of effect. First is to actually not have an impact on that component.

Second, the impact could be less-than-significant and adverse. It didn't exceed that threshold that we set forth early in the analysis.

Third is the potentially significant, adverse effect and really needs to take a hard look at it, a proposed measure, mitigation measures or best management practices, to reduce to either negative or less-than-significant.

And the last one, positive impacts, what good changes could occur from implementing either Alternatives 1, 2, or 3 or the no-action alternative.

Where we identify significant adverse effect, in some cases we identified less-than-significant adverse effects, we proposed mitigation measures. Remedies that could be effective at one of these three stages of the project to reduce said effect on the environment or the community. So these are consistent buckets of mitigation measures you'll see throughout document. Table 6.4-2 in the EIS provides a complete summary of all the mitigation measures and best management practices that were proposed.

Let's take a look at what less-than-significant adverse impacts, all of the build alternatives share in common and they are listed here. Short-term construction effects that would occur during the construction phase and for a large-scale project that could involve a large area with many moving parts with a layout. You would expect they would occur. They were less-than-significant, but they would occur and we propose control measures for things like noise during construction, dust from construction, traffic from

construction operations, things of that nature.

Then consisting across all build alternatives were long term, less-than-significant adverse effects, from operations and maintenance running the system over time, noise from pump stations, such as sediment transport, utilities for pump stations, maintenance and temporary road closures to keep this infrastructure operational and overall BMPs are included in those effects. Those were generally the buckets of less-than-significant adverse effects.

Let's look at potentially significant adverse effects, which is one of the reasons we did an environmental impact statement. We found through that lengthy analysis in the smaller document, the draft EIS, itself and the larger document on the table is the set of appendices that support the analyses. These seven areas have the potential under one or more of the considered build alternatives to have a potentially significant effect and we are going to walk through these relatively quickly in a comparative way.

The purpose of NEPA is to provide the government, NJDEP, for choice between the alternatives taking into environmental consideration. So the slide

is parallel in the analysis in the EIS.

For land use we found that Alternative 1 was the only alternative that had potential for significant adverse effective land uses strictly from the Berry's Creek storm surge barrier.

The mitigation measures we proposed was during design, pre-construction, the property owners would be coordinated with to who obtain mutually agreeable settlement, but that was the only alternative that we found to have a significant adverse effect.

Cultural and historical resources included potential effects to the historic Route 46 Bridge from Fluvial Park and possible disturbance to areas, potentially archeological resources during construction. You can see the differences between the alternatives with regards to high-sensitivity areas. Alternative 1 had the potential to effect five such areas. Alternative 2, three such areas. Alternative 3, two such areas and we propose mitigation measures to reduce those effects.

Noise and vibration, each of the alternatives have a potential for significant adverse effect to specific structures and facilities during construction and we propose mitigation measures to

reduce those effects.

Biological resources, Alternative 1, again is the wall. Generally, as to the Hackensack River, Berry's Creek storm surge barrier, so one would envision that could have potentially more biological unavoidable effects and impact.

Alternatives 2 and 3, which were stormwater improvements more than the internal stormwater drainage alternatives didn't. So we propose mitigation measures for those.

Water resource is a huge concern here. It had a variety of potential significant adverse effects and those are listed here. Water is a big concern. The whole purpose and need of the proposed action is to control the water. That's discussed in Section 4.16.

Wetlands are also a big issue. Keep in mind when the project was initially conceptualized during the rebuild by design composition, one of the first letters I read about this action, written about three years ago now, that agencies were concerned and the public was concerned that hundreds of acres of Meadowlands wetlands would be affected by the action. Back when we had Meadowlands Park, things of that nature.

Through your good help and citing analyses and sensitive engineering designs, we were able to substantially and significantly reduce the amount of impact. We still considered it potentially significant and adverse, but these are the acreage totals that we had identified. A little bit more for Alternative 1, less for Alternative 2, but less hundreds of acres or even dozens of acres. We're talking about an acre or two acres, which is pretty impressive. So congratulations to you for making that happen.

We proposed a variety of mitigation measures for water resources. Again, a very sensitive area, alternative pre-construction, during construction and post construction.

Hydrology and flooding, one issue that came up during the modeling of the various alternatives, that Alternative 1, the wall has a potential for reducing flooding outside of our project area. Alternative 2 and 3 did not and we proposed mitigation measures that would avoid that effect.

Hazards and hazardous materials, another large area of concern in the project area vicinity. A lot of work on this area, as well. We did not identify potential significant adverse effects

through hazards and hazardous materials. Read through that list here.

Generally, fewer sites under Alternative 1 and same number of sites during Alternative 2 and 3. Again, we proposed very detailed mitigation measures on all three phases of the project to address those to reduce of the less-than-significant adverse impacts.

This is a summary of what I just said in the very, very high level and I do apologize for going through this quickly, but if I went through it at length, I think I would probably be the only one awake in the room, but I'm almost done. If you have comments, please ask them during the public comment period.

This shows that Alternative 1 has potential for significant adverse effects in the seven resource areas and Alternatives 2 and 3 are similar and not surprisingly, they have potential for significant adverse effects for four resource areas.

So one thing that is critical and this is great to see in this analysis and what these alternatives were the potential beneficial effects from the action. From all the hard work that went in over the last couple of years and developed these

improved alternatives, we found 19 resource areas potential for beneficial effects for each of the three alternatives.

If you're adding, okay, Boose said there were 21 resource areas and Alternative 1 has 7 potential significant adverse effects and there's about another dozen, plus the significant adverse effects that adds up to 21. You have to understand that we looked at all components of the resource area. So there is a whole litany and spectrum of potential effects.

Let's quickly go through beneficial impacts. Alternative 1, as Chris noted, would provide increased coastal flood protection from 12 to 21 percent of the project area depending upon the future sea level rise. To build parks, four new parks, 10.1 acres in total and would create about 990 construction job years and 20 annual operations and maintenance jobs.

By comparison, Alternative 2 is a little bit different because it's the stormwater alternative verse the wall. So here we identified increased inland flood protection in East Riser Ditch and Losen Slote drainage basins. Those buildings and those amount of damages would be avoided. As Lulu

pointed out, there would be effect from the structure feature if installed.

Alternative 2 would create five new parks, which is less than Alternative 1, in terms of number, but more in acreage. It would improve five existing open space areas and the components are listed below. It would create about the same number of construction jobs and annual O&M jobs as Alternative 1.

Alternative 3, generally very similar, as Lulu said, to Alternative 2. It will be slightly less reduction along Losen Slote and slightly less stormwater management improvements than Alternative 2, but generally very, very similar. It would create three new parks, so slight reduction. 7.6 acres in total and five open space areas and result in fewer construction job years and operations jobs, but overall beneficial in each case.

So this summarizes what I've said and Alternative 1 would result in the seven resource area, potentially significant adverse effects. Alternative 2 and 3 are similar. They do have differences and then some resource areas would experience a gamut from beneficial to significant adverse depending on the component of the resource you look at and the draft

EIS is very comprehensive in its analysis, if you want to get more information on those topics.

The last piece I have is cumulative impacts effect. If you thought that doing the straight analysis of the direct and indirect effect on three different alternatives on 5500 acres in an area that is changing seemingly vaguely here. Since we started this project over two years, we've had a fire, a plane crash. I don't even remember what else happened in the project area. It's been a very busy place.

Cumulative impact analysis is generally confusing. I'll try to simplify it for non-practitioners, but if you look at overlay, your considered action and time and space of all the other things that are going on in time and space with your action. So just think about all the things that are going around in this project area on a daily, weekly, monthly, annual basis and you had to figure that out through the out years and operation of the project.

We collected data from the sources listed under the second header available numerous resources, local government officials, NJDEP, input from ya'll as part of the CAG, advisory group. All that was assembled and we have identified 120

projects, 120 projects that were overlaid in time and space in the future with our proposed action here and reached the three alternatives. That's a lot of analysis and try to figure out in a crystal ball how these projects are going to interact with one another.

We did a very good job with our affected environment discussion in the EIS, which is chapter three of the EIS for those of you who are reading it. We've considered everything that's happened so far, but in modern times what shape the project area is, 5500 acres. So, therefore, we are able to focus on those projects that are reasonably foreseeable.

What does the community, the decision makers, the politicians think is going to happen within the project area, the vicinity that could affect you as citizens of the project area and the project area environment. So we did that and we overlaid that and I think we got it down to a 60-page analysis in the draft EIS, what that could look like and how the projects could work together, this project and other projects proposed or how they can conflict.

For example, if a portion of this project was proposed in an area where it would cause traffic during construction and someone else was

proposing to do another redevelopment project in the same area at the same time. So think about the effects three projects going on at once. You're building a McDonald's, a Walmart and new highway next to each other. Not happening here, but that's the analysis. We did a long analysis.

We found potential for significant adverse cumulative effects in four resource areas and they would all occur during the construction phase either Alternative 1, 2 or 3. There will be no long-term cumulative effects. So once the alternatives would be build, it wouldn't work adversely with other actions or conflict with other actions. Those areas were transportation, construction traffic from our proposed project with other projects in the area. Noise and vibration at the same time. It affects the biological impact resources and affects the water resources and among them proposed project of Teterboro Airport, which many of you are aware of and the other was keep in mind, as Lulu identified, Alternative 3, we have the build plan, which was similar to Alternative 2, but we also have laid the groundwork for a future plan when more money becomes available, what else could be done to work synergistically with the build plan under

Alternative 3. When we analyzed what that future could look like, too, should that money become available in the future a lot of that groundwork for the analysis has been done and would speed that process along. We did propose mitigation measures for each of those potentially significant cumulative effects and those are set forth in the EIS.

So I'm done. Overall, it was very participatory and for those of you who have been participatory within this process with us, me, the team, thank you.

MR. BENOSKY: What's coming up next? We are we today? The EIS public hearing, July 2018, public comment period, which we talked about before, but we're moving quickly towards a record of decision and ultimately into design and permit and construction as we get into the end of 2019. So the next year and a half is going to be a busy time. Not that it hasn't been busy for the last two years, but we are going to be moving towards construction and we have a 30-month construction that we are looking forward to to complete this by September 2022.

So again, the public comment period ends July 15th. We're hoping to publish the final EIS in October, prepare the ROD, publish the notice of

availability and request release of funds in November and we're going to continue our coordination with the different agencies. We work hand in hand with USEPA, Berry's Creek Study Area Group, as well as the Historic Preservation Office. So we're going to continue to coordinate with the regulatory agencies and to move this forward and get it through the permitting.

We're also developing an operation and maintenance plan. You've heard us talk about that. We're going to be identifying the entity that will be performing the maintenance and the state is obligated to identify that agency and make ensure that operation maintenance plan is maintained.

Again, to comment, you're going to have an opportunity to get up and make comments at the mike. It's a public comment. There is no question and answer. So you won't get any responses to your comments tonight, but they will be addressed in the final EIS and again, you can fill out the comment card in front of you. You can e-mail comments to the State website or you can mail comments to the DEP, Dennis. Again, not to keep reiterating, but the deadline is July 15th.

So now it's time for the public

comment. We are going to open up the mike there to my left, your right. The public comment period will go to 8 o'clock. I think we have three people on the list to comment so far. The time limit is three minutes per comment. We are going to have a timer up. We ask you to state your name and affiliation. Be clear and concise and hopefully, be constructive and with that, I will let Dennis come up and put a timer up on the screen. And the other thing I can say, if your three minutes are up for the first comment, you're welcome to come back.

MR. REINKNECHT:There was a sign-up sheet. I have three people signed up. If somebody wants to speak at the microphone, you still can. We can add your name to the list. Some projects we have 60 comments. Sometimes we have none because there's multiple ways to comment. If you're uncomfortable with the microphone, use a card. Just speaking to anybody here isn't going to help. You need to put it on the record, send an e-mail, use one of the four methods that's in your handout.

Also, before I call up our first speaker, I would just like to re-emphasize, the slideshow you saw tonight as Brian went through, a lot of information on those slides. Tomorrow, they will

be on our project website. The website address is on your handout, if you've never gone to that website. Also, the entire EIS document is on there, if you have never looked through the executive summary, it is quite excellent.

If you have comment cards you want to drop them off tonight, put them in that white box. If not, drop them in the mail. They will come to me. So as always, Bernie, would you like to be first? Step up to the microphone.

MR. SOBOLEWSKI: Bernie Sobolewski. I'm a part of the Little Ferry Care Group. The only comment I'm going to make is relative to this whole planning that's taking place here. I have requested members of the school board and some others to attend this meeting for one reason. Little Ferry right now is proposing to build a $30 million school specifically to replace the school that's had problems with water all related to the Losen Slote Creek problem and I asked them before they continue with the planning to at least attend this meeting. For the purpose of getting some input to see what is going to be done that might negate the need for building a new $30 million school and repairing the one that exists currently.

The Losen Slote Creek, for those who are not familiar, drains the entire town. It actually starts from South Hackensack and across Route 46 and comes through the entire town and sadly, many portions of it are so sedimented in, so pathetically overloaded with bad piping, so forth and so on, when the water comes down the creek system, if the pipe systems can't handle the water, it winds up on our streets. It makes a mess. It creates a poor impression for the community and I'm tired of seeing Little Ferry in the papers with flooding problems. I would have liked to have had these folk see what's proposed for the Losen Slote creek. I know there was mention about the school system some improvements that may benefit from it. I'm hoping that the dredging process will begin as soon as possible because without the Losen Slote Creek draining properly we suffer and quite frankly, I think, unfortunately, 80 percent of the town of Little Ferry is now in a flood zone and that's troublesome for real estate values, et cetera.

I'm anxious to see this project brought to fruition. I hope I live to see it done and I'm optimistic. Thanks for the opportunity to speak here.

MR. REINKNECHT: Don Torino.

MR. TORINO: My name is Don Torino.

I'm a resident of Moonachie and the president of the Bergen County Audubon Society, which is the local chapter of the National Chapter of the Audubon Society. So I've been a resident of Moonachie for over 50 years and Meadowlands kid, grew up there and still live there and anybody whose done that has seen the worst environmental tragedies done to the environment that could possibly ever been done and one of the reasons we're sitting in this room is exactly because of that and indiscriminate building and so on and so forth. So I really do look at this plan as a step forward after 50 years of putting up with flooding and limited flooding as part of your life in Moonachie, but also a part in small way at least to start to bring back some of the environment at the same time. So it's a plan that at least works with the environment instead of working against it and I'd just like to say that Bergen County Audubon will be there whatever is needed as far as training, as far as helping with the habitat enhancement and I really look forward to this getting off the ground.

MR. REINKNECHT: Thank you for your comment. Leslie Gottlieb, Little Ferry.

MS. GOTTLIEB: My name the Leslie Gottlieb, Little Ferry Citizens, as well as a member

of the Little Ferry Board of Ed. I seem to be the only one here tonight. We came to see what was going on with this project. I notice there was a line item that said Little Ferry Public Schools and as Bernie I mentioned as you may or may not know we have a situation. We've closed one of our elementary schools Washington School, which has a creek running behind it. I guess it's part of Losen Slote and we are having to put portable classrooms behind our other schools and we've gone through the permits and everything else with the drainage and everything else needed to be done with a flood zone. So our primary concern now is getting that finished for school, but we have to plan with you guys and you guys with us to mitigate anything going on if we rebuild or repair Washington School. So that needs to be somehow this recent addition, recent project, has to be reflected in your plan and we have to work with you guys on the Washington School property to do the right thing because we have that flood behind us and we don't want to build a school or fix a school and have it flood out. Thank you.

MR. REINKNECHT: Thank you for your comment. The mike is open. Does anybody else want to say anything? How does this work? This is a public

hearing. I love to talk. I love to answer questions. That won't be happening tonight. Tonight is really about comments that must be on the public record. Brian would probably tackle me if I tried to do it. So this hearing stays open until the recorded time of 8 o'clock for anybody who wants to comment. We'll be putting the mike on standby and anybody that comes in a little late and wants to make a comment on the record they are entitled to do that. If you're having trouble finding the website, clearly, we can help you with that. There's comment cards in the corner. The box is over there if you'd like to write anything or if you need help writing. If not, we'll stand down until somebody need the microphone.

- - -

(At which time a short recess was taken.)

- - -

MR. REINKNECHT: We have a resident that would like to make a comment. For the record, we are, going to turn the mike back on.

MS. HELOU: Regina Helou. My name is Regina Helou and live in Little Ferry. I know there is a problem with Losen Park. I know the EPA and DEP would give them a hard time anytime they wanted to

clean out the drainage. However, where I live in Little Ferry, I've been flooded three times. Nine foot the first, four-and-a-half the second and five-and-a-half the third. Two of them within 13 months of each other.

And from what I see of what you're going to do with plan three you're not going to address any coastal or river flooding and that's where my problem comes from all the time.

So I think they should consider what they are going to consider with the rivers because the Hackensack River comes through my house every single time. The first time I was out of the house for ten days and couldn't even get near my house with nine foot of water.

MR. REINKNECHT: I want to thank you for your comment. It's on the record.

- - -

(At which time a short recess was taken.)

- - -

MR. TUASON: I'm Alex Tuason, Little Ferry. I'm on the committee of Little Ferry/South Hackensack Soccer Club. This particular project concerns four towns, Carlstadt, Moonachie, Little

Ferry and you mentioned South Hackensack. We only received the notification of this particular meeting two days ago. My concern is from the lack of participation from our local government here and representation that we're not being notified days in advance where we can go ahead and analyze what's actually going on and make an educated decision or some sort of comment as to what is going to be proceeding in our towns and my comment really is if possible if we can get an earlier notification. So this way, we can prepare. I mean, I had to come from New York to be here and I went home and regardless, I just wanted to make sure that we get enough time in advance so that this way we can see our local government, ask them if they are going to actually participate and come here and maybe, represent us a little bit more. Thank you.

MR. REINKNECHT: Thank you for your comment.

MS. IPP: DeeAnn Ipp from the flood plane of Teaneck, New Jersey and I'm a little concerned that all the modeling shows impact of Alternative 1, the wall for Moonachie and South Hackensack, but it stops there and it doesn't model how the storm surge, how it would affect my street,

Pomander Walk in Teaneck, which I am the final zone of impact for the tidal surge from Hurricane Sandy, which was a biblical event. That was like wrestling with the devil. Thank you.

- - -

(At which time a short recess was taken.)

- - -

MR. REINKNECHT: If there are no other comments, we are going to be closing the hearing and wrapping everything up. Thank you very much for coming.

- - -

(The hearing concluded at 8:00 p.m.)

C E R T I F I C A T E

I, LATITISA RUSSELL, a Certified Court Reporter and Notary Public of the State of New Jersey, certify that the foregoing is a true and accurate transcript of the stenographic notes of the deposition of said witness who was first duly sworn by me, on the date and place hereinbefore set forth.

I FURTHER CERTIFY that I am neither attorney, nor counsel for, nor related to or employed by, any of the parties to the action in which this deposition was taken, and further that I am not a relative or employee of any attorney or counsel in this case, nor am I financially interested in this case.

Latitisa Russell

LATITISA RUSSELL, C.C.R.
LICENSE NO. 30XI00234100

A

able (3) 9:22 29:3 34:12
above-entit... 2:2
access (4) 13:23,24,24 14:15
accomplish... 22:9
accurate (1) 47:6
acre (3) 23:4 23:17 29:9
acreage (2) 29:5 32:5
acres (11) 7:24 16:6 18:22 28:22 29:8,8,9 31:17 32:15 33:6 34:11
Act (3) 7:6,9 9:5
action (9) 23:2 28:15 28:20,23 30:24 33:15 33:17 34:2 47:12
actions (3) 9:12 35:13 35:14
adapt (1) 22:19
add (2) 19:18 38:15
adding (1) 31:4
addition (2) 15:23 42:17
additional ... 8:6 11:18 11:19 16:14 17:22 19:6
address (6) 6:13 9:25 10:20 30:7 39:1 44:8
addressed (... 37:19
addresses (1) 12:9
adds (1) 31:8
advance (2) 45:6,14
adverse (23) 12:2 24:18 24:22 25:4 25:6,16 26:4,10,13 27:4,11,23 28:12 29:5 29:25 30:8 30:17,20 31:6,7 32:21,24 35:8
adversely (1) 35:13
advisory (3) 8:9 10:9 33:24
AECOM (3) 4:12 6:24 8:17
affect (4) 4:19 24:10 34:17 45:25
affiliation (1) 38:6
agencies (3) 28:21 37:3 37:6
agency (1) 37:13
ago (3) 9:19 28:21 45:3
agreeable (1) 27:9
ahead (1) 45:6
Airport (1) 35:19
Alex (2) 3:17 44:22
Alexa (1) 4:11
allowing (1) 8:15
allows (2) 10:2 11:19
Almeda (3) 3:7 4:23,25
Alt (2) 18:25 19:2
alternative ... 5:25 12:5,8 12:11,12,21 12:21,22 13:2,15,25 14:11,21,23 15:2,7,18 16:3 17:3,4 17:5,6,7,19 17:23,24 18:6,10,14 18:18 19:9 19:19 20:5 20:17,20,22 20:24 21:4 21:6,9,14 21:16,17,18 21:20 22:1 25:3 27:2,3 27:10,18,19 27:19 28:2 29:7,7,14 29:18,20 30:4,5,16 31:5,13,20 31:22 32:3 32:4,9,10 32:11,13,20 32:21 35:10 35:21,22 36:1 45:23
alternative... 5:15 7:14 8:24 9:13 9:16 10:12 12:4,17 19:22 20:4 22:3 23:2 23:18,22 25:3,17 26:3,19,24 27:17,23 28:7,9 29:18 30:18 30:23 31:1 31:3 33:6 34:3 35:12
amazing (1) 22:9
amenities (2) 16:8 18:24
amount (3) 22:21 29:4 31:25
analyses (2) 26:17 29:2
analysis (16) 22:5 23:9 23:10 24:5 24:20 26:15 27:1 30:22 33:1,5,12 34:4,20 35:6,6 36:4
analyze (2) 23:13 45:6
analyzed (1) 36:1
annual (3) 31:18 32:8 33:19
answer (2) 37:18 43:1
anxious (1) 40:21
anybody (5) 38:19 41:6 42:24 43:6 43:7
anytime (1) 43:25
apologize (2) 22:24 30:10
appendices... 26:17
applies (1) 9:5
approach (1) 7:25
approxima... 13:5,16,17 16:6 18:22 23:17
archeologic... 27:15
area (32) 7:24 8:2 11:5 19:13 20:18,23 21:9 23:4 23:17,18 24:5,9 25:20 29:14 29:20,23,23 29:24 31:9 31:15 32:20 33:6,10,18 34:11,16,17 34:18,24 35:2,16 37:4
areas (21) 11:1 20:18 20:19 21:7 23:14,16 26:18 27:15 27:17,19,19 27:20 30:18 30:20 31:1 31:5 32:6 32:16,23 35:8,14
arrow (1) 9:18
asked (1) 39:20
assembled ... 33:25
attend (2) 39:15,21
attorney (2) 47:11,14
Audubon (3) 41:2,3,18
Authority (... 10:8
availability... 37:1
available (7) 6:16 11:20 18:3 19:6 33:22 35:24 36:3
Avenue (2) 1:23 15:21
avoid (1) 29:21
avoided (1) 31:25
awake (1) 30:13
aware (2) 11:5 35:20

B

back (9) 10:21 12:1 20:1 24:6,6 28:24 38:11 41:15 43:21
bad (1) 40:6
ball (1) 34:4
barrier (6) 13:13 14:1 14:2,7 27:5 28:4
basic (1) 24:15
basically (7) 12:23 13:2 13:7 15:10 15:20 16:22 18:11
basins (1) 31:24
basis (1) 33:19
behalf (1) 4:23
beneficial (5) 30:23 31:2

31:12 32:18 32:24
benefit (7) 11:24 21:8 21:13,17,23 21:23 40:14
benefits (7) 8:6,25 13:10 16:13 18:24 20:3 22:2
Benosky (5) 3:8 8:17,19 20:2 36:12
Bergen (3) 10:8 41:2 41:18
berms (1) 13:18
Bernie (4) 3:13 39:9 39:11 42:4
Berry's (5) 14:1 15:20 27:5 28:4 37:4
best (3) 11:11 24:23 25:13
biblical (1) 46:3
big (2) 28:13 28:17
Bill (2) 4:24 5:1
biological (3) 28:2,5 35:17
bioswales (1) 16:21
bit (6) 13:14 17:20 20:1 29:6 31:21 45:17
black (1) 9:18
blue (2) 20:14,18
BMPs (1) 26:9
board (2) 39:15 42:1
boat (1) 13:24
Bob (1) 4:11
Boose (4) 3:10 22:4,6 31:4
bottom (1) 19:24
boundary (1) 20:6
box (3) 7:21 39:7 43:12
boxes (1) 24:5
Brian (5) 3:10 4:12 8:25 38:24 43:4
bridge (2) 15:23 27:14
brief (2) 12:20 14:21
bring (3) 12:15 22:3 41:15
broken (1) 17:12
brought (1) 40:21
Brugger (1) 4:13
buckets (3) 24:15 25:10 26:10
budget (1) 17:12
build (22) 8:24 17:13 17:15 18:1 18:1,4,10 18:17 19:1 19:7,7 21:25 23:22 25:17 26:2 26:19 31:16 35:12,21,25 39:17 42:21
building (3) 35:4 39:23 41:10
buildings (1) 31:24
built (1) 11:20
Bureau (1) 4:3
businesses ... 5:3
busy (3) 33:10 36:18 36:19

C

C (3) 2:1 47:1,1
C.C.R (1) 47:20
CAG (3) 10:9 22:11 33:24
call (3) 12:8 23:4 38:22
called (1) 14:18
Cantilever ... 14:19
capacity (6) 8:6 16:1,25 17:1,2 19:16
card (3) 7:21 37:20 38:18
cards (3) 10:18 39:6 43:11
Care (1) 39:12
Carlstadt (2) 8:11 44:25
case (3) 32:18 47:15 47:16
cases (1) 25:5
cause (1) 34:24
CCR (1) 2:3
center (1) 20:7
Certified (1) 47:4
certify (2) 47:6,10
Cesar (1) 16:10
cetera (1) 40:20
challenges ... 17:8,9
challenging... 22:17
changes (2) 23:25 25:2
changing (1) 33:7
channel (6) 15:19,24 18:12,13,16 19:15
chapter (3) 34:8 41:3,3
chapters (1) 7:4
checkpoint... 8:4
choice (1) 26:24
Chris (8) 4:12 8:17 12:19 14:9 19:25 22:8 23:2 31:13
Christophe... 3:8
citing (1) 29:1
Citizen (1) 10:9
citizens (2) 34:17 41:25
claims (1) 11:8
classrooms ... 42:9
clean (1) 44:1
clear (2) 24:11 38:7
clearly (1) 43:10
close (1) 10:23
closed (1) 42:6
closing (1) 46:10
closure (2) 13:22,22
closures (1) 26:7
Club (1) 44:24
co-benefits ... 11:12 14:10
coastal (5) 12:24 17:9 17:25 31:14 44:8
colleagues ... 5:6
collected (1) 33:21
combinatio... 12:12 15:4 16:11
come (6) 22:20 38:8 38:11 39:8 45:11,16
comes (5) 40:4,7 43:7 44:9,12
coming (4) 6:16 10:22 36:12 46:12
commencin... 2:7
comment (... 6:18,19 7:18 9:3,23 10:16,17 30:14 36:14 36:23 37:15 37:17,20 38:1,2,4,5 38:10,17 39:6,13 41:23 42:24 43:6,8,11 43:20 44:17 45:8,9,19
comments ... 7:19 9:23 9:25 10:18 10:19,21,21 30:14 37:16 37:19,21,22 38:16 43:3 46:10
committee ... 8:9 10:6 44:23
common (1) 25:17
communic... 5:16
communiti... 5:3,18 8:7 16:19
community... 8:9 11:7,12 12:25 14:15 15:1 16:4,8 17:8 18:2,9 25:9 34:14 40:10
comparativ... 26:21
compariso... 21:5 31:20
complemen... 15:6 17:24
complete (2) 25:12 36:22
completed ... 21:3
complex (1) 24:10
component... 20:25 24:16

32:25
component... 23:11 31:9 32:6
compositio... 5:9 28:19
comprehen... 22:20 23:16 33:1
concept (8) 13:1,3 14:24,24 15:19 17:3 17:5 19:19
conceptual... 28:18
concern (5) 28:11,14 29:23 42:13 45:3
concerned ... 28:21,22 45:22
concerns (1) 44:25
concise (1) 38:7
concluded ... 46:14
concludes (1) 19:21
concurrent... 23:9
condition (5) 20:13,13,14 20:16,20
conditions ... 9:14 20:7 21:12
conflict (2) 34:22 35:13
confusing (1) 33:13
congratula... 29:10
Congressm... 4:24 5:1
connected ... 15:16
connection... 15:9
consequen... 9:15
consider (3) 24:2 44:10 44:11
considerati... 26:25
considered ... 7:15 24:12 26:19 29:4 33:15 34:9
considerin... 18:22
considers (1) 9:7
consistent (... 25:10
consisting (... 13:3 26:2
constituent... 5:14
constraints... 11:15,16 17:11,17
constructe... 17:16
constructin... 14:1 18:11 18:15
constructio... 14:2,6 25:18,19,25 25:25 26:1 27:16,25 29:15,15 31:17 32:8 32:17 34:25 35:9,15 36:16,20,21
constructiv... 38:7
context (1) 24:9
continue (5) 7:15 19:14 37:2,6 39:20
control (3) 13:21 25:24 28:15
conveyanc... 16:1 19:16
coordinate ... 37:6
coordinate... 27:8
coordinati... 9:13 37:2
copy (1) 6:11
corner (1) 43:11
cost (2) 11:24 23:10
cost-effecti... 13:11
counsel (2) 47:11,14
County (3) 10:9 41:2 41:18
couple (2) 4:8 30:25
Court (1) 47:4
cover (3) 7:2 23:14,16
Craig (1) 2:5
crash (1) 33:9
create (5) 8:6 31:17 32:3 32:7,14
created (2) 5:10 14:20
creates (1) 40:9
creating (1) 15:8
creation (1) 16:11
creative (1) 14:10
creek (11) 14:2 15:20 27:5 28:4 37:4 39:19 40:1,7,13 40:17 42:7
criteria (1) 24:11
critical (2) 7:11 30:21
cross (1) 24:4
cross-refer... 24:6
crystal (1) 34:4
cubic (1) 14:3
cultural (2) 23:15 27:12
culverts (1) 15:22
cumulative... 33:3,12 35:8,11 36:6
current (1) 11:2
currently (1) 39:25

D

D (1) 3:2
daily (1) 33:18
damage (1) 5:5
damages (1) 31:25
darker (1) 20:18
dashed (1) 20:5
data (1) 33:21
date (1) 47:9
day (1) 19:20
days (3) 44:14 45:3 45:5
deadline (2) 10:22 37:23
decision (4) 10:1 34:14 36:15 45:7
DeeAnn (2) 3:18 45:20
definition (1) 24:8
definitive (1) 24:11
DEIS (5) 1:11 7:18 9:1,9 23:20
delegation ... 5:7
Dennis (9) 3:5,6 4:2,7 4:11 10:15 10:21 37:22 38:8
DEP (4) 4:10 10:20 37:22 43:24
DEPART... 1:2
depending ... 31:15 32:24
deposition ... 47:7,13
description... 9:12
design (12) 1:8 5:9 7:16 10:2,11 13:12 14:14 15:6 17:13 27:7 28:19 36:16
designed (3) 11:20 16:22 16:24
designers (1) 12:16
designs (1) 29:2
detail (1) 13:14
detailed (2) 19:23 30:5
determine ... 24:12
devastatin... 5:2
develop (1) 23:11
developed (... 30:25
developing ... 37:9
devil (1) 46:4
differences ... 27:16 32:22
different (7) 12:17 17:13 22:1,22 31:21 33:6 37:3
direct (2) 7:3 33:5
direction (1) 7:11
discharge (1) 15:14
discussed (5) 18:14,25 23:2,3 28:15
discussion ... 34:7
distinction ... 18:9
disturbanc... 27:14
Ditch (4) 8:4 15:15 21:1 31:23
document (... 7:1,3 22:13 25:11 26:15 26:16 39:3
documents ... 24:7
doing (7) 4:18 22:17 23:8,9 24:1

24:14 33:4
dollar (3) 5:7 11:25 12:1
Don (3) 3:14 40:24,25
downpour ... 13:7
downstrea... 8:5
dozen (1) 31:7
dozens (1) 29:8
Dr (1) 8:15
draft (9) 1:9 6:25 8:20 9:11 19:25 22:14 26:15 32:25 34:20
drainage (1... 8:3 12:9 14:23 15:16 17:10 18:6 19:9,13,14 21:9 28:9 31:24 42:11 44:1
draining (1) 40:17
drains (1) 40:2
dredging (3) 15:19 19:16 40:15
drop (3) 7:21 39:7,8
due (1) 11:2
duly (1) 47:8
dust (1) 25:25
dutifully (1) 6:8

E

E (3) 3:2 47:1 47:1
e-mail (5) 7:19 10:19 10:20 37:21 38:20
earlier (2) 6:6 45:10
early (1) 24:19
east (9) 8:4 14:5 15:15 18:12 19:14 20:25 21:16 21:20 31:23
Ed (1) 42:1
edge (1) 15:24
educated (1) 45:7
education (1) 16:15
effect (14) 23:21 24:3 24:15,22 25:5,9 26:20 27:11 27:18,24 29:21 32:1 33:4,5
effective (2) 25:7 27:4
effects (26) 9:8 12:2 25:6,18 26:4,9,11 26:13 27:13 27:21 28:1 28:6,13 29:25 30:17 30:20,23 31:2,6,8,11 32:21 35:3 35:8,11 36:7
efforts (1) 9:13
EIS (20) 8:21 9:11,25 19:25 22:14 22:23 23:1 23:13 25:12 26:16 27:1 33:1 34:7,8 34:20 36:7 36:13,24 37:20 39:3
either (3) 24:24 25:2 35:10
elementary... 2:6 42:6
elements (7) 13:14 16:22 17:23 18:1 19:5,8,9
elevation (2) 13:6 14:20
employed (1) 47:11
employee (1) 47:14
encourage ... 5:14
ended (1) 13:3
ends (1) 36:24
engagemen... 10:5
engineerin... 29:2
engineers (1) 14:13
enhance (1) 11:8
enhanceme... 14:16 41:20
ensure (2) 14:13 37:13
ensures (1) 9:7
entire (4) 7:2 39:3 40:2,4
entitled (1) 43:9
entity (1) 37:11
environme... 9:15 23:15 23:21,24 25:9 34:7 34:18 41:8 41:15,17
environme... 1:2,10 4:19 6:25 7:6,9 9:4,8 22:5 23:8 26:14 26:25 41:7
envision (1) 28:5
EPA (1) 43:24
ESC (1) 22:11
estate (1) 40:20
et (1) 40:20
evaluate (1) 7:25
evening (8) 4:4,6 5:16 5:23 6:1,21 8:19 12:18
event (6) 4:16 11:14 14:8 16:23 16:25 46:3
everybody ... 4:21 5:21
exactly (1) 41:9
example (3) 14:18 16:9 34:23
exceed (1) 24:18
excellent (2) 22:14 39:5
executive (3) 8:9 10:5 39:4
existing (8) 9:14 16:7 18:23 20:6 20:13,14 21:12 32:6
exists (1) 39:24
expect (1) 25:22
experience ... 32:23
experts (1) 23:6
Exposition ... 10:8

F

F (1) 47:1
faces (3) 6:5 15:1 17:8
facilities (1) 27:24
familiar (3) 6:5 23:6 40:2
far (5) 18:19 34:10 38:4 41:19,19
feasibility (2) 10:11 23:9
feature (1) 32:2
features (2) 12:20 18:19
Federal (3) 9:5,7 10:13
Federally-f... 11:23
feel (1) 6:6
feet (6) 13:16 13:17 14:3 14:6 20:8 20:12
felt (1) 5:3
Ferry (14) 4:14 8:11 39:12,16 40:10,19 41:23,25 42:1,4 43:23 44:2 44:23 45:1
Ferry/Sout... 44:23
fewer (2) 30:3 32:16
fight (1) 5:6
figure (2) 33:19 34:4
fill (1) 37:20
filter (1) 16:22
final (5) 9:25 13:1 36:24 37:20 46:1
financially ... 47:15
find (2) 7:4 24:7
finding (1) 43:10
finished (1) 42:13
fire (1) 33:8
first (11) 4:10 23:20 24:1 24:15 28:20 38:10,22 39:9 44:3 44:13 47:8
five (9) 10:6 11:1 16:4,7 18:23 27:18 32:3,5,16
five-and-a-... 44:4
fix (1) 42:21
flood (21) 4:3 5:13 6:4 7:25,25 10:25 11:3 11:7,11 12:5,22 14:19 17:19 20:1 31:14 31:23 40:19 42:12,20,21 45:20
flooded (4) 20:19,21,21 44:2

flooding (14) 12:10,14 14:7 15:1 17:9 20:16 21:5,16 29:16,19 40:11 41:13 41:13 44:8
floodwalls (... 13:17
flow (1) 16:12
fluctuation... 13:21
Fluvial (1) 27:14
focus (1) 34:12
fold (1) 14:10
folk (1) 40:12
Following (1) 6:17
foot (3) 14:20 44:3,15
force (3) 15:10,10 18:16
foregoing (1) 47:6
foreseeable... 34:13
form (1) 22:10
formal (1) 6:6
forth (7) 13:12 24:11 24:19 36:7 40:6 41:11 47:9
forward (9) 6:4 7:16 8:12 10:2 12:5 36:21 37:7 41:12 41:21
found (6) 14:11 26:14 27:2,10 31:1 35:7
four (7) 14:11 24:14 30:20 31:16 35:8 38:20 44:25
four-and-a... 44:3
frankly (1) 40:17
frequent (1) 14:25
friends (1) 4:10
front (2) 10:19 37:21
fruition (1) 40:22
full (5) 17:1,1 17:24,25 23:14
fully (1) 11:22
function (1) 11:19
functional ... 11:22
funding (7) 5:11 9:6 11:16,18 17:12 18:3 19:6
funds (3) 5:12 11:21 37:1
further (2) 47:10,13
future (9) 17:14,22 18:3 19:6 31:15 34:2 35:23 36:1 36:3

G

gamut (1) 32:23
gardens (1) 16:21
Gary (1) 4:12
gate (4) 13:20,20 14:4,5
gates (4) 13:19,22,22 14:5
generally (6) 26:10 28:3 30:3 32:10 32:14 33:12
getting (3) 39:22 41:21 42:13
give (1) 43:25
giving (1) 6:24
go (8) 6:21 8:21 10:1 18:19 22:24 31:12 38:2 45:6
goals (1) 11:10
goes (1) 9:11
going (48) 4:9,19 5:22 6:21,23 8:21,22,23 9:1,9 12:15 12:16,19 13:13 14:22 19:4 22:3,4 22:22,24 26:20 30:11 33:16,18 34:5,15 35:3 36:18 36:19 37:2 37:5,11,15 38:1,5,19 39:13,22 42:2,15 43:21 44:7 44:7,11 45:7,8,15 46:10
good (7) 4:6 8:19 12:18 22:16 25:2 29:1 34:6
Gottlieb (4) 3:15 41:23 41:24,25
governmen... 9:7 26:24 33:23 45:4 45:15
graphic (5) 14:17 19:8 20:7 21:10 21:15
great (1) 30:22
green (5) 15:3 16:16 16:18 18:8 19:1
grew (1) 41:5
grey (3) 15:3 16:11 18:7
ground (2) 13:10 41:21
groundwor... 35:23 36:3
group (6) 8:9 10:9,10 33:24 37:4 39:12
guess (1) 42:8
guest (1) 4:23
guys (4) 11:4 42:14,14,18

H

habitat (5) 14:16 16:2 18:25 19:17 41:20
Hackensac... 4:13 8:10 14:15 28:3 40:3 44:12 44:24 45:1 45:24
half (1) 36:18
hand (2) 37:3 37:3
handle (1) 40:8
handlers (1) 23:7
handout (2) 38:21 39:2
happen (3) 16:10 29:11 34:15
happened (2) 33:10 34:10
happening ... 35:5 43:2
happy (1) 8:20
hard (3) 24:22 30:24 43:25
hazardous ... 29:22 30:1
hazards (2) 29:22 30:1
header (1) 33:22
health (1) 11:9
hear (1) 7:7
heard (1) 37:10
hearing (13) 1:3 6:5,6,10 6:19 7:17 9:22 10:14 36:13 43:1 43:5 46:10 46:14
held (1) 2:5
Helou (4) 3:16 43:22 43:22,23
help (8) 14:25 15:25 16:12 22:10 29:1 38:19 43:10,13
helping (1) 41:20
helps (1) 13:20
hereinbefo... 47:9
high (3) 20:11 22:25 30:10
high-level (1) 6:24
high-sensit... 27:17
highway (1) 35:4
historic (2) 27:13 37:5
historical (1) 27:12
hit (1) 5:5
holistic (1) 7:25
home (2) 23:4 45:12
homes (1) 5:3
hope (1) 40:22
hopefully (1) 38:7
hoping (2) 36:24 40:15
horizon (3) 20:7,11,15
host (1) 4:4
hosting (1) 5:20
house (3) 44:12,13,14
huge (1) 28:11
human (1) 23:15
hundreds (2) 28:22 29:8
Hurricane ... 46:2

hybrid (5) 17:3,5,13 21:15,19
hydrologic ... 23:10
Hydrology ... 29:16

I

idea (6) 5:24 14:10,18 17:25 19:7 19:13
ideas (1) 13:10
identified (8) 17:4,6 23:20 25:5 29:6 31:22 33:25 35:21
identify (4) 24:2 25:4 29:25 37:13
identifying... 37:11
image (2) 12:25 18:5
impact (17) 1:10 4:19 6:25 11:2 22:5 23:9 24:5,12,16 24:17 26:14 28:6 29:4 33:12 35:17 45:22 46:2
impacted (1) 11:6
impacts (6) 5:2 25:1,16 30:8 31:13 33:4
implement ... 16:17
implement... 9:8 21:6,9 21:14
implement... 18:2
implementi... 25:2
impression... 40:9
impressive ... 29:10
improve (1) 32:5
improved (2) 15:3 31:1
improveme... 23:24
improveme... 12:9 14:24 15:16,17,20 15:21,25 16:7,9 18:7 18:12,13,16 18:17,23 19:14,17 23:23 28:8 32:13 40:14
inches (1) 16:23
include (2) 15:9 17:24
included (5) 15:21 21:25 23:19 26:9 27:13
including (2) 10:7 19:15
incorporat... 14:12
incorporat... 13:18 19:5 19:10
incorporati... 13:10
increase (3) 11:1 16:1 20:16
increased (2) 31:14,23
increases (1) 20:23
increasing ... 19:16
independe... 11:17
indirect (1) 33:5
indiscrimin... 41:10
individual ... 20:3
infiltration... 17:1
influence (1) 23:18
informatio... 7:4 19:23 19:23 22:7 24:7 33:2 38:25
infrastruct... 11:2 15:3,4 15:5 16:12 16:17,18 18:8,8 19:1 26:8
initial (1) 22:13
initially (1) 28:18
inland (2) 17:19 31:23
input (4) 7:10,14 33:23 39:22
installed (1) 32:2
instrument... 8:12
insurance (1) 11:8
integral (2) 7:5,16
intensity (1) 24:9
interact (1) 34:5
interconne... 8:2
interested (1) 47:15
interior (3) 16:5 17:10 18:21
intermedia... 20:8,11
internal (1) 28:8
interventio... 21:19
introduce (1) 4:4
invite (1) 19:25
involve (1) 25:20
involved (2) 10:4,6
Ipp (3) 3:18 45:20,20
issue (2) 28:17 29:16
issues (1) 17:10
item (1) 42:3

J

January (1) 7:14
Jen (1) 4:12
Jersey (9) 1:1 1:22,24 2:5 2:7 5:7 10:8 45:21 47:5
job (3) 31:18 32:17 34:6
jobs (4) 31:19 32:8 32:8,17
July (7) 7:19 9:19 10:22 22:12 36:13 36:24 37:24
June (2) 1:8 2:7

K

Karlito (2) 3:7 4:23
keep (5) 7:23 26:8 28:17 35:20 37:23
kid (1) 41:5
Kim (1) 4:11
know (6) 7:10 23:7 40:13 42:5 43:23,24

L

L (1) 2:5
lack (1) 45:3
laid (1) 35:23
LAKE (1) 1:24
land (2) 27:2 27:4
large (6) 7:1 7:24 14:8 24:9 25:20 29:23
large-scale ... 25:20
larger (1) 26:16
late (1) 43:8
LATITISA... 2:3 47:4,20
layout (1) 25:21
lead (1) 12:16
learn (1) 5:11
left (7) 6:8 20:6,13 21:1,6,11 38:2
length (1) 30:12
lengthy (1) 26:15
Leslie (3) 3:15 41:23 41:24
less-than-si... 24:18,25 25:6,16,23 26:3,10 30:8
Let's (4) 10:24 25:15 26:12 31:12
letters (1) 28:20
levees (1) 13:18
level (7) 13:5 20:8,12,23 22:25 30:10 31:16
LICENSE ... 47:20
life (1) 41:13
light (1) 20:14
liked (1) 40:11
limit (1) 38:4
limited (2) 22:21 41:13
line (4) 13:3 13:18 20:5 42:3
linear (2) 13:16,17
list (3) 30:2 38:4,15
listed (5) 19:24 25:17 28:13 32:7 33:22
lists (1) 20:6
litany (1) 31:10
little (25) 4:14 8:10 13:14 17:20 20:1,2 22:1 29:6 31:21 39:12,16 40:10,18 41:23,25 42:1,4 43:8 43:23 44:2

44:22,23,25 45:17,21
live (4) 40:22 41:6 43:23 44:1
local (4) 33:23 41:2 45:4,14
location (2) 15:11,12
long (2) 26:3 35:6
long-term (1) 35:11
longer (2) 20:21,21
look (13) 8:22,23 15:23 22:23 24:22 25:15 26:12 32:25 33:14 34:20 36:2 41:11 41:20
looked (6) 8:1 13:8 14:9 15:7 31:9 39:4
looking (13) 10:12 13:11 13:16 14:25 15:2,13,19 16:4,17,20 18:20 19:18 36:21
looks (3) 12:23 16:3 18:7
Loquidis (3) 3:9 12:15 12:18
Losen (15) 8:4 15:9,14 18:14 19:12 21:10,21 31:24 32:12 39:19 40:1 40:12,16 42:8 43:24
lot (10) 6:4 10:3 12:2 22:10,22 23:7 29:24 34:3 36:3 38:24
love (3) 23:7 43:1,1
low (1) 20:8
low-lying (1) 11:5
lower (1) 15:14
Lulu (8) 3:9 4:12 12:15 22:8 23:3 31:25 32:11 35:21

M

mail (4) 7:20 10:20 37:22 39:8
main (3) 15:10,10 18:16
maintain (1) 13:23
maintained... (1) 37:14
maintenan... (4) 26:4,7 31:18 37:10 37:12,14
major (2) 8:3 10:7
makers (1) 34:15
making (2) 5:12 29:10
manageme... (3) 24:24 25:13 32:13
mandate (1) 4:17
mark (1) 7:17
materials (2) 29:22 30:1
matter (2) 2:3 23:5
Mayor (7) 3:6 4:5,6,12 4:13 5:20 8:8
mayors (2) 8:10 10:6
McDonald'... (2) 35:4
Meadowla... (8) 1:9 5:13,17 6:3 28:23 28:24 41:5
mean (2) 11:17 45:11
meaningful... (2) 23:1
means (3) 7:9 11:17,25
measure (1) 24:23
measures (... (10) 24:23 25:7 25:10,13,24 27:6,20,25 28:10 29:13 29:21 30:6 36:5
meeting (5) 9:20 10:10 39:16,21 45:2
meetings (1) 6:7
meets (1) 17:7
member (1) 41:25
members (2) 7:8 39:15
mention (2) 4:9 40:13
mentioned ... (8) 5:24 12:19 13:25 14:9 16:16 42:5 45:1
mess (1) 40:9
methods (1) 38:21
microphon... (8) 6:18 7:21 10:17 38:14 38:18 39:10 43:14
middle (1) 9:24
mike (5) 37:17 38:1 42:24 43:7 43:21
million (2) 39:17,24
mind (3) 7:23 28:18 35:20
minimize (1) 12:2
minutes (2) 38:5,10
mitigate (1) 42:15
mitigation ... (10) 24:23 25:7 25:10,12 27:6,20,25 28:10 29:12 29:21 30:6 36:5
model (1) 45:24
modeling (3) 23:10 29:17 45:22
modern (1) 34:10
modified (1) 23:24
moment (1) 17:21
money (4) 11:21 22:21 35:24 36:2
monthly (2) 10:10 33:19
months (1) 44:5
Moonachie... (8) 2:6 4:21 8:10 15:21 41:1,4,14 44:25 45:23
move (6) 6:3 7:16 10:2 14:22 15:11 37:7
moving (5) 8:12 15:13 25:21 36:15 36:20
multiple (2) 13:8 38:17
mutually (1) 27:8

N

N (2) 2:1 3:2
name (5) 38:6,15 40:25 41:24 43:22
names (1) 4:10
National (4) 7:6,9 9:4 41:3
native (1) 15:24
natural (1) 23:14
nature (2) 26:1 28:25
NAVD88 (1) 13:7
near (1) 44:14
necessary (1) 13:22
need (14) 7:12 8:23 9:12 10:24 11:4,5 12:1 12:1 23:1 28:14 38:19 39:23 43:13 43:14
needed (3) 13:24 41:19 42:12
needs (7) 4:16 11:20 11:22,24 12:6 24:22 42:16
negate (1) 39:23
negative (1) 24:24
neither (1) 47:10
NEPA (6) 7:8 8:21 9:4,17 24:8 26:23
network (1) 15:4
never (2) 39:2,4
new (25) 1:1 1:24 2:5,7 5:7 10:8 13:12 14:3 14:12,14 15:2,8,15 16:1,3 18:7 19:17 31:16 32:3,15 35:4 39:23 45:12,21 47:5
night (1) 4:18
nine (2) 44:2 44:14
NJDEP (2) 26:24 33:23
NJSEA (1) 10:7
no-action (6) 20:4,20 21:4,12,15 25:3

NOAA (2) 20:8,11
noise (4) 25:24 26:5 27:22 35:16
non-practit... 33:14
normal (3) 20:12,16,20
Notary (2) 2:4 47:5
noted (1) 31:13
notes (2) 2:2 47:7
notice (3) 6:7 36:25 42:3
notificatio... 45:2,10
notified (1) 45:5
November ... 37:1
number (4) 19:11 30:4 32:5,7
numerous (... 33:22

O

o'clock (2) 38:3 43:6
O&M (1) 32:8
obligated (1) 37:12
obtain (1) 27:8
obvious (1) 10:25
occur (5) 25:2,19,22 25:23 35:9
occurring (2) 21:19,20
October (1) 36:25
Office (2) 4:24 37:5
officials (1) 33:23
okay (3) 22:15 24:2 31:4
once (4) 9:24 23:21 35:3 35:11
open (13) 6:17 14:12 15:6 16:7 16:18 18:19 18:20,23 32:6,16 38:1 42:24 43:5
operation (3) 33:20 37:9 37:13
operational... 26:8
operations ... 26:1,4 31:18 32:17
opportunit... 14:12
opportunit... 6:20 7:18 9:2 16:2,14 37:16 40:23
optimistic (... 40:23
oral (1) 10:17
origin (1) 21:8
outreach (1) 10:13
outside (1) 29:19
overall (3) 26:8 32:18 36:8
overlaid (3) 23:22 34:1 34:19
overlay (2) 23:3 33:14
overloaded... 40:5
overview (2) 6:24 8:21
overwhelm... 22:7,24
overwhelm... 22:7
owners (1) 27:7

P

P (1) 2:1
p.m (2) 2:7 46:14
PAGE (2) 3:4,12
pamphlet (1) 6:13
papers (1) 40:11
parallel (1) 27:1
park (7) 2:6 16:3,10 18:21 27:14 28:24 43:24
parks (10) 15:5 16:5,5 16:6 18:20 18:21 31:16 31:16 32:4 32:15
part (12) 4:17 7:6,16 10:13 11:12 14:2,14 33:24 39:12 41:13,14 42:8
participate... 6:3 45:16
participati... 7:5 45:4
participato... 36:9,10
particular ... 44:24 45:2
parties (1) 47:12
parts (1) 25:21
Pascrell (2) 4:24 5:1
PASSAIC (... 1:23
patheticall... 40:5
people (4) 4:9 8:13 38:3,13
percent (2) 31:15 40:18
performing... 37:12
period (7) 9:23 20:9 22:21 30:15 36:14,23 38:2
permit (1) 36:16
permits (1) 42:10
permitting ... 17:17 37:8
personnel (1) 4:11
phase (3) 7:16 25:19 35:9
phases (1) 30:6
piece (1) 33:3
pipe (2) 15:11 40:7
piping (1) 40:6
place (5) 16:10 23:7 33:11 39:14 47:9
places (1) 14:14
plan (28) 12:22,23 13:2,15 17:14,14,15 17:16,22,25 18:1,4,10 18:17 19:1 19:7 21:1 21:25 35:22 35:23,25 37:10,14 41:11,16 42:14,18 44:7
plane (2) 33:9 45:21
planning (2) 39:14,21
plans (1) 17:13
played (1) 7:11
please (1) 30:14
pleased (1) 5:11
plus (1) 31:7
podium (1) 7:8
pointed (1) 32:1
Policy (3) 7:6 7:9 9:5
politicians ... 34:15
Pomander ... 46:1
Ponds (1) 8:15
poor (1) 40:9
portable (1) 42:9
portion (2) 6:18 34:23
portions (1) 40:4
positive (2) 11:24 25:1
possible (5) 11:11 22:25 27:14 40:16 45:10
possibly (1) 41:8
post (3) 6:11 11:14 29:15
posting (1) 6:14
potential (... 5:4 13:10 14:12,16 19:13,18 26:18 27:3 27:13,18,23 28:12 29:19 29:25 30:17 30:19,23 31:2,6,10 35:7
potentially ... 11:13 16:10 19:10 24:21 26:12,20 27:15 28:5 29:4 32:21 36:6
PowerPoin... 6:12
practices (2) 24:24 25:13
pre-constr... 27:7 29:14
preferred (5) 5:15 7:13 12:12 17:4 17:6
prepare (2) 36:25 45:11
presentatio... 4:18 6:12 6:15,17,24 7:2 8:17
presented (4) 5:16 13:9 17:18 22:9
Preservatio... 37:5
president (1)

41:1
pressurized... 15:11
pretty (2) 10:4 29:9
primary (1) 42:12
prior (1) 9:8
priorities (1) 5:17
privilege (1) 22:18
probably (3) 11:4 30:12 43:4
problem (3) 39:20 43:24 44:9
problems (2) 39:18 40:11
procedural... 7:7
proceeding... 45:9
proceeding... 2:2 6:10
process (8) 9:17 10:3 10:11,11 22:16 36:5 36:10 40:15
produced (1) 13:1
progress (1) 5:12
project (54) 4:7 5:10 6:4 7:12,23,24 8:2,12,23 8:25 9:6,9 11:10,11,18 11:19,21,23 14:11 17:11 18:7 20:6 21:2,13 22:18,19 23:4,10,17 25:8,20 28:18 29:19 29:23 30:6 31:15 33:8 33:10,18,20 34:11,16,17 34:18,21,24 35:1,15,19 39:1 40:21 42:3,17 44:24
projects (12) 4:20 9:5,6 34:1,1,5,12 34:21,22 35:3,16 38:15
promote (1) 11:7
properly (1) 40:17
property (3) 11:9 27:7 42:19
proposal (1) 13:12
propose (5) 25:24 27:20 27:25 28:10 36:5
proposed (... 9:12 24:23 25:6,14 27:6 28:14 29:12,20 30:5 34:2 34:22,24 35:15,19 40:12
proposing (... 35:1 39:17
protect (4) 5:12,17 11:8 14:7
protecting ... 12:6
protection ... 1:2 11:13 12:24 13:4 13:4,6,19 31:14,23
protects (1) 12:13
proud (1) 5:6
provide (11) 9:22 10:16 10:17,18 11:10 13:4 15:2 16:13 16:14 26:23 31:13
provided (1) 14:14
provides (3) 11:11 16:1 25:12
providing (2) 12:24 19:16
public (30) 1:3 2:4 3:12 6:5,7,18 7:5 7:10 9:2,20 9:21,25 10:5,16 11:9 14:12 16:8 18:23 28:22 30:14 36:13,14,23 37:17,25 38:2 42:4 42:25 43:3 47:5
publish (2) 36:24,25
pump (13) 14:3,4 15:8 15:8,15 18:11,12,15 19:12,17 21:24 26:5 26:7
purple (1) 20:5
purpose (9) 7:12 8:22 9:11 10:24 10:25 23:1 26:23 28:14 39:22
put (7) 4:15 11:25 12:5 38:8,19 39:7 42:9
putting (3) 13:12 41:12 43:7

Q

quality (2) 11:8 16:13
question (1) 37:17
questions (1) 43:1
quick (1) 18:4
quicker (1) 11:13
quickly (6) 12:19 19:4 26:21 30:11 31:12 36:15
quite (4) 17:18 18:5 39:5 40:17

R

R (3) 2:1,1 47:1
Raguseo (1) 4:13
railroad (1) 15:22
rain (1) 16:21
rainfall (3) 11:6 12:9 12:14
raised (1) 14:19
ratio (1) 11:24
re-emphasi... 38:23
reached (1) 34:3
reaches (3) 15:13 17:1 19:15
read (4) 4:25 22:14 28:20 30:1
reading (1) 34:9
real (1) 40:20
really (6) 13:22 24:22 41:11,20 43:2 45:9
reason (2) 17:5 39:16
reasonable ... 17:16
reasonably... 34:12
reasons (2) 26:13 41:9
rebuild (4) 1:8 5:9 28:19 42:15
recap (2) 18:4 19:21
received (2) 5:8 45:2
recess (3) 43:16 44:19 46:6
recognize (2) 4:8 8:13
recognized ... 8:14
recommen... 7:13
record (7) 10:1 36:15 38:20 43:3 43:9,20 44:17
recorded (1) 43:5
recording (1) 6:9
recovery (2) 5:7 11:13
recreation ... 14:15 16:15 18:25
redevelop... 35:1
reduce (10) 5:13 10:25 11:2,7 24:24 25:8 27:21 28:1 29:3 30:7
reduced (1) 21:23
reducing (1) 29:19
reduction (7) 11:11 12:6 12:22 17:19 20:1 32:12 32:15
refer (1) 19:25
reflected (1) 42:17
regardless ... 45:12
regards (1) 27:17
Regina (3) 3:16 43:22 43:23
regions (1) 15:14
regulatory ... 37:6
Reinknech... 3:5 4:2,2,22 5:19 38:12 40:24 41:22 42:23 43:19 44:16 45:18 46:9
reiterating ... 37:23
related (2) 39:19 47:11
relative (2)

relatively (1) 26:21
release (1) 37:1
rely (1) 11:18
remain (4) 5:4 18:13 18:17 19:2
Remedies (1) 25:7
remember ... 21:24 33:9
reminder (1) 12:23
repair (1) 42:15
repairing (1) 39:24
replace (1) 39:18
replaceme... 15:22
Reporter (1) 47:5
REPORTI... 1:22
represent (1) 45:16
representat... 45:5
represents ... 17:15 19:8 19:12 20:5
request (1) 37:1
requested (1) 39:14
requireme... 7:7
requires (1) 9:9
resident (3) 41:1,4 43:19
resilience (3) 4:3 11:1,7
Resiliency ... 6:4
resource (13) 5:25 23:13 24:4 28:11 30:18,20 31:1,5,9 32:20,23,25 35:8
resources (7) 27:12,15 28:2 29:13 33:23 35:18 35:18
responses (1) 37:18
restabilizin... 15:24
result (2) 32:16,20
review (1) 5:15
right (10) 6:22 9:20 9:24 20:10 21:4,7,12 38:2 39:16 42:19
rise (3) 20:8 20:12 31:16
Riser (8) 8:4 15:15 18:12 19:14 20:25 21:16,20 31:23
rises (1) 20:23
risk (3) 5:13 8:1 11:1
river (4) 14:15 28:4 44:8,12
rivers (1) 44:11
road (2) 13:24 26:7
roadmap (1) 5:22
roads (1) 13:24
roadways (1) 16:19
Robert (1) 2:5
robust (1) 10:4
ROD (1) 36:25
role (1) 7:11
room (4) 9:21 22:10 30:13 41:9
Route (2) 27:13 40:3
RPR (1) 2:4
running (2) 26:5 42:7
RUSSELL ... 2:3 47:4,20

S

S (1) 2:1
sadly (1) 40:4
Sandy (3) 5:2 5:11 46:2
saw (1) 38:24
scenario (2) 15:12 20:22
school (13) 2:6 8:15 39:15,17,18 39:24 40:14 42:7,13,16 42:19,21,21
schools (3) 42:4,6,10
scoping (2) 9:20 22:13
screen (2) 13:1 38:9
screening (1) 24:11
sea (4) 20:8 20:12,23 31:16
second (5) 14:4 19:12 24:17 33:22 44:3
Section (1) 28:16
sections (2) 19:24 24:6
sediment (1) 26:6
sedimented... 40:5
see (22) 4:18 6:4 8:6 9:18 18:5 19:11 20:4,15,22 21:5 22:8 23:25 25:11 27:16 30:22 39:22 40:12 40:21,22 42:2 44:6 45:14
seeing (5) 12:25 14:17 21:8,13 40:10
seemingly (1) 33:7
seen (1) 41:6
send (1) 38:20
sense (1) 8:5
sensitive (2) 29:2,13
September ... 11:22 36:22
series (1) 13:19
set (6) 18:16 24:11,19 26:17 36:7 47:9
settlement ... 27:9
seven (4) 14:20 26:18 30:17 32:20
seven-foot ... 13:6,7
shape (1) 34:10
shaping (1) 7:11
share (1) 25:17
sheet (1) 38:13
SHORE (1) 1:22
shores (1) 5:5
short (5) 4:25 22:20 43:16 44:19 46:6
Short-term... 25:18
show (1) 8:25
showing (2) 19:13 20:14
shows (3) 20:18 30:16 45:22
sign-up (1) 38:12
signed (1) 38:13
significant ... 24:3,12,21 25:4 26:12 26:20 27:4 27:10,23 28:12 29:5 29:25 30:17 30:20 31:6 31:7 32:21 32:24 35:7 36:6
significantl... 29:3
similar (8) 17:18 18:5 21:10 30:18 32:10,14,22 35:22
simplify (1) 33:13
simply (1) 22:19
single (1) 44:12
sit (1) 13:6
sites (2) 30:3 30:4
sitting (2) 22:13 41:9
situation (1) 42:6
slide (3) 6:20 19:24 26:25
slides (3) 7:3 24:6 38:25
slideshow (1) 38:24
slight (1) 32:15
slightly (3) 21:23 32:11 32:12
Slote (14) 8:4 15:9,14 18:15 19:12 21:10,21 31:24 32:12 39:19 40:1 40:13,16 42:8
slow (1) 16:12
small (1) 41:14
smaller (1) 26:15
Sobolewski... 3:13 39:11 39:11
Soccer (1) 44:24
Society (2) 41:2,4
solution (2) 22:20 23:12
solutions (1) 13:11
somebody (... 38:13 43:14
soon (1) 40:16

sort (2) 16:15 45:8
sources (1) 33:21
South (5) 4:13 8:10 40:3 45:1 45:23
space (9) 14:13 18:19 18:23 23:3 32:6,16 33:15,16 34:2
spaces (4) 15:6 16:7 16:18 18:20
speak (3) 6:20 38:14 40:23
speaker (1) 38:23
SPEAKER... (1) 3:4,12
speaking (2) 15:17 38:18
special (1) 4:23
specific (2) 24:10 27:24
specifically... (1) 13:23 39:18
spectrum (2) 23:14 31:10
speed (1) 36:4
Sports (1) 10:8
SPRING (1) 1:24
stages (1) 25:8
stakeholde... (1) 5:15 10:7
stand (1) 43:13
standby (1) 43:7
start (4) 4:3 8:5 10:24 41:15
started (1) 33:8
starting (1) 12:21
starts (1) 40:3
state (7) 1:1 2:4 5:4 37:12,21 38:6 47:5
statement (4) 1:11 5:1 6:25 26:14
station (8) 14:3,4 15:15 18:13 18:15 19:12 19:17 21:25
stations (5) 15:8,8 18:11 26:6 26:7
stays (1) 43:5
Steering (2) 8:9 10:5
stenograph... (1) 6:8
stenograph... (1) 2:1 47:7
step (5) 7:15 10:16 24:1 39:9 41:12
stops (1) 45:24
storage/tre... (1) 16:21
storm (22) 5:5 11:6,13 11:14 12:6 12:13,24 13:5 14:8 17:9,25 19:19 21:2 21:3,7,11 21:16,22,22 27:5 28:4 45:25
storms (1) 13:2
stormwate... (1) 12:8 14:23 15:6 16:25 17:10 18:6 19:9 23:23 23:24 28:8 28:9 31:21 32:13
straight (1) 33:5
strategies (4) 13:9 14:25 16:20 17:20
strategy (1) 8:3
street (2) 2:6 45:25
streets (1) 40:8
strictly (1) 27:4
structural (... (1) 12:5,22
structure (1) 32:1
structures ... (1) 27:24
study (2) 23:10 37:4
sub-waters... (1) 20:25 21:1
subject (1) 23:5
submission... (1) 10:22
submit (1) 7:19
substantial... (1) 29:3
suffer (1) 40:17
summaries ... (1) 8:24
summarize... (1) 32:19
summary (5) 9:1 22:3 25:12 30:9 39:4
sums (1) 22:2
Superstor... (1) 5:2
supplemen... (1) 5:11
support (1) 26:17
sure (1) 45:13
surge (16) 11:6 12:7 12:13,24 13:2,13 14:1,2,7 17:9,25 19:19 27:5 28:4 45:25 46:2
surprisingl... (1) 30:19
sworn (1) 47:8
synergistic... (1) 35:25
synopsis (2) 12:20 14:21
system (5) 14:4 16:25 26:5 40:7 40:14
systems (5) 16:4,20,24 19:2 40:7

T

T (4) 2:1,1 47:1,1
table (3) 22:13 25:11 26:16
tackle (1) 43:4
tail (1) 15:17
take (7) 8:23 9:1 12:19 23:1 24:2 24:22 25:15
taken (5) 2:3 43:17 44:20 46:7 47:13
talk (11) 5:24 7:8 9:9 12:3 17:20 18:9 20:1,2 22:4 37:10 43:1
talked (3) 15:18 21:24 36:14
talking (1) 29:9
talks (2) 9:13 9:15
team (3) 13:8 23:6 36:11
Teaneck (2) 45:21 46:1
telling (1) 22:15
temporary ... (1) 26:7
ten (1) 44:13
term (1) 26:3
terms (2) 24:8 32:4
Teterboro ... (1) 8:11 35:19
thank (18) 4:6,14 5:18 5:19,20 6:2 8:8,15,18 36:11 41:22 42:22,23 44:16 45:17 45:18 46:4 46:11
Thanks (1) 40:23
thing (3) 30:21 38:9 42:19
things (7) 5:23 14:7 25:24 26:1 28:24 33:16 33:17
think (9) 11:4 30:12 33:17 34:15 34:19 35:2 38:3 40:18 44:10
thinking (1) 15:5
third (2) 24:21 44:4
thought (1) 33:4
three (23) 4:20 12:4 15:8 16:5 18:20 19:22 23:23 25:8 27:19 28:21 30:6 31:2 32:15 33:6 34:3,8 35:3 38:3,4,10 38:13 44:2 44:7
threshold (2) 24:4,19
tidal (2) 13:21 46:2
tide (5) 13:20 13:20 20:12 20:16,20
tieback (1) 16:24
time (26) 6:3 18:2 20:15 22:12,21 23:3,25 26:5 33:15 33:16 34:1 35:2,17 36:18 37:25 38:4 41:16 43:5,16,25 44:9,13,13

44:19 45:13 46:6
timeline (4) 8:22 9:17 17:12,17
timer (2) 38:5,8
times (3) 11:14 34:10 44:2
tired (1) 40:10
today (5) 5:10 9:19 13:5 22:12 36:13
tomorrow (... 6:12 38:25
tonight (20) 5:21,22 6:11 7:1,20 8:13,16,20 9:10,22 10:14,16 12:3 22:10 37:19 38:24 39:7 42:2 43:2,2
tonight's (3) 4:16 6:10 6:15
topics (1) 33:2
Torino (4) 3:14 40:24 40:25,25
total (4) 14:6 16:5 31:17 32:16
totaling (1) 16:6
totals (1) 29:6
touch (1) 19:4
town (6) 8:1 8:1 11:1 40:2,4,18
towns (3) 10:6 44:25 45:9
traffic (3) 25:25 34:25 35:15
tragedies (1) 41:7
training (1) 41:19
transcript (... 6:9 47:7
transcripti... 7:22
transport (1) 26:6
transportat... 35:14
trenches (1) 16:21
tried (1) 43:4
trouble (1) 43:10
troublesom... 40:19
true (1) 47:6
truly (1) 23:15
truth (1) 22:15
try (4) 22:24 23:11 33:13 34:4
trying (1) 22:19
Tuason (3) 3:17 44:22 44:22
turn (2) 8:16 43:21
two (18) 9:19 12:12 14:5 15:8 16:5 17:13 18:11 18:21 19:11 22:11 23:5 23:23 27:20 29:9 33:8 36:19 44:4 45:3
two-hour (1) 16:23
two-year (5) 21:2,7,11 21:16,22
type (1) 18:24

U

ultimately ... 10:1 13:12 14:6,19 15:25 17:15 36:16
unavoidabl... 28:6
uncomfort... 38:17
understan... 31:8
unfortunat... 40:18
unplug (1) 8:3
upper (2) 15:13 19:15
upstream (1) 8:7
use (5) 5:25 8:15 27:2 38:18,20
USEPA (1) 37:3
uses (1) 27:4
utilities (1) 26:6
utility (1) 11:17

V

Vaccaro (4) 3:6 4:5,6 8:8
vaguely (1) 33:7
values (1) 40:20
variables (1) 22:22
variety (2) 28:12 29:12
various (1) 29:17
vegetation ... 15:24
verse (1) 31:22
vibration (2) 27:22 35:16
vicinity (2) 29:24 34:16
video (1) 6:15
videotaped... 6:11

W

walk (6) 8:20 10:10 12:16 13:13 26:21 46:1
walkway (2) 14:19,21
wall (5) 23:23 28:3 29:18 31:22 45:23
Walmart (1) 35:4
want (13) 4:8 4:14,20 5:19 6:2 8:8 8:12 11:6 33:1 39:6 42:20,24 44:16
wanted (2) 43:25 45:13
wants (3) 38:14 43:6 43:8
Washingto... 42:7,16,19
water (16) 11:8 13:21 15:11,13 16:13,13,23 28:11,13,15 29:13 35:18 39:19 40:6 40:8 44:15
waterfront ... 16:5 18:21
watershed ... 8:2,5 21:21
way (5) 10:15 26:22 41:14 45:11,14
ways (3) 14:10 15:2 38:17
we'll (12) 4:18 6:14 6:17,20 9:25 12:3,8 15:12 18:9 20:2 43:6 43:13
we're (23) 4:17 5:22 6:23 7:1 8:19,21,22 8:23 9:9 14:22 16:20 19:4 21:13 22:19 29:8 36:15,24 37:2,5,9,11 41:9 45:5
we've (9) 4:7 8:1 14:11 15:17 17:10 33:8 34:9 42:6,10
website (7) 6:12,13 37:22 39:1 39:1,2 43:10
weekly (1) 33:18
weeks (1) 6:16
welcome (2) 4:21 38:11
went (4) 30:11,24 38:24 45:12
west (2) 2:6 14:5
wetland (1) 16:11
wetlands (2) 28:17,23
white (1) 39:7
winds (1) 40:8
wishing (1) 6:19
witness (1) 47:8
word (1) 6:9
work (12) 4:14 14:13 20:15 23:12 29:24 30:24 34:21 35:12 35:25 37:3 42:18,25
working (4) 4:7 22:18 23:8 41:17
works (1) 41:16
workshops ... 6:7
worried (1) 5:4
worst (1) 41:7
wouldn't (1) 35:12
wrapping (1) 46:11
wrestling (1) 46:3
write (1) 43:12
writing (1) 43:13

written (2) 10:18 28:20

X

X (1) 3:2

Y

ya'll (1) 33:24
year (1) 36:17
years (14) 4:8 9:19 22:11 22:17 23:5 28:21 30:25 31:18 32:17 33:8,20 36:19 41:5 41:12
York (1) 45:12

Z

zone (3) 40:19 42:12 46:1

0

07762 (1) 1:24

1

1 (27) 12:5 12:21,22 13:2,15,25 14:11,21 17:24 19:19 20:17,22 25:3 27:3 27:18 28:2 29:7,18 30:4,16 31:5,13 32:4,9,20 35:10 45:23
1,000 (1) 14:3
1.2 (2) 16:23 20:8
10.1 (1) 31:16
100 (1) 23:5
100-storm ... 21:7
100-year (3) 21:3,11,22
118 (1) 14:6
12 (2) 3:9 31:14
120 (2) 33:25 34:1
13 (1) 44:4
15 (1) 7:19
1561 (1) 1:23
15th (3) 10:22 36:24 37:24
19 (1) 31:1
19,700 (1) 13:16

2

2 (35) 12:8 14:23 15:7 15:19 16:3 17:19,23 18:6,14,18 18:25 19:2 19:9 20:24 21:6,9,14 21:17,18,20 22:1 25:3 27:19 28:7 29:7,20 30:5,18 31:20 32:3 32:11,13,22 35:10,22
2.4 (1) 20:11
20 (5) 2:6 3:8 11:22 16:6 31:18
2016 (2) 9:20 22:12
2018 (4) 1:8 2:7 7:19 36:13
2019 (1) 36:17
2022 (3) 11:23 17:17 36:22
2023 (4) 21:2 21:3,7,22
2075 (3) 20:7 20:10,15
21 (4) 23:13 31:5,8,14
22 (1) 3:10
26 (2) 1:8 2:7

3

3 (15) 12:11 17:3,4 18:10 25:3 27:20 28:7 29:20 30:5 30:18 32:10 32:22 35:10 35:21 36:1
30 (3) 22:17 39:17,24
30-month (1) 36:20
30XI00234... 2:4 47:20
36 (1) 3:8
38 (1) 3:5
39 (1) 3:13

4

4 (3) 3:5,6,7
4.16 (1) 28:16
40 (1) 3:14
41 (2) 3:5,15
42 (1) 3:5
43 (1) 3:16
44 (1) 3:17
45 (1) 3:18
45-day (1) 9:23
45-miniute... 7:2
46 (3) 3:5 27:13 40:3

5

5 (1) 3:5
5,000 (1) 7:23
50 (2) 41:5 41:12
50-year (1) 13:5
517A (1) 1:23
5500 (4) 23:4 23:17 33:6 34:11

6

6 (2) 9:19 22:12
6.4-2 (1) 25:11
6:00 (1) 2:7
60 (1) 38:16
60-page (1) 34:19

7

7 (1) 31:5
7.6 (2) 18:22 32:15
732-282-07... 1:25

8

8 (3) 3:8 38:3 43:6
8:00 (1) 46:14
80 (1) 40:18

9

900 (1) 13:17
990 (1) 31:17

Appendix F: DEIS Public Comment Matrix

This Page has been Intentionally Left Blank.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
1	PC-001	Public Input / Outreach	The comment period for the 9 million people who live in New Jersey should be extended. I do not believe 45-days is a long enough comment period.	Comment noted. The comment period is 45-days pursuant to 40 CFR §1506.10. No change to the Environmental Impact Statement (EIS) has been made.
2	PC-001	Proposed Action	I do know when this project was proposed before that United Sates Army Corps of Engineers union workers were paid and bussed in to act as the public, even though they were paid for their time and hardly represented the public that actually lives in the area and concerned with the developments of Xandu and others in the area.	Comment noted. In accordance with the RBDM Citizen Outreach Plan (COP), the NJDEP conducted a public outreach program with residents of the Project Area (see **Section 1.9.1**). The Proposed Project's website (https://www.nj.gov/dep/floodresilience/rbd-meadowlands.htm) further contains a record of all Citizen Advisory Group (CAG) and public community meetings that were conducted throughout the NEPA process, including all associated meeting materials. No change to the EIS has been made.

[2] Public Hearing: PH-000, Federal Agency: FA-000; State Agency: SA-000, Private/Public Entity: PE-000 (includes local government agencies, organizations, groups, and/or businesses), and Private Citizen: PC-000.

[3] **Green** The comment was incorporated in the FEIS as suggested by the commenter. | **Blue** No change was made to the FEIS in response to the comment. | **Purple** The comment was incorporated in the FEIS in a different manner from that suggested by the commenter.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
3	PC-001	Proposed Action	In no case, should any more development take place in this area. It is a criminal act to develop this swamp. It has been a swamp for hundreds of years. Secondly, the developments in this area should pay for flood control, not all the taxpayers in New Jersey who had absolutely nothing to do with this development of commercial establishments in this known swamp area. No government should have allowed this overdevelopment to occur in this known swamp. It has always flooded and should continue to flood. The New Jersey State government is very crooked and needs real examination and change immediately so that these kinds of developments in known environmental problem areas do not continue to happen. Allowing this development on our shoreline is inviting flooding and needs to be stopped. NJDEP has allowed this to happen .It is not working for the welfare of the people of New Jersey in any way shape or form; it is working for environmental destruction and hazards for the people of this State.	Comment noted. As described in **Section 1.4**, the purpose of the Proposed Project is to reduce flood risk and increase the resiliency of the communities and ecosystems within the Project Area, thereby protecting critical infrastructure and facilities, residences, businesses, and ecological resources from frequent and intense flood events anticipated in the future. The Proposed Project would not be expected to induce additional development in the Project Area. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
4	PC-002	Alternative 3	I am a resident of Chapman Drive in Little Ferry, NJ and the part of your plan for the improvement of the Losen Slote is not acceptable and I strongly disagree with and I am sure many others who live is this area once they fully are aware of it. The area of Chapman Drive and Lamker Court, (homes built in the 1960's) normally does not flood, the only time is when Sandy occurred. Due to the fact that your plan states the 36" force main only goes from the new pump station at Lorena Street down Eckel and then Birch Street and will than dissipate into energy structure and to Losen Slote marsh than means Chapman Drive and Lamker Court will get flood water. This 36" force main should continue down an around Chapman Drive and Lamker Court and dissipate farther down so we will not be flooded. Please do not tell me that you do not have the money, I am sure you can make some type of changes. Also, who do you expect to maintain and monitor the pumps and keep ditch clean? I sincerely hope it is not the town workers or managed from afar for that would be a mistake and the project a failure. I do realize that this project has and still is taking a great amount of research and time and it is greatly appreciated and I do hope can become a reality.	Comment noted. Engineering and modeling performed during the feasibility study and design processes will ensure that the Proposed Project would not induce flooding. According to Federal and State requirements, the Proposed Project cannot increase flooding within, or outside of, the Project Area. Further, we must demonstrate that there would be no induced flooding to properties within and outside the Project Area in order to obtain the necessary permits from the New Jersey Department of Environmental Protection (NJDEP). NJDEP is also required to establish an operations and maintenance (O&M) Plan for the Proposed Project in accordance with the Community Development Block Grant - Disaster Recovery (CDBG-DR) funding. The plan will identify the entities that would perform on-going maintenance following construction. The State has begun establishing an O&M subcommittee to assist in the development of this plan. No change to the EIS has been made.
5	PC-003	Alternative 3	To fully evaluate the DEIS Preferred Alternative 3, the recommendations that are not funded (and will not be built in the foreseeable future) should be listed separately with specific details.	Comment noted. The Alternative 3 *Build Plan* is described in **Section 2.5.4** and analyzed in **Section 4.0**. The Alternative 3 *Future Plan* components are identified in **Table 2.5-7** and described and analyzed in **Section 5.0** (Cumulative Impacts). No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
6	PC-003	Alternative 3	The Preferred Alternative 3 Build Plan project is, for the most part, replacement of existing stormwater management structures, deferred maintenance of stormwater conveyances, and a relatively small amount of "green infrastructure" that could be helpful in addressing nuisance flooding associated with the NJDEP stormwater quality design storm (total rainfall depth of 1.25 inches and a total duration of two hours). The proposed Build Plan will not protect residents or businesses from tidal surge events associated with a major Nor'easter or a Sandy-type hurricane. The Build Plan is designed specifically for managing stormwater in the pilot project communities, but is not original (the proposed methods are commonly in use). Therefore, the project does not promote innovative Meadowlands District-wide scalable approaches to increase resiliency, especially during significant storm surge/high tide events. Unlike other RBD award winning designs, the Meadowlands project has failed to attract additional implementation funding beyond that provided by HUD.	Comment noted. The Alternative 3 *Build Plan* includes new and enhanced infrastructure designed to increase the capacity of existing stormwater drainage systems. No change to the EIS has been made.
7	PC-003	Feasibility Study Report	The comparison of costs/benefits associated with Alternatives 1, 2, and 3 (Table ES1.1-1) is misleading because there is no identification of resources that will provide the additional funds needed to complete 58% of the proposed Alternative 3 installation. The proposed project budget for the Preferred Alternative 3 has been broken up into a *Phase 1 Build Plan* ($150,000,000) and a *Phase 2 Future Project Plan* ($208,000,000), without any consideration of how or when Phase 2 would be funded. However, the Benefit to Cost Ratio was calculated based on the complete Alternative 3, not the *Build Plan Phase 1*. The comparison of costs/benefits should only include the components that are actually being built by 2022.	Comment noted. This comment references benefit-cost analysis data/information in the Feasibility Study Report. The benefit-cost ratio for the Alternative 3 *Build Plan* (i.e., the Preferred Alternative components that would be built by 2022) was individually analyzed in Chapter 10 of the Feasibility Study Report. The benefit-cost analysis is not specifically detailed in the Draft Environmental Impact Statement (DEIS); therefore, no change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
8	PC-003	Feasibility Study Report	The DEIS estimates the five (5) pilot project municipalities would need to cover annual operation and maintenance (O&M) costs of either $1.2 or $2.4 million dollars, Build Plan or Alternative 3 (including Future Plan), respectively. There is no discussion of where/how these municipalities will raise the required annual O&M funds. Without the required consistent maintenance needed, the new infrastructure will deteriorate as previous stormwater management infrastructure has.	Comment noted. This comment references data/information included in the Feasibility Study Report. The DEIS identifies that the State must develop an O&M Plan for the Proposed Project, which would be prepared by the O&M subcommittee. The O&M subcommittee would include members from the Project Area municipalities with the purpose of outlining the O&M Plan and identifying individual O&M responsibilities and funding. O&M funding and cost are not specifically detailed in the DEIS; therefore, no change to the EIS has been made.
9	PC-003	Feasibility Study Report	The existing conditions section (DEIS 3-54) characterizes the chronic flooding problem as a "recent event". This is incorrect. Flooding has been documented in the District for decades by the former NJ Meadowlands Commission and numerous previous studies, many conducted by scientists/engineers at Rutgers, The State University of New Jersey.	Comment noted. Page 3-54 of the DEIS discusses income and poverty data within the Project Area, and does not reference flooding. This comment appears to pertain to the following statement in the Feasibility Study Report, Page 3-54: "However, in the recent past, because of drainage network deficiencies, fluvial flood frequency has increased in the Project Area, making it a recurrent or even chronic problem." No change to the EIS has been made.
10	PC-003	Feasibility Study Report	The "*flood risk in the Project Area mainly comes from two types of events: (1) systemic inland flooding from high-intensity rainfall/runoff events; and (2) coastal flooding from storm surges*" (DEIS 3-54). These are not the types of events that are addressed in the proposed Alternative 3 Build Project that focuses on management of smaller precipitation events.	Comment noted. Please refer to the response to Comment #9. The Alternative 3 *Build Plan* would include stormwater drainage improvements designed to reduce inland flooding in the East Riser Ditch and Losen Slote watersheds during precipitation events up to the 100-year storm, which represents high intensity rainfall/runoff events (see **Sections 2.5.4** and **4.17.4.4** of the DEIS). No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
11	PC-003	**Feasibility Study Report**	"*The majority of the Project Area is within the FEMA 100-year floodplain*" (ES-3). The Level of Protection (LOP) from storm surges, proposed in the Alternative 3 *Future Plan Phase 2* (no LOP is proposed in the Build Plan Phase 1) is 7 feet NAVD 88. Surge heights considered (DEIS 3-55 Tables 3.4-1 and 3.4-2) are "*exclusive*" of predicted tide heights. Examination of the Preliminary Flood Insurance Rate maps for the Project Area show the "*100-year flood elevation is 8 feet*" (DEIS 3-66). The proposed project height of protection is 5½ feet below the FEMA-accredited Meadowlands District level of protection against the 100-year flood (LOP elevation of 12.6 feet NAVD 88). Even if Alternative 3 were fully funded and built, the proposed surge protection is inadequate to protect from large storm surge/high tide events. Flood maps from NJSEA show potential flooding when the surge elevation is 8 feet NAVD 88 in Moonachie, South Hackensack, Teterboro, and Little Ferry (DEIS 3-59). The 7 feet proposed barrier would only offer partial protection from 8 feet storm surges. Two-thirds of the buildings in the Project area (3,107) are estimated to be at 7 feet or lower (DEIS 3-65). The proposed 7 foot barrier does not take into account future sea level rise. Therefore, the preferred Alternative 3 does not sufficiently address the "Protect" function of the original RBD Meadowlands conceptual design, nor does the preferred Alternative include the "Connect" and "Grow" aspects of the award winning design.	Comment noted. This comment cites page and table references for the Feasibility Study Report. Overall, the constructible line of protection (LOP) at a height of 7.0 feet NAVD 88 would be sufficient to provide protection against approximately the present-day 50-year storm surge, and against approximately the 10-year storm surge in 50 years, based on future sea level rise (SLR) projections that reflect large storm surge/high tide events. While this level of protection would not benefit every property, it would provide substantial benefit to the Project Area overall. A description of the LOP can be found in the DEIS in **Section 2.5.2**. Further, per the Final Rebuild by Design Meadowlands (RBDM) Public Scoping document, the Proposed Project does not address the "Connect" and "Grow" aspects of the original $850M Rebuild by Design (RBD) design. Based on the amount of funding (i.e., $150M), the scope of the Proposed Project includes the "Protect" component only. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
12	PC-003	Feasibility Study Report	The Alternative 3 Build Plan identifies twenty (20) potentially contaminated sites that could affect implementation of this project (DEIS 10-3). Fifteen of these locations (75%) involve the proposed Green Infrastructure sites. Geotechnical analyses were based on limited soil information, and so additional soil borings are needed to fully characterize the extent of any contamination (DEIS 11-1). The Green Infrastructure at the proposed locations has not yet been designed (DEIS 11-1). If contamination is present, the 10-month estimated construction time for Green Infrastructure Improvements (DEIS 11-6) may not be achievable and costs for contaminate mitigation do not appear to be addressed or considered in the DEIS. Should contamination be present in these areas designated as "green infrastructure" the methods/cost of remediating contamination have not been discussed, and so there is a risk that these unknown conditions could result in less green infrastructure than is currently projected in the Build Plan. Funds dedicated to Green Infrastructure are $24,685,000 (15% of the project), of which $10.3 is dedicated to site acquisition (DEIS 11-5). If contamination must be remediated, this does not appear to be part of the budget.	Comment noted. The sections referenced correlate with the Feasibility Study Report. Additional information, including geotechnical data, would be gathered, developed, and refined as design progresses to address potential constraints associated with contamination. No change to the EIS has been made.
13	PC-003	Feasibility Study Report	The estimated annual benefit of the Build Plan is $1,449,000. If the estimate correct, the majority of this amount would be needed to cover the annual O&M costs. The Build Plan "assumes that funding for O&M will be procured from local government funds" (DEIS 10-14).	Comment noted. This comment references data/information included in the Feasibility Study Report. The DEIS references the development of an O&M Plan, but O&M funding and cost are not specifically detailed in the DEIS. Therefore, no change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
14	PC-003	Alternative 3	Funding sources and Timeline to complete preferred Alternative 3 Phase 2 are missing.	Comment noted. The Alternative 3 *Future Plan* would not be implemented as part of this Proposed Project; the *Future Plan* is described and analyzed as a reasonably foreseeable action in the cumulative impacts analysis in the DEIS that could occur between 2023 and 2030 (**Section 5.0**). Funds to complete the Alternative 3 *Future Plan* are not currently available. If additional funding is secured in the future, the timeline, design, and permitting of the additional flood protection features could be completed. No change to the EIS has been made.
15	PC-003	Feasibility Study Report	Source of Municipal operation and maintenance funds ($1.2 - $2.4 million) is not identified or secured.	Comment noted. This comment references data/information included in the Feasibility Study Report. The DEIS references the development of an O&M Plan, but O&M funding source(s) are not specifically detailed in the DEIS. Therefore, no change to the EIS has been made.
16	PC-003	Feasibility Study Report	DEIS 3-14: The Transco gas pipeline may pose potential conflicts with the Proposed Project components along the Williams Transco Gas Pipeline Rd. What are these conflicts and how would they be resolved?	Comment noted. This comment appears to pertain to Page 3-14 in the Feasibility Study Report. Please refer to **Section 4.12** (Utilities and Service Systems) in the DEIS for more information, including proposed mitigation measures and best management practices (BMPs) that would be implemented during final design and construction of the Proposed Project. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
17	PC-003	Feasibility Study Report	DEIS 3-18: 48% of existing waterfront structures are in critical to poor condition; the majority of structures would require significant reinforcement or reconstruction to support new coastal protection structures. Who will be responsible for correcting these deficiencies? What happens if the structural weaknesses are not corrected?	Comment noted. This comment references data/information from the Feasibility Study Report. Identification and improvement of deficient waterfront structures, not included in the Proposed Project, are the responsibility of the entity that owns/manages the respective structure. The condition of existing waterfront structures is not discussed in the DEIS; therefore, no change to the EIS has been made.
18	PC-003	Feasibility Study Report	DEIS 3-25: The hydrologic calculations in the DEIS include groundwater heights that are characterized as “rough estimates”. These estimates also do not include any tidal influences, which were “not considered in this assessment”. In the Meadowlands District the tidal effects on groundwater height can be significant. When will groundwater data be presented and integrated into the hydrologic designs?	Comment noted. This comment references data/information included in the Feasibility Study Report. Groundwater heights and tidal influences would be refined as appropriate during the final modeling and design of the Proposed Project. No change to the EIS has been made.
19	PC-003	Public Input / Outreach	Will there be public meetings/public input if hydrologic designs are altered and elements described in the proposed Build Plan change/are eliminated?	Comment noted. As described in the RBDM COP, NJDEP will engage community stakeholders during all phases of the Proposed Project. These phases include feasibility/environmental review (planning), design, and implementation (construction). A copy of the COP is maintained on the Proposed Project website at: www.rbd-meadowlands.nj.gov. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
20	**PC-003**	**Feasibility Study Report**	DEIS 3-30: USEPA data related to listing of the Hackensack River below Oradell Dam on the NPL as a Superfund Site was not included in the DEIS. How might Hackensack River contamination affect the proposed project?	Comment noted. This comment appears to pertain to Page 3-30 in the Feasibility Study Report. Currently, the Hackensack River is not on the National Priorities List (NPL) as a Superfund site, and, at this time, the State has not requested that it be placed on the NPL. The Lower Hackensack River Investigation was analyzed in the cumulative impacts analysis of the DEIS (**Section 5.0**). **Section 3.20** and **Section 4.20** in the DEIS provide additional information on Hazards and Hazardous Materials associated with the Proposed Project. No change to the EIS has been made.
21	**PC-004**	**Alternative 1 / Hydrology**	I am concerned that the computer modeling does not show that the impact on upstream floodplain communities north of South Hackensack – especially Alternative #1 = wall. My house in Teaneck was “Final zone of impact” for Hurricane Sandy. Tidal surge – Biblical event.	Comment noted. The coastal modeling domain (discussed in the Feasibility Study Report) was established to include all areas that could potentially be impacted by the Proposed Project. Although the area referenced in this comment is outside the Project Area, and thus is not explicitly shown in the figures or discussed in the text, it was included within the modeling domain. As noted in **Section 2.2.2.1** of the DEIS, the Proposed Project would not induce flooding outside of the Project Area. As such, no change to coastal flooding would be anticipated in the referenced area as a result of the Proposed Project. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
22	PC-005	Proposed Action	As a resident of 9 Chapman Drive, Little Ferry, NJ, I am greatly concerned about the proposed by-pass pipeline from Lorena Street pump station to its termination point in the Losen Slote at Birch Street. I have lived in my home on Chapman Drive since 1962. We have never received water in our house prior to and after Sandy. My concern is that you are only diverting water from one part of town to our area. This by-pass pipe will certainly cause flooding in our part of town. This is a major concern to myself and the other residents of the area. Why can't this pipeline be extended further into the Meadows, downstream of the residential area of Birch Street, Chapman Drive, and Lamker Court?	Comment noted. Please refer to the response to Comment #4. No change to the EIS has been made.
23	PC-005	Proposed Action	I was under the impression that a protective berm was to be built to protect us from another tidal surge similar to Sandy. It looks like that will never happen, leaving us with the potential of a major disaster.	Comment noted. The proposed LOP (a combination of floodwalls, berms/levees, gates, and a surge barrier and pump station), which would protect against tidal storm surges, is being considered for implementation under Alternative 1 and the Alternative 3 *Future Plan*. Alternative 3 (**Section 2.5.4**) is the Preferred Alternative because it would provide both coastal flood protection and stormwater drainage improvements. The stormwater drainage improvements included in the Alternative 3 *Build Plan* are prioritized to provide relief from the more frequent stormwater flooding events. The Alternative 3 *Future Plan*, including the LOP, could then be constructed over time by others as funding sources become available and construction feasibility permits. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
24	PC-005	Proposed Action / Parks	In previous proposals, a waterfront park was proposed at the end of Washington Avenue. The present proposal moves it locations to the DePeyster Creek area. The new area is isolated and not readily accessible to most of our residents. The end of Washington Avenue waterfront park site is more visible, accessible, and an overall better location.	Comment noted. Alternative 3 (**Section 2.5.4**), which is the Preferred Alternative, does include a proposed park at the termination of Washington Avenue. Known as "Riverside Park," this park would comprise 2.6 acres of riverfront property located along Riverside Avenue and Washington Avenue. A more detailed description of Riverside Park is provided in **Section 2.5.3.1**. No change to the EIS has been made.
25	PC-005	Proposed Action	Except for the above concerns, your group has done a superior job in planning this project.	Comment noted. No change to the EIS has been made.
26	PC-006	Alternative 3	The recommended "Build Plan" primarily addresses the systemic inland flooding that results from heavy or frequent precipitation in the Project Area, rather than focusing on construction of berms, levees, and floodwalls to form a "line of protection" (LOP) around the Project Area to guard against flooding during storm surges and spring high tides. The "Build Plan" fails to provide Backflow Preventers on the multiple stormwater outfalls to the Hackensack River, located on Mr. Nuckel's North Village I, LLC and North Village II, LLC properties, which carry stormwater drainage from large areas of Little Ferry, both on Mr. Nuckel's properties and offsite. Despite the fact that the DEIS fails to include Backflow Preventers on stormwater outfalls to the Hackensack River, that same DEIS formally recognizes the importance of such infrastructure. Specifically, the DEIS states that, "... Without backflow preventers, this could result in river water traveling backwards through the stormwater drainage pipes and into the streets of the Project Area [Page 2-5, DEIS]. The reason given in the DEIS for not including Backflow Preventers is that, "Bergen County is currently coordinating backflow preventer installation on existing stormwater outfalls to the Hackensack River." [Footnote 14, Page 232, DEIS]. *[Comment continues on next page.]*	Comment noted. The Proposed Project's funding cannot be used to address past actions, ongoing actions by others, or O&M issues on existing structures. The funding can only be used for the development of new flood control measures, and the conduct of the associated analyses. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
26	PC-006	Alternative 3	*[Comment continues from previous page.]* Thonet Associates' is familiar with Bergen County's plans in this regard and has previously spoken with Neglia Engineering, which is serving as consultants to the County of Bergen regarding the Backflow Preventer program. It was, and remains, Thonet Associates' understanding however, that contrary to the DEIS's apparent assumption, Bergen County does not intend to install Backflow Preventers on all stormwater outfalls to the Hackensack River, but rather only some of those outfalls would have Backflow Preventers installed. Mr. Nuckel's property alone has five (5) such outfalls, serving to discharge inland stormwater from the entire residential / commercial neighborhood in and around Mr. Nuckel's property. This entire neighborhood would benefit from the installation of Backflow Preventers on all of these outfalls. The installation of this infrastructure would probably be the simplest, single-most helpful flood plain management improvement that could be made to minimize flooding within the entire area encompassing Mr. Nuckel's 406 residential housing units and other surrounding commercial and residential developments. The DEIS further indicates that Backflow Preventers would be appropriate to include in the overall design of Alternative 1, which is essentially the "Future Plan" portion of Preferred Alternative 3. The reason given in the DEIS for including Backflow Preventers in the "Future Plan," portion of Alternative 3 is that this, as yet unfunded alternative "...would require more extensive alterations to existing outfalls to accommodate then in the LOP. However, since there is no funding for the LOP at this time, and in fact this LOP may never be funded, there is no reason to believe that these beneficial Backflow Preventers will ever be installed for all of the stormwater outfalls to the Hackensack River, despite the formal recognition by the RBD Meadowlands Flood Protection Project that such Backflow Preventers would indeed with beneficial. *[Comment continues on next page.]*	See response to Comment #26 on previous page.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
26	PC-006	Alternative 3	*[Comment continues from previous page.]* In Thonet Associates' opinion, the installation of Backflow Preventers at this time, on all stormwater outfalls to the Hackensack River would provide immediate flood control benefits to all neighborhoods along the Hackensack River, without needing to wait for the uncertain construction of a LOP at some, as yet undetermined, future time. Not to include such beneficial, flood protection infrastructure as part of the selected and funded "Build Plan" is thus inconsistent with the stated purpose of that "Build Plan," which is to address the systemic inland flooding that results from heavy or frequent precipitation in the Project Area. Recommendation No. 1: Mr. Nuckel has consistently and regularly encouraged the inclusion of Backflow Preventers on stormwater outfalls to the Hackensack River, both verbally and in writing, over the past 33 months and continues to make that recommendation for the "Build Plan." Clearly, such Backflow Preventers would be beneficial in terms of minimizing flooding on multiple properties proximate to the Hackensack River, with no negative environmental impacts. Hence, the Benefit / Cost ratio for the "Build" project should not be negatively impacted by including this additional "Grey Infrastructure."	See response to Comment #26 on Page F-11.
27	PC-006	Alternative 3	It is further recommended that a meeting now be scheduled between RBD Meadowlands representatives and Mr. Nuckel and/or Thonet Associates, on behalf of Mr. Nuckel, to continue our discussions regarding the installation of Backflow Preventers on the numerous stormwater outfall structures located on Mr. Nuckel's properties, which discharge directly into the Hackensack River. RBD Meadowlands Project Team Leader, Linda Fisher, emailed the undersigned on March 1, 2018, agreeing to meet with Thonet Associates and Mr. Nuckel, for just such a discussion, but she suggested that the appropriate timing for that meeting would be after we'd had the opportunity to review the project's DEIS. Now that we've had the opportunity to review the DEIS, Thonet Associates again requests that this meeting be scheduled.	Comment Noted. NJDEP notes your request for a meeting. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
28	PC-006	Alternative 3	The *Future Plan,* which is not proposed to be built until such time as funding is available, would include a "line of protection" (LOP) around the Project Area to guard against flooding during storm surges and spring high tides, including along that portion of the Hackensack River which abuts Mr. Nuckel's North Village I and II apartment complexes. Mr. Nuckel has previously advised RBD Meadowlands representatives that even during Hurricane Sandy, flood elevations and flood damages were minimal and manageable, and that a protective flood barrier constructed to elevation 7.0-feet NAVD (50-year flood level), as currently proposed, would provide minimal benefit since the first-floor elevations in the 408 residential units in North Village I and II, are already about 3-feet above that level of protection. For the above-stated reason, Mr. Nuckel continues to voice his opposition to any such flood barrier protection on his property, should funding become available for the *Future Plan.* Accordingly, he continues to recommend that the currently proposed flood barrier proposed along the Hackensack River on his property, be eliminated from future consideration. In addition, NJDEP will recall that Thonet Associates, in its previous comments on the RBD Meadowlands project, specifically recommended that alternatives, such as the *Future Plan* portion of "Preferred Alternative 3," which would require more funding that was currently available, should simply be rejected due to the fact that such alternatives have not been demonstrated to be fiscally feasible. *[Comment continues on next page.]*	Comment noted. Under the Alternative 3 *Future Plan*, the constructible LOP at a height of 7.0 feet NAVD 88 would be sufficient to provide coastal flood protection to the Project Area against approximately the present-day 50-year storm surge, and against approximately the 10-year storm surge in 50 years, based on SLR projections. While this level of protection would not benefit every property, it would provide substantial benefit to the Project Area overall. A description of the LOP can be found in the DEIS in **Section 2.5.2**. Per the RBDM Public Scoping Document, Alternative 3 was designed to integrate components of Alternatives 1 and 2 into a hybrid design that would protect against both inland flooding and coastal flooding. Due to the all-or-nothing nature of the LOP, it could not be incorporated into the *Build Plan* with stormwater drainage improvements within the available funding and mandatory schedule (i.e., completed by September 2022). However, because the LOP design was designed for Alternative 1, it was also included in the Alternative 3 *Future Plan* so that it could be further investigated with additional funding and environmental analysis in the future. The potential environmental consequences (e.g., physical and visual impacts) of the LOP can be found in the DEIS throughout **Section 4.0**. However, the DEIS cannot present specific potential impacts for each property in the 5,405-acre Project Area. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
28	PC-006	Alternative 3	*[Comment continues from previous page.]* Specifically, on August 19, 2016, Thonet Associates recommended that the NJDEP,"...not even go through the exercise of evaluating as "alternatives," projects that can't be accomplished within the monies available..." Thonet Associates continues to advise the NJDEP that including LOP in the "preferred plan," when the fiscal feasibility of that LOP cannot be demonstrated, is inappropriate. Nonetheless, since the *Future Plan* portion of Alternative 3 is still being considered, Mr. Nuckel would like to see what this flood barrier protection would look like and approximately what portion of his property would have to be acquired, or placed within easements, in order to accommodate that flood barrier. Absent that information, it is not reasonable to expect that Mr. Nuckel could realistically evaluate the potential physical, visual and fiscal impact of that flood barrier on the 408 residential housing units located on his property. Thonet Associates has reviewed the DEIS looking for an analysis regarding specific impacts to Mr. Nuckel's properties and finds that no information specific to Mr. Nuckel's property has been provided. Thus, it is impossible to make informed comments regarding the accuracy and reasonableness of the DEIS's environmental impact analysis with regard to Mr. Nuckel's specific properties as related to the *Future Plan* portion of Preferred Alternative 3. It is important to note that one of the purposes of providing the DEIS to the public is to provide information in sufficient detail to allow members of the public to review and comment on the DEIS's findings. The DEIS is clearly deficient in this regard with respect to the impact of the *Future Plan* portion of Alternative 3 on Mr. Nuckel's property. Recommendation No. 2: Mr. Nuckel continues to recommend that the flood barrier being proposed along the Hackensack River on his property, at some, as yet undetermined future date, be eliminated from future consideration, for the reasons stated above. Nonetheless, since the "Future Plan" portion of Alternative 3 (the LOP) is still being considered, Mr. Nuckel would like to meet with the NJDEP and, if possible, be shown how much of his property would be impacted by the Future Plan's proposed flood barrier. Since Linda Fisher has already agreed that a meeting could be scheduled with us to discuss the "Backflow Preventers" issue, perhaps we can discuss the impact of the Future Plan's LOP on Mr. Nuckel's property as well during that meeting.	See response to Comment #28 on previous page.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
29	PC-006	Land Use and Land Use Planning	The *Substantial Amendment* document, released earlier this year, reported that the NJDEP has also taken steps to meet resilience performance standards and indicates that the NJDEP's Flood Hazard Area Control Act (FHACA) Rules as amended in 2007, 2013 and 2017 have been followed in designing the Project, which includes ensuring that the best available flood elevation data is used to determine the flood hazard area design flood elevation for a given site, including FEMA's advisory flood maps and subsequently released preliminary maps for New Jersey's coast. In addition, the *Substantial Amendment* makes a point of clarifying that permits-by-rule, general permits-by-certification, and general permits may not be used for activities qualifying as "major development," which means that Individual Permits are required for those projects and that those projects must meet New Jersey's Stormwater Management Rules at NJAC 7:8. Finally, the *Substantial Amendment* formally acknowledged that the flood mapping used by the State of New Jersey, prior to this rulemaking was outdated and generally underestimated the 100-year flood elevation by approximately 1 to 4 feet and, in some circumstances, by as much as 8 feet. Thonet Associates agrees with all of these regulatory findings in the Substantial Amendment but hastens to add that based on recent observation and participation in municipal planning board reviews of major developments within the Study Area, these NJDEP regulations do not require or even encourage significant improvements to flood protection and resiliency, and. as a result, generally do not result in any significant improvement to flood protection and resiliency. This ongoing situation is clearly a "missed opportunity" for addressing needed flood protection and resiliency. <u>Recommendation No. 3:</u> It is for the above reason that, Thonet Associates' previous comment letters on behalf of Mr. Nuckel, recommended was that as part of the RBD Meadowlands Flood Control Project, the NJDEP should make specific recommendations to all of the affected municipalities in the Study Area,"...to amend municipal Master Plans and land development ordinances (including zoning, subdivision/site plan, flood plain, and stormwater management ordinances), to ensure that redevelopment projects and proposed significant expansions or changes to existing developments, within flood prone areas, result in significant improvements to flood protection and resiliency." *[Comment continues on next page.]*	Comment noted. Conducting a reexamination of existing municipal stormwater policies and producing a list of recommendations was an inland flood reduction concept that was considered but dismissed. Please refer to **Section 2.4.2** of the EIS for more detail. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
29	PC-006	Land Use and Land Use Planning	*[Comment continues from previous page.]* Mr. Nuckel continues to make this recommendation, which if implemented, would help to ensure that all of the individual municipalities play an active role in the effort to improve flood protection and resiliency within the Study Area.	See response to Comment #29 on previous page.
30	PC-007	Alternative 1 / Hydrology	I attended the June 26,2018 Public Hearing, for the Draft Environmental Impact Statement (DEIS) presentation by Rebuild By Design Meadowlands. At this Public Hearing, I provided my comments on the DEIS thru an oral statement, and a short paragraph written on a postcard. If Alternative 1: Structural Flood Protection, is chosen to protect the "Project Area" against flooding from the Hackensack River during coastal storm surges; it would be CATASTROPHIC for my Teaneck home of two generations, my life, and my property. As I stated at the Public Hearing, the Tidal Surge of Hurricane Sandy landed on the Pomander Walk Riverbank, with epic force. If you carefully examine a map of the Hackensack River, and follow the curves and shape of the shoreline, you can easily see that the Pomander Walk Riverbank is the " final zone of impact ", for a tidal surge from the Atlantic Ocean. A tidal surge begins in the Atlantic Ocean and gathers energy as the surge is channelized during movement upstream. Energy dissipates when the surge is allowed to move thru the entire floodplain, which includes the Moonachie and Little Ferry Project Area. I am certain that the Floodplain Engineers are aware of this obvious truth, therefore I will labor no further to describe a Tidal Surge flow thru floodplain. If the floodwaters and tidal surge cannot dissipate thru Moonachie Project Area, it will obviously hit my Riverfront with much more velocity, volume, and strength. I do understand that Rebuild by Design Meadowlands want to do this job, and the people living in Moonachie, Little Ferry, and South Hackensack, want a flood wall for flood protection. However, my life and property, and the same for my neighbors and residents of Bogota and Hackensack, should not be sacrificed. That would tremendously immoral. I urge NJDEP not to allow permits for Alternative 1 - Structural Flood Protection. Alternative 2- Stormwater Drainage Improvements, is the best choice, as it will not cause harm, property damage, and possible loss of life to the downstream floodplain dwellers in Teaneck, Bogota, Hackensack.	Comment noted. Please see the response to Comment #21. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
31	PC-007	Public Input / Outreach	I live on 708 Pomander Walk, Teaneck, in the Hackensack River floodplain. Most of my property lies at an elevation of 6 Feet M.S.L. down to 3.17 M.S.L. I have several neighbors also living within this floodplain. None of us were notified about the June 26 Public Hearing, or informed in any way about the Flood Protection/ Resiliency studies and proposals for Little Ferry, Moonachie, South Hackensack, Carlstadt, and Teterboro. All of us were catastrophically affected by Superstorm Sandy Tidal Surge, which smashed into the Pomander Walk Riverfront with enormous force. I witnessed this. My cat died of shock when the surge hit the house, not of drowning. I found out about the HUD Grant and the Hurricane Sandy Rebuilding Task Force - only by chance/heresay- thru a politically involved Teaneck friend of mine- a person who just happened to be interested in studying/understanding the full scope and impact of Superstorm Sandy. Notice of the Public Hearing in Moonachie should have been provided, by registered mail, to every single household within the Hackensack River floodplain downstream from the proposed project area. Basic Floodplain Common Law states that an Upstream Neighbor may not increase floodwater to a downstream neighbor, and an Upstream Neighbor MUST provide notice of intention to a downstream neighbor, of any proposed engineering plan, that could cause increase of floodwaters downstream. It is unconscionable that this project would proceed in a way that deliberately neglects to notify other floodplain residents who would most certainly suffer harmful consequences from flood engineering projects approved for Moonachie, Little Ferry, et al. - specifically if Alternative 1, Structural Flood Reduction, is chosen.	Comment noted. Notification methods set forth in the Proposed Project's COP and Guidance for Public Involvement (GPI) were used to solicit comments on the DEIS from Federal, State, and local stakeholders and private citizens, and to notify them of the Public Hearing held on June 26, 2018. The notification methods employed by NJDEP for the DEIS public comment period and the Public Hearing are outlined in the Public Comment Summary Report. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
32	PC-007	Alternative 1 / Hydrology	It is my understanding, as I was informed by the Rebuild by Design engineers and design planners, and also by the Engineer for Moonachie - that they were explicitly instructed, I believe by the EPA or HUD, to STOP the Flood Resilience Design Plan, at South Hackensack. Therefore, there would not be computer modeling of water flows, or development of a Flood Protection Plan for Bogota, on the Eastern side of the Hackensack River, or for Teaneck, on the Northern stretch downstream. To summarize the above: Computer modeling presented at the June 26 Public Hearing, shows water flows in the Moonachie et.al. project area. We were shown what to expect before, and after, a Resilience Plan from 3 Alternatives choices, would be implemented. However, under orders of EPA or HUD?: The computer modeling of water flows stopped short of Bogota, and the floodplain where I live, in Teaneck. This deliberate NEGLECT to fully model water flows East and North of the proposed project, is unconscionable. It is unconscionable to propose " Alternative 1 " Structural Flood Reduction", to protect Moonachie , Little Ferry, et.al., and NEGLECT to do the computer modeling studies, that would fully show the Environmental Impact that a Structural Flood Wall would have on the other floodplain communities, including Teaneck and Bogota.	Comment noted. Please see the response to Comment #21. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
33	PC-007	Agency Involvement / Coordination	Where is FEMA and the Army Corp of Engineers ? Have they weighed in and approved Alternative 1 ? Alternative 1 would be a MAJOR change to the hydrological flows of the Hackensack River. It is inconceivable that FEMA and Army Corp of Engineers would permit Alternative 1 - Structural Flood Wall.	Comment noted. The NJDEP is working closely with a number of Federal, State, and local agencies throughout the National Environmental Policy Act (NEPA) process. During the public scoping period, the NJDEP invited numerous Federal and State agencies with jurisdiction by law or special expertise to participate in the NEPA process as Cooperating Agencies; both FEMA and the US Army Corps of Engineers (USACE) New York District identified themselves as Cooperating Agencies. FEMA and USACE New York District were also notified of the DEIS public comment period and methods, and were given copies of the DEIS for review and comment. No formal approvals have been obtained for the Build Alternatives. The permitting process would occur following the Record of Decision (ROD). No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
34	PC-008 & PC-009	O&M Funding	According to the DEIS, responsibility for routine maintenance of facilities such as the Losen Slote stormwater pump stations and associated force mains described on page 2-63 will be considered in 2019 and described prior to construction. For example, page 2-42 says: "…In accordance with the CDBG-DR funding requirements, the NJDEP must develop an O&M [Operations and Maintenance] Plan for the Proposed Project. In early 2019, the NJDEP would form an O&M subcommittee with local and State partners to develop this plan. The participants in the O&M planning and development process would include, but not be limited to, entities such as the NJDEP, Bergen County, BCUA, PANYNJ, NJSEA, and the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack. The O&M Plan would contain five functions (Operations, Maintenance, Engineering, Training, and Administration) and describe the procedures and responsibilities for routine maintenance, communication, and timing of activation in the event of an impending storm…" In considering and describing responsibilities for routine maintenance, the NJDEP and the O&M subcommittee should carefully and expressly take into account (with assistance where appropriate from knowledgeable legal counsel) statutory authority to perform and obtain funds or such maintenance. For example, Bergen County and the above named Boroughs and Township appear to have clear statutory authority to perform such maintenance under the "Municipal and County Flood Control Financing Act," N.J.S.A. 40A:27-1 et seq., but some other entities potentially under consideration may currently lack such authority (especially for areas like this part of Bergen County where stormwater does not enter combined sewer systems). Any initiatives in the New Jersey Legislature to expand such authority should also be tracked. The applicable statutes will also determine the potentially available funding sources.	Comment noted. The O&M subcommittee will consider statutory authority to perform, and obtain funds for, maintenance activities when developing the O&M Plan. Close coordination with NJDEP Division of Water Quality Surface Water Permitting and/or Nonpoint Pollution Control and other applicable entities would be conducted to ensure all proper permits are in place and appropriate funding mechanisms are secured. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
35	PC-008 & PC-009	Permitting and Compliance	In considering and describing responsibilities for routine maintenance, NJDEP and the O&M subcommittee should also carefully and expressly take into account USEPA and NJDEP rules that require permits for "small municipal separate storm sewer systems" (small MS4s) operated by federal, interstate, State, and local governments. See, e.g., the USEPA small MS4 rules at 40 CFR 122.30 through 122.37, and the NJPDES Municipal Stormwater Regulation Program (MSRP) rules at N.J.A.C. 7:14A-25. Publicly maintained stormwater pump stations and associated force mains in this part of Bergen County would be considered small MS4 facilities under these rules. If such a pump station and force main is operated by one or more of the above named Boroughs or Township, no permit acquisition issue would arise because the pump station and force main would be within the scope of the NJPDES Tier A or Tier B Municipal Stormwater General Permit already held by those Boroughs and Township. Similarly, if such a pump station and force main is operated by a Bergen County highway agency or State highway agency **at their highway or other thoroughfare,** no permit acquisition issue would arise because the pump station and force main would be within the scope of the NJPDES Highway Agency Stormwater General Permit already held by that County or State highway agency. On the other hand, however, if such a pump station and force main is operated by a governmental entity (such as BCUA) that does **not** currently have a NJPDES MSRP permit, or is operated by Bergen County at a location **other than** a highway (or other thoroughfare) or "public complex" (as defined in N.J.A.C. 7:14A-25.2) operated by Bergen County, then NJDEP may have to prepare a new or modified NJPDES MSRP permit to authorize and control this governmental entity's stormwater discharge. Because such a discharge would be outside the scope of current N.J.A.C. 7:14A-25.2 (unless the discharge qualifies for "special designation" under current N.J.A.C. 7:14A-25.2(a)4), the initial requirement for this permit may come from the USEPA small MS4 rules, and NJDEP may need to expand current N.J.A.C. 7:14A-25.2 to include this discharge. *[Comment continues on next page.]*	Comment noted. No change to the EIS has been made. All permits would be obtained for the Proposed Project in compliance with Federal, State, and local requirements and standards.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
35	PC-008 & PC-009	Permitting and Compliance	*[Comment continues from previous page.]* None of the above statements about small MS4s apply to facilities, such as the East Riser Ditch pump station described on page 2-62, whose intake is in East Riser Ditch or other tributaries of the Hackensack River that are "waters of the United States" (WOUS) as discussed on page 3-219. East Riser Ditch and other tributaries of the Hackensack River are **not** "municipal separate storm sewers," and pump stations that withdraw water from those tributaries are **not** "small MS4" facilities.	See response to Comment #35 on previous page.
36	PC-008 & PC-009	Permitting and Compliance	My comments on this issue were prompted by the following statements in Sections 3.19.2.2 and 3.19.2.3. Section 3.19.2.2 State Policies and Regulations: Statewide stormwater management planning rules are discussed under NJAC 7:8, last amended on June 20, 2016. This code includes a section that specifically applies to major developments... **"The State of New Jersey has delegated authority to Bergen County to review the compliance of major development plans with NJAC 7:8 stormwater management rules..."** (emphasis added) 3.19.2.3 Regional and County Policies and Regulations: **"As described above, the Bergen County Stormwater Management Program is the enforcement mechanism for NJAC 7:8. It is through this program that the Bergen County Planning Board may require plan review and stormwater management facilities that comply with the New Jersey Stormwater Best Management Practices Manual based on the gross size of new development..."** (emphasis added) On their face, these statements apply to all of Bergen County, and to major development on private as well as public property. The unavoidable implication of these statements is that the above named Boroughs and Township, **and** all other Bergen County municipalities, are **not** part of "the enforcement mechanism for NJAC 7:8," and thus have **no** duty or even authority to review the compliance of major development plans with N.J.A.C. 7:8. If true (which I doubt), these statements describe one of the most significant changes ever made to institutional arrangements for stormwater management in New Jersey. *[Comment continues on next page.]*	Comment noted. **Section 3.19.2.2** was revised to identify the correct entities responsible for implementation of the various stormwater rules/regulations, including NJAC 7:8 and NJAC 7:14A. RSISs are not applicable to the Proposed Project. Further, the Proposed Project is not proposing revisions to State regulations and would obtain all necessary permits/approvals prior to construction.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
36	**PC-008 & PC-009**	**Permitting and Compliance**	*[Comment continues from previous page.]* Therefore, the final EIS for this project should specifically identify, and provide an internet link to, the official correspondence in which, purportedly, the State of New Jersey has delegated authority to Bergen County to review the compliance of major development plans with N.J.A.C. 7:8 stormwater management rules, and established that the Bergen County Stormwater Management Program is the enforcement mechanism for N.J.A.C. 7:8. As discussed below, the major role of municipalities in Bergen County (and elsewhere) in reviewing compliance of major development plans with N.J.A.C. 7:8 is deeply rooted in three major elements of the Municipal Land Use Law (MLUL); in N.J.A.C. 7:8 itself; in the Residential Site Improvement Standards (RSIS) promulgated by the New Jersey Department of Community Affairs (N.J.A.C. 5:21); in the NJPDES Municipal Stormwater Regulation Program (MSRP) rules at N.J.A.C. 7:14A-25; and in the NJPDES Tier A and Tier B Municipal Stormwater General Permits (one or the other of which is held by every Bergen County municipality). I doubt that NJDEP has the statutory authority to eliminate this role, and any serious NJDEP attempt to do so would require drastic changes to N.J.A.C. 7:8, N.J.A.C. 7:14A25, and those Tier A and Tier B Permits. Note that my concern about the role of municipalities is not with major development plans for county-owned or state-owned property, but with major development plans for private property or property owned by municipalities. *[Comment continues on next page.]*	See response to Comment #36 on Page F-23.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
36	PC-008 & PC-009	Permitting and Compliance	*[Comment continues from previous page.]* N.J.A.C. 7:8 is the primary component of the NJDEP "comprehensive storm water management regulations" authorized by the New Jersey Stormwater Management Act, codified in the MLUL primarily at N.J.S.A. 40:55D-93 through -99. Particularly for nonresidential development, it is this same New Jersey Stormwater Management Act that expressly authorizes municipalities to adopt stormwater control ordinances that conform to those regulations. I do not believe that NJDEP has the statutory power to remove this ordinance adoption authority from municipalities. On the contrary, an entire N.J.A.C. 7:8 subchapter, N.J.A.C. 7:8-4, is devoted fully to municipal stormwater management plans and municipal stormwater control ordinances, and this subchapter nowhere suggests that NJDEP has power to remove ordinance adoption authority from municipalities. Nor could NJDEP use N.J.A.C. 7:8-2.5, Exemptions, on a county-wide basis to waive municipalities from requirements of N.J.A.C. 7:8. (The New Jersey Stormwater Management Act and N.J.A.C. 7:8-4 expressly authorize Bergen County and other counties to approve, conditionally approve, or disapprove adopted municipal stormwater management plans and ordinances, but that activity is very different from Bergen County and other counties enforcing compliance of individual major development proposals with N.J.A.C. 7:8.) Moreover, and again particularly for nonresidential development, the MLUL stipulates that every ordinance requiring approval of subdivisions or site plans must include provisions ensuring "adequate water supply, **drainage,** shade trees, sewerage facilities and other utilities necessary for essential services to residents and occupants" (N.J.S.A. 40:55D-38b(3); emphasis added). Such provisions apparently may, and perhaps must, conform to N.J.A.C. 7:8, particularly because of the way that the applicable MLUL definition of "drainage" (in N.J.S.A. 40:55D-4) was itself expressly and substantially modified by the New Jersey Stormwater Management Act. I do not believe that NJDEP has the statutory power to nullify N.J.S.A. 40:55D-38b(3) as it pertains to drainage, and N.J.A.C. 7:8 nowhere suggests that NJDEP has such power. *[Comment continues on next page.]*	See response to Comment #36 on Page F-23.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
36	PC-008 & PC-009	Permitting and Compliance	*[Comment continues from previous page.]* The preceding paragraphs focus on nonresidential development because for site improvement in residential development, the stormwater control ordinance and utilities (including drainage) provisions of the New Jersey Stormwater Management Act and N.J.S.A. 40:55D-38b(3) were to a large extent superseded by the RSIS Act element of the MLUL (N.J.S.A. 40:55D-40.1 through-40.7). The RSIS Act stipulates that the RSIS promulgated by the New Jersey Department of Community Affairs supersede any site improvement standards in the municipality's development ordinances. The stormwater management subchapter of the current RSIS (N.J.A.C. 5:21-7) expressly incorporates the standards in N.J.A.C. 7:8-5. Therefore, whenever a Bergen County municipality reviews the compliance of residential development plans with the RSIS, this municipality reviews the compliance of such plans with (among other things) the N.J.A.C. 7:8 standards incorporated in the RSIS. Because NJDEP authority concerning residential development is preserved by the RSIS Act (see N.J.S.A. 40:55D-40.7) and by the RSIS itself (see N.J.A.C. 5:21-1.5(b) and (e)), NJDEP could, if it chose, issue rules and NJPDES permits that supersede the RSIS for stormwater management. The NJDEP has not done so, however. Instead, N.J.A.C. 7:8-1.5(c) expressly references the RSIS for stormwater management, and (as discussed below) N.J.A.C. 7:14A-25 and the Tier A and Tier B Permits require municipalities holding those permits to ensure major development compliance with the RSIS for stormwater management. N.J.A.C. 7:8 is closely linked to the NJPDES Municipal Stormwater Regulation Program (MSRP) rules, which regulate many small MS4s operated by federal, interstate, State, and local governments including county and municipal governments. N.J.A.C. 7:14A-25.6 lists the "Statewide Basic Requirements" (SBRs) that must (with some exceptions for the Tier B Permit) be included in every general NJPDES permit for small MS4s. (Four such general permits have been in force since 2004: the Tier A and Tier B Permits for municipalities, and the Highway and Public Complex stormwater general permits for other governments including counties.) *[Comment continues on next page.]*	See response to Comment #36 on Page F-23.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
36	PC-008 & PC-009	Permitting and Compliance	*[Comment continues from previous page.]* N.J.A.C. 7:14A-25.6(b)3 (applicable to the Tier B Permit via N.J.A.C. 7:14A-25.8(e)1) lists the SBR for "post-construction stormwater management" in new major development and redevelopment. Part of this SBR is the N.J.A.C. 7:14A-25.6(b)3ii requirement (with two specific exceptions) for "compliance with the applicable design and performance standards established under N.J.A.C. 7:8 for major development." Moreover, N.J.A.C. 7:14A-25.6(b)3iv stipulates expressly that if the permittee is a municipality, the municipality must (among other things) ensure compliance with the RSIS for stormwater management (which incorporate standards in N.J.A.C. 7:8-5), and adopt and implement a municipal stormwater control ordinance(s) in accordance with N.J.A.C. 7:8 (for nonresidential development, and for aspects of residential development not preempted by the RSIS). N.J.A.C. 7:14A includes no provision that would make it simple for NJDEP to waive municipalities from requirements of N.J.A.C. 7:14A-25.6(b)3. The "post-construction" SBR in N.J.A.C. 7:14A-25.6(b)3 and 25.8(e)1 could be modified by "additional measures" (formally adopted in water quality management plans) pursuant to N.J.A.C. 7:14A-25.6(e) and 25.8(g), but the current Tier A and Tier B Permits include no such "additional measures." Nor can the "sharing of responsibility" provision in N.J.A.C. 7:14A-25.7 be used for fully waiving municipalities from requirements of N.J.A.C. 7:14A-25.6(b)3, because the municipality is responsible for compliance with its NJPDES permit obligations if the other entity fails to implement the control measure(s), or component(s) thereof. Nor has NJDEP used its "waiver rule," N.J.A.C. 7:1B, to waive municipalities from requirements of N.J.A.C. 7:14A-25.6(b)3 or N.J.A.C. 7:8. The "post-construction" SBR in Part IV.B.4 of the current Tier A Permit and Part IV.B.2 of the current Tier B Permit expressly requires the municipalities holding these permits to ensure compliance with N.J.A.C. 7:8, ensure compliance with the RSIS for stormwater management (which incorporate standards in N.J.A.C. 7:8-5), and adopt and implement a municipal stormwater control ordinance(s) in accordance with N.J.A.C. 7:8 (for nonresidential development, and for aspects of residential development not preempted by the RSIS). *[Comment continues on next page.]*	See response to Comment #36 on Page F-23.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
36	PC-008 & PC-009	Permitting and Compliance	*[Comment continues from previous page.]* The "Shared or Contracted Services" provisions in these permits cannot be used for fully waiving municipalities from this requirement, because the municipality is responsible for compliance with the permit if the other entity fails to implement the control measure(s), or component(s) thereof. When, if ever, has NJDEP directly notified any Bergen County municipality in writing that because the State of New Jersey has delegated authority to Bergen County to review the compliance of major development plans with N.J.A.C. 7:8, the municipality is not obligated by the Tier A or Tier B Permit to ensure such compliance? The "post-construction" SBR in Part IV.B.4 of the current Tier A Permit and Part IV.B.2 of the current Tier B Permit expressly requires the municipalities holding these permits to ensure compliance with N.J.A.C. 7:8, ensure compliance with the RSIS for stormwater management (which incorporate standards in N.J.A.C. 7:8-5), and adopt and implement a municipal stormwater control ordinance(s) in accordance with N.J.A.C. 7:8 (for nonresidential development, and for aspects of residential development not preempted by the RSIS). The "Shared or Contracted Services" provisions in these permits cannot be used for fully waiving municipalities from this requirement, because the municipality is responsible for compliance with the permit if the other entity fails to implement the control measure(s), or component(s) thereof. When, if ever, has NJDEP directly notified any Bergen County municipality in writing that because the State of New Jersey has delegated authority to Bergen County to review the compliance of major development plans with N.J.A.C. 7:8, the municipality is not obligated by the Tier A or Tier B Permit to ensure such compliance? *[Comment continues on next page.]*	See response to Comment #36 on Page F-23.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
36	PC-008 & PC-009	Permitting and Compliance	*[Comment continues from previous page.]* The NJPDES Highway and Public Complex stormwater general permits require Bergen County to apply N.J.A.C. 7:8 to major development disturbing one acre or more on county highway property and county public complex property, but nowhere else. For major development proposals that require certain NJDEP permits (mainly flood hazard area, coastal, and wetlands permits), NJDEP directly enforces compliance with N.J.A.C. 7:8. Such NJDEP enforcement does not, however, eliminate municipal obligations to enforce compliance with N.J.A.C. 7:8 for those proposals. N.J.S.A. 13:1D-9.q authorizes NJDEP to contract with counties (among others) for the performance of any function under NJDEP's enabling act. What contract, if any, have NJDEP and Bergen County executed to authorize Bergen County to perform NJDEP enforcement of N.J.A.C. 7:8 for these major development proposals? Along the same lines, N.J.S.A. 58:16A-55.6 and N.J.A.C. 7:13-1.4 authorize NJDEP to delegate to counties NJDEP's permit approval and enforcement powers under the Flood Hazard Area Control Act. What, if any, official NJDEP correspondence delegated such powers to Bergen County? Finally, I have not found on Bergen County's own website any indication that the Bergen County Stormwater Management Program is the enforcement mechanism for N.J.A.C. 7:8. For example, the "Bergen County Stormwater Management Program" document on that website (copy attached to my e-mail submitting this letter) does not expressly mention N.J.A.C. 7:8 or, in a comprehensive manner, expressly or indirectly incorporate N.J.A.C. 7:8.	See response to Comment #36 on Page F-23.
37	PC-010	Biological Resources / Birds	As a CAG member I am optimistic about the overall plan, I do however very much worry about the environmental studies done especially when it comes to the bird life. I think some of the species recorded were badly misidentified and could only have been done by people who do not know or understand the bird life of the area. This concerns me regarding the overall long-term effects of the project on the wildlife.	Comment noted. The avian species list (see **Appendix J**) was reviewed for likely misidentifications and clerical errors. Species with a high probability of having been misidentified in the field were removed from the data set and replaced with a more general unidentified data point (e.g., unidentified seabird).

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
38	**PC-011**	**Alternative 3**	The third plan does not help my area at all. Three floods – a nor'easter in the 90s, Irene, and Sandy – all brought water surge from Hackensack River. The third plan does not address this issue. 9.5, 4.5, and 5.75 feet went through my first floor and destroyed my apartment rental.	Comment noted. Due to funding and construction constraints associated with a project of this magnitude, the Alternative 3 features would be separated into two stages: a *Build Plan*, which includes all features to be constructed as part of the Proposed Project, and a *Future Plan*, which includes the remaining features that could be constructed by others over time as funding sources become available and construction feasibility permits. Beyond 2022, as future funding becomes available, implementation of the *Future Plan* would incorporate additional inland flood reduction and coastal flood protection during storm surges. The *Future Plan* is described and analyzed as a reasonably foreseeable action in the cumulative impacts analysis (**Section 5.0**). No change to the EIS has been made.
39	**PC-011**	**Proposed Action**	Since the 1970s a plan has been on hold to dredge the Hackensack. Early 1990s Corps of Engineers said tide gates and berms should be repaired and upgraded, but politicians thought it too costly. The nor'easter, Irene, and Sandy cost more than the Engineers estimated for repairs.	Comment noted. Dredging the Hackensack River and conducting maintenance of existing local stormwater drainage infrastructure were considered as initial concepts for the Proposed Project. However, these concepts were dismissed from further consideration; please refer to **Sections 2.4.2** and **2.4.3** for more detail. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
40	PH-001	**Cumulative Effects / Little Ferry Public Schools**	Bernie Sobolewski. I'm a part of the Little Ferry Care Group. Little Ferry right now is proposing to build a $30 million school specifically to replace the school that's had problems with water all related to the Losen Slote Creek problem. The Losen Slote Creek, for those who are not familiar, drains the entire town. It actually starts from South Hackensack and across Route 46 and comes through the entire town and, sadly, many portions of it are so sedimented in, so pathetically overloaded with bad piping, so forth and so on, when the water comes down the creek system, if the pipe systems can't handle the water, it winds up on our streets. It makes a mess. It creates a poor impression for the community and I'm tired of seeing Little Ferry in the papers with flooding problems. I would have liked to have had these folk see what's proposed for the Losen Slote Creek. I know there was mention about the school system some improvements that may benefit from it. I'm hoping that the dredging process will begin as soon as possible because without the Losen Slote Creek draining properly we suffer and quite frankly, I think, unfortunately, 80 percent of the town of Little Ferry is now in a flood zone and that's troublesome for real estate values, et cetera. I'm anxious to see this project brought to fruition. I hope I live to see it done and I'm optimistic. Thanks for the opportunity to speak here.	Comment noted. Alternative 3 (the Preferred Alternative) includes pump stations and force mains in the Losen Slote drainage basin (one in the *Build Plan*, and one in the *Future Plan*); flood depth reduction in Losen Slote is expected under the Preferred Alternative. The Alternative 3 *Build Plan* also includes improvements at Washington Elementary School that include open space, native habitat, stormwater storage and filtration, and converted impervious pavement to permeable pavement, all of which would improve stormwater conveyance and filtration on site. The EIS was revised to incorporate the recent closure and planned reconstruction of Washington Elementary School into the cumulative impacts analysis (see **Section 5** and **Appendix C**), based on available information.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
41	PH-002	Proposed Action	My name is Don Torino. I'm a resident of Moonachie and the president of the Bergen County Audubon Society, which is the local chapter of the National Chapter of the Audubon Society. So I've been a resident of Moonachie for over 50 years and Meadowlands kid, grew up there and still live there and anybody whose done that has seen the worst environmental tragedies done to the environment that could possibly ever been done and one of the reasons we're sitting in this room is exactly because of that and indiscriminate building and so on and so forth. So I really do look at this plan as a step forward after 50 years of putting up with flooding and limited flooding as part of your life in Moonachie, but also a part in small way at least to start to bring back some of the environment at the same time. So it's a plan that at least works with the environment instead of working against it and I'd just like to say that Bergen County Audubon will be there whatever is needed as far as training, as far as helping with the habitat enhancement, and I really look forward to this getting off the ground.	Comment noted. No change to the EIS has been made.
42	PH-003	Cumulative Effects / Little Ferry Public Schools	My name is Leslie Gottlieb, Little Ferry Citizens Advisory Group (CAG), as well as a member of the Little Ferry Board of Ed. I notice there was a line item that said Little Ferry Public Schools and as Bernie I mentioned as you may or may not know we have a situation. We've closed one of our elementary schools, Washington School, which has a creek running behind it. I guess it's part of Losen Slote and we are having to put portable classrooms behind our other schools and we've gone through the permits and everything else with the drainage and everything else needed to be done with a flood zone. So our primary concern now is getting that finished for school, but we have to plan with you guys and you guys with us to mitigate anything going on if we rebuild or repair Washington School. So that needs to be somehow this recent addition, recent project, has to be reflected in your plan and we have to work with you guys on the Washington School property to do the right thing because we have that flood behind us and we don't want to build a school or fix a school and have it flood out. Thank you.	Comment noted. Please see the response to Comment #40.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
43	PH-004	Flooding	My name is Regina Helou and I live in Little Ferry. I know there is a problem with Losen Park. I know the EPA and DEP would give them a hard time anytime they wanted to clean out the drainage. However, where I live in Little Ferry, I've been flooded three times. Nine foot the first, four-and-a-half the second and five-and-a-half the third. Two of them within 13 months of each other. And from what I see of what you're going to do with plan three, you're not going to address any coastal or river flooding and that's where my problem comes from all the time. So I think they should consider what they are going to consider with the rivers because the Hackensack River comes through my house every single time. The first time I was out of the house for ten days and couldn't even get near my house with nine foot of water.	Comment noted. Please see the response to Comment #38. No change to the EIS has been made.
44	PH-005	Public Input / Outreach	I'm Alex Tuason, Little Ferry. I'm on the committee of Little Ferry/South Hackensack Soccer Club. This particular project concerns four towns, Carlstadt, Moonachie, Little Ferry, and you mentioned South Hackensack. We only received the notification of this particular meeting two days ago. My concern is from the lack of participation from our local government here and representation that we're not being notified days in advance where we can go ahead and analyze what's actually going on and make an educated decision or some sort of comment as to what is going to be proceeding in our towns and my comment really is if possible if we can get an earlier notification. So, this way, we can prepare. I just wanted to make sure that we get enough time in advance so that this way we can see our local government, ask them if they are going to actually participate and come here and maybe, represent us a little bit more. Thank you.	Comment noted. Please see the response to Comment #31. No change to the EIS has been made.
45	PH-006	Alternative 1 / Hydrology	DeeAnn Ipp from the floodplain of Teaneck, New Jersey and I'm a little concerned that all the modeling shows impact of Alternative 1, the wall for Moonachie and South Hackensack, but it stops there and it doesn't model how the storm surge, how it would affect my street, Pomander Walk in Teaneck, which I am the final zone of impact for the tidal surge from Hurricane Sandy, which was a biblical event. That was like wrestling with the devil. Thank you.	Comment noted. Please see the response to Comment #21. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
46	PE-001	Biological Resources	Much biological field work has been conducted, but the analytical path between the biological results and the flood control proposals is unclear. I am appending comment letters on this project that I submitted previously, inasmuch as most of my earlier comments are relevant to the DEIS, and many do not seem to have been responded to. A lot of effort and funds were expended on biological work, and some interesting results are reported in the DEIS. Given the effort and expenditures, current and future scale and importance of the flood protection project, and rich urban biodiversity of the study area and its surroundings, the process of collecting, reporting, and interpreting the biological data should be fully transparent and comprehensive. Without amendment and correction of some of the data reported, filling the gaps in data, and further clarification of the relationships of the biota to the proposed flood protection engineering, the implementation of the proposed 2022 and "Future" flood protection features could result in significant and unnecessary harm to biodiversity. It should be possible to implement flood protection in the study area without degrading biodiversity. These issues need to be addressed to optimize and integrate the consideration of social, economic, engineering, and biological issues, as is required by NEPA and common public and professional concern. Flooding issues are likely to worsen during the rest of this century due to sea level rise and intensification of storms, potentially requiring additional engineering, as suggested in the DEIS. The probable need for creation and expansion of dikes and other alterations, combined with the continuing infill development and manipulative management of wetlands and other greenspaces, will make the interface of engineering and biodiversity ever more important. Flood protection can potentially benefit biodiversity, including rare plants and wildlife, if enough information about the site is available and features such as rain gardens and dikes are specifically designed to create habitats for particular species (Kiviat 2017).	Comment noted. While the biological data collected for this EIS is more extensive than usual for a NEPA document, it was not intended to constitute full inventories for any particular groups of species. Rather, it was intended to map and characterize habitats and general species presence. During the initial stages of the Proposed Project, specific Build Alternative footprints had not yet been identified within the 5,405-acre Project Area; as such, the biological data collected was used to identify the most sensitive habitats within the Project Area and inform the alternatives development process, so as to minimize potential impacts overall and particularly to high-quality areas. Additionally, the biological and water resources analyses presented in the EIS, per typical NEPA protocol, remain relatively high-level, and focus largely on regulatory concerns identified through consultation with the US Fish and Wildlife Service (USFWS), National Marine Fisheries Service, USACE, NJDEP, and New Jersey Natural Heritage Program (NJ NHP) (e.g., federally or state-protected species, wetlands, etc.). If a Build Alternative is selected in the ROD and advanced to the permitting stage, those agencies would continue to be consulted in order to finalize design of the Proposed Project in a manner that minimizes adverse impacts and maximizes beneficial impacts, to the extent feasible, based on specific conditions and concerns within the proposed footprint. *[Response continues on next page.]*

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
46	PE-001	Biological Resources	*[See full comment on previous page.]*	*[Response continues from previous page.]* It is understood that additional, site-specific biological data may need to be collected as part of that process. In regard to potential "future" flood protection features (i.e., the Alternative 3 *Future Plan*) that could be implemented if additional funding is made available in the future, it is noted in **Section 2.5.4.1** of the EIS that additional environmental analysis may be required for those features due to changes in the existing conditions of the Project Area over time, or due to specific regulations associated with the funding. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
47	PE-001	Biological Resources / Literature Review	It is axiomatic that both science and environmental planning build on existing information. The biological sections of the DEIS (section 3 and appendix J) show little evidence of literature search on Meadowlands biology. It is not sufficient to use the few synthetic sources cited (mostly Kiviat and MacDonald 2002, 2004, Hales et al. 2007, Kiviat 2011, all incomplete and out of date) without conducting a thorough review of relevant reports, papers, and theses, many of which are readily available online or in the Meadowlands Environmental Research Institute library. If a broader review of extant information and more consultation with experts on the biology of the region had been performed, the DEIS team could have looked for, and in many cases found, additional plants and animals of conservation concern, and could have performed the environmental assessment more incisively. The DEIS focuses narrowly on federally and state-listed endangered and threatened species among many species of conservation concern, downplaying rare elements of biodiversity that are not officially listed as endangered or threatened. The New Jersey (animal) Species of Greatest Conservation Need (SGCN), and the New Jersey Natural Heritage Program S1, S2, and S3 rare plants, should also be addressed, as well as a few species of conservation concern that are not listed. Many SGCN are mentioned in the DEIS bird lists with no consideration of their conservation. The intention of these lists is to inform environmental planning and prevent additional species from becoming endangered, and the state SGCN list was created under federal funding to the New Jersey Department of Environmental Protection which is heading up the flood protection project. All of these rare species are important and valuable elements in the biological resources of the Meadowlands and the state as a whole.	Comment noted. The literature review conducted for the Proposed Project was sufficient to describe the existing conditions of the Project Area necessary for a NEPA document. It was also supplemented by the habitat mapping and biological community observations conducted in the field, and provided a baseline on which to conduct the biological impact analysis. Per standard NEPA protocol, greater attention was given to Federal and State threatened and endangered species, as well as species of special concern identified through consultation with the NJ NHP, than other species of conservation concern. During the initial stages of the Proposed Project, the scope of the biological resources analysis included an all-encompassing, very large tract of the Meadowlands District, including several sensitive habitats. However, as the Build Alternatives were developed and smaller footprints were defined, the potential impacts of the Proposed Project (including to species of special concern) narrowed substantially, and it was found that the Build Alternatives would primarily impact areas that are currently developed or highly disturbed. As such, the analysis focuses on species of regulatory concern, with the expectation that continued consultation with NJ NHP would occur to address any potential State concerns regarding other species. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
48	PE-001	Biological Resources / Plants	It's good to see a wide-ranging flora survey and a list of species that includes some grasses, sedges, and other difficult-to-identify taxa. Although true sedges (*Carex* spp.) are not common in the Meadowlands, the disjunct southeastern extension of the Teterboro Airport Woods (on the east side of Redneck Avenue and north of Moonachie Avenue) alone almost certainly supports more than five true sedges, based on my field observations and collections. It's reassuring that the DEIS reports floating marsh pennywort (*Hydrocotyle ranunculoides*, S3 Endangered), as this species has been documented in at three other Meadowlands sites outside the study area, and would be expected in non-wooded freshwater in the study area. Other species on the list, including may-apple and Virginia chain fern, also indicate a fairly thorough survey. Nonetheless, the few *Carex* sedges listed, the listing of only three species of *Cyperus* flatsedges, no listing of dodders (*Cuscuta* spp.), and other "missing" species (e.g., tall cordgrass and bluejoint grass, and, surprisingly, Canada mayflower and dogtooth violet, all of which have elsewhere been recorded in the study area), suggest that the botanists were not allotted sufficient time or did not survey certain areas and habitats at the appropriate seasons. I found *Cyperus polystachyos* in the study area several years ago, at the Kane Natural Area. This could be *C. p.* var. *texensis*, a rare species (S1) in New Jersey, and may well persist despite subsequent alterations of the area for the mitigation bank. The potentially invasive, nonnative dodder *Cuscuta japonica* was found in the Kane area as well as the Berry's Creek Study Area. Neither plant is mentioned in the DEIS. Four mosses are listed at the end of the vascular plant list with no explanation as to why a few species should be mentioned without a thorough survey. Although mosses are neither diverse nor abundant in the study area, I have documented more than 60 species in the Meadowlands region overall, a dozen of which are nominally rare statewide (Kiviat, unpublished data).	Comment noted. The informal plant surveys were intended to characterize selected mapped habitats that were representative of other mapped habitats in the Project Area. A vegetation survey was conducted by botanists during the late summer/early fall of 2016 within a variety of large habitat complexes and selected sites within the Project Area. The selected sites included upper Berry's Creek, Losen Slote Creek, East and West Riser Ditches, Peach Island Creek, Teterboro Woods, and several large open spaces and parks along the main stem of the Hackensack River. Neither a comprehensive, multi-season botanical inventory nor any detailed species-specific searches were conducted. Mosses were identified during the plant survey, although a specific moss survey was not conducted. Further, based on early consultation with NJ NHP, no rare plants or ecological communities were identified in the immediate vicinity of the Project Area. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
49	PE-001	**Biological Resources / Mammals**	It is amazing that seven bat species are listed as identified in the study area (presumably by bat detector recordings, per Methodology, although no details are presented). I am not aware of any definitive species identifications of bats in the Meadowlands otherwise, although little brown bat is mentioned without documentation in some environmental documents. The bat diversity reported in the DEIS could be important for bat conservation. The methods used for identifying the bat detector recordings should be described in detail, including the geographic and institutional sources of reference recordings, and the qualifications of the taxonomist, and the identifications should be confirmed by an independent expect on northeastern bats; as well, the numbers and locations of records of each species should be reported. There are at least two important questions: 1. Documenting and verifying all the species identified; and 2. Confirming that the *Myotis* (see p. J-24 to J-25) identified are only little brown bat and not other *Myotis* spp., all three of which are federally listed as Endangered (Indiana bat), Threatened (northern longeared bat), or New Jersey SGCN (small-footed bat). (*Myotis* species are difficult to distinguish from bat detector data.) It would also be important to present a discussion of where each species was recorded, what habitats it was using, and whether there are threats to bats from the flood protection project or other activities, or opportunities for conservation of this diverse urban bat assemblage. If identifications are verified, the bat data would be one of the most important results of the biological surveys. Without details, it's impossible to know if the bats would be helped or harmed by the proposed flood control engineering. It should be of concern that the state's most important Indiana bat (Endangered) hibernaculum is in Hibernia Mine (http://www.conservewildlifenj.org/species/spotlight/indiana/) about 25 miles from the study area (https://thediggings.com/mines/usgs10082371/map), well within the potential seasonal migration of this species between hibernaculum and summer nursery and foraging habitats. The study area contains woodlands with trees that could provide summer roosts for this species. This kind of background research on species of conservation concern should have been conducted and presented in the DEIS, to ensure that, if trees must be removed for the flood protection project or for other reasons, an endangered species is not disturbed. A federally-funded DEIS overseen by a state agency should address a federally- and state-listed endangered species constructively.	Comment noted. **Appendix J** was revised to note that the echolocation recordings were automatically identified by Wildlife Acoustics, Inc.'s Kaleidoscope Pro software. A footnote was added to describe the level of uncertainty associated with this software. Further, **Table J-12** and **Table J-13** in **Appendix J** were revised to note that the unidentified bat species previously noted as *Myotis* sp. was of an unknown genus and species. Overall, the passive bat survey was primarily intended to identify whether habitats in the Meadowlands District are utilized by bat species, and to determine an approximate species assemblage, such that general Proposed Project impacts could be assessed. Further, no recordings of Indiana bats or northern long-eared bats, which are both federally listed, were tentatively identified by the Kaleidoscope software. This conclusion is supported by the consultation conducted with the USFWS and NJ NHP to date, which has not identified any bat species of concern. During the permitting stage of the Proposed Project, additional, site-specific species surveys could be conducted, and standard BMPs (such as seasonal tree clearance/construction restrictions, etc.) would be determined.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
50	**PE-001**	**Biological Resources / Mammals**	Why is mouse (*Mus* sp.) not identified to species (see p. J-24)? There is only one *Mus* in New Jersey, the house mouse (*Mus musculus*), which is mentioned elsewhere in the DEIS.	Comment noted. **Table J-12** in **Appendix J** was revised to note that the unidentified mouse species previously noted as *Mus* sp. was actually of an unknown genus and species.
51	**PE-001**	**Biological Resources / Mammals**	The narrative about marine mammals presents an incomplete list of species recorded in the Hackensack River system (separately from the DEIS studies). Additional data may be found in Hackensack TideLines (newsletter of the Hackensack Riverkeeper) and Marine Mammal Stranding Center (https://mmsc.org/) data for New Jersey.	Comment noted. After further review, no additional marine mammal species were found to have been recently observed near the Project Area. Further, USFWS, National Oceanic and Atmospheric Administration (NOAA), and NJ NHP did not identify marine mammals as species of concern for the Proposed Project; however, further consultation with these agencies would be conducted during the permitting stage to identify and minimize/mitigate potential adverse impacts to marine mammals as applicable. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
52	PE-001	Biological Resources / Birds	The bird surveys, in general, seem thorough. However, it's unclear if the whole study area was covered thoroughly enough to detect something important (e.g., a rare species breeding, or a concentration of an uncommon species) at an unexpected location where impacts from flood protection engineering could occur. The four prior observation points around the corners of the Kane Natural Area shown in the DEIS must have been the observation points used for bird surveys for the Meadowlands Mills development proposal of two decades ago (US ACOE 2000), yet the DEIS does not acknowledge the SGCN birds reported from that survey, including sedge wren (NJ Endangered), king rail (SGCN), and northern harrier (NJ Endangered). That only seven bird species were confirmed nesting during the DEIS surveys (page J-20) indicates that the "special care [was] taken to determine if there were any nesting birds" was not very intensive, as it is almost certain that many more than seven species would have been nesting in the study area.	Comment noted. The avian surveys were designed to characterize the general species usage of the Project Area's habitats (e.g., marshes, wooded areas, urban habitats, etc.); a full avian inventory was not conducted. As stated in **Section 3.2.2.2** of **Appendix J**, special care was taken to observe nesting birds during the transect surveys (seven nesting birds were observed). The avian transect surveys were limited in nature and often occurred in or adjacent to tall stands of common reed located next to roads and access ways within areas of potential disturbance. They did not constitute nesting bird surveys and were not the primary method of bird observation for the avian survey. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
53	PE-001	Biological Resources / Birds	Two storm-petrels are included in the data tables as detected during the bird surveys (Appendix J). Tristram's storm-petrel is a Pacific Ocean species that was not mentioned for New Jersey by Walsh et al. (1999). Leach's storm-petrel is a pelagic (ocean) species that is considered accidental onshore in New Jersey. Documentation of these storm-petrels should be described, and the records submitted to the New Jersey Bird Records Committee (http://njbrc.com/) for evaluation. There is a slight chance of Leach's storm-petrel appearing onshore after a major storm, hence the weather conditions at and prior to the time of observation are important to know. On the other hand, the report of Tristram's storm-petrel is almost certainly based on a misidentification or a clerical error. Without details of the observation it's impossible to know. Black swift is included in the data tables. This is a western species and at least as of Walsh et al. (1999) had not been recorded in New Jersey. Documentation is needed, as for the storm-petrels. Without documentation (e.g., photos, videos, drawings, audio recordings, field notes, observation conditions), and a statement of the relevant experience of the observer(s) including experience with those species, it would ordinarily be assumed that the identifications were incorrect. (See the reporting form at http://njbrc.com/ regarding the information that is ordinarily used for evaluating a report of a rare species, and note that this procedure is separate from the reporting of a state-listed endangered or threatened species.) Although most of the chickadee observations are entered as black-capped chickadees, there is one observation reported as Carolina chickadee. The latter species does not normally occur in northern New Jersey (Walsh et al. 1999). Documentation is needed (see above). The very sparse overlap of the two chickadee species in New Jersey is well south of the study area. Walsh et al. (1999) also stated that, in the zone of overlap, the two species may sing each other's songs. Another report that needs documentation is that of black-throated gray warbler. This species is evidently a rare stray in New Jersey (Walsh et al. 1999 considered it "occasional").	Comment noted. The avian species list was reviewed for likely misidentifications and changes to the EIS were made based on this review (**Appendix J**). Species with a high probability of having been misidentified in the field were removed from the data set and replaced with a more general unidentified data point (e.g., unidentified seabird). Tristram's storm-petrel and Leach's storm-petrel were among the species likely to have been misidentified in the field. Black swift, Carolina chickadee, and black-throated gray warbler were also among the species likely to have been misidentified in the field.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
54	PE-001	Biological Resources / Birds	Although spotted sandpiper is not a SGCN in New Jersey, it is an uncommon breeder in the Meadowlands thus the discovery of a nest in the flood protection study area has interest. The habitat and microhabitat of that nest should be reported. This is a species for which nesting habitat might be created in concert with flood protection engineering. Spotted sandpiper nesting habitat constitutes more-or-less bare soil or riprap (e.g., railroad ballast), suggesting that not all created habitat should be planted.	Comment noted. The avian surveys were focused primarily on recording species presence in general habitats. As noted in **Section 2.2.2** of **Appendix J**, the transect surveys occurred at locations CM-1, CM-2, LS-1, and LS-3, which are associated with large marsh/wooded habitats. Microhabitat data is not available for this nesting observation; however the habitat improvements associated with the Proposed Project would be finalized to provide a diversity of habitats during the final design phase. No change to the EIS has been made.
55	PE-001	Biological Resources / Birds	DEIS space is devoted to a survey of potential raptor nests (stick nests in trees) and 37 such nests were recorded. This is very interesting, as it suggests a possibly high density of nesting raptors or other stick nest builders in the study area. However, the DEIS does not explain how the stick nests observed were distinguished as possible raptor nests rather than nests of herons (e.g., green heron), crows, or gray squirrels. If there were dozens of crow nests, the implications are quite different than if there were dozens of hawk nests. Were these nests re-examined during the late winter – early spring nesting season of hawks and owls to confirm their identifications and discover how many nests were active? If that had been done, it would have been possible to conserve the appropriate nesting and foraging habitats.	Comment noted. The nest survey was performed within the Build Alternative footprints to document the potential for raptor nesting. Nest types were compared to data from the Cornell Lab of Ornithology (see **Table J-2** in **Appendix J**) to verify they were likely raptor nests. No surveys of nest usage were performed. During the permitting stage of the Proposed Project, additional, site-specific species surveys could be conducted in the final Proposed Project footprint, and standard BMPs (such as seasonal tree clearance/construction restrictions, etc.) would be determined. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
56	PE-001	Biological Resources / Birds	There are clerical errors in the bird lists that should be corrected. For example, Forster's tern is misspelled "Foster's turn." The common name fox sparrow is mis-paired with the scientific name for field sparrow *Spizella pusilla* – which species is intended? The scientific name *Butorides virescens* is paired with "green heron" and separately "great heron" in the same table – the first is correct. "Black Crowbird Night Heron" is listed in one of the tables – a nonexistent species that sounds like it came from Marvel Comics. There are other errors; some errors may be due to software auto-correct routines. Evidently a competent human ornithologist did not proofread the tables, and this casts some doubt on the accuracy of the surveys themselves and the implied conclusions that the proposed engineering will have little impact on birds.	Comment noted. This comment was incorporated in the FEIS as suggested by the commenter. The avian species list was reviewed for technical accuracy.
57	PE-001	Biological Resources / Reptiles and Amphibians	Only four species of the herpetofauna were found in the DEIS surveys. Although, with the exception of painted turtle, red-eared slider, and snapping turtle, no reptile or amphibian is common in the Meadowlands, the DEIS team should have been able to record several additional species, all of which are of conservation concern in the Meadowlands. I have seen eastern box turtle and northern brown snake (both SGCN) near Mehrhof Pond, and American toad at the Kane Natural Area. There is a breeding population of the Atlantic Coast leopard frog in the aforementioned southeast extension of Teterboro Airport Woods (see next paragraph), and I have also seen it at the Kane Natural Area. I have also seen yellow-bellied slider (usually differentiated from the red-eared slider at the subspecific level) in Indian Lake. Some of the proposed rain gardens and other flood protection features could be designed to provide habitat for herpetofauna if we know which species are present and what habitats they are using.	Comment noted. As discussed in the DEIS, many of the habitats and habitat complexes in the Project Area are important to the regional ecology of northern New Jersey. Consistent with the other surveys conducted, the herpetofauna surveys were designed to characterize the general species usage of the Project Area's habitats; a full species inventory was not conducted. During the permitting phase, additional, site-specific surveys may be conducted as necessary based on consultation with Federal and State agencies. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
58	PE-001	**Biological Resources / Reptiles and Amphibians**	It should be noted that the "southern leopard frog," reported from my 2006 surveys in Teterboro and Moonachie as well as North Bergen (Kiviat 2011), has been re-identified as Atlantic Coast leopard frog (ACLF, also called Kauffeld's leopard frog). ACLF was described based on genetic, morphological, and acoustic data by Newman et al. (2012) and Feinberg et al. (2014), and J. Feinberg (personal communications) confirmed my audio recordings of this species from Moonachie. Additional data on ACLF in the Meadowlands, including the study area, are in Feinberg (2015). The misrepresentation of the Meadowlands populations as southern leopard frog should be corrected, especially since the species occurs in the study area. This suggests that the DEIS team did not survey the literature about Meadowlands biota (see, e.g., https://www.nj.gov/dep/fgw/ensp/pdf/leopardfrog_guide.pdf and http://www.reptilesmagazine.com/Frogs-Amphibians/Information-News/New-Leopard-Frog-Species-Discovered-in-New-York-New-Jersey-Region/) and may have paid insufficient attention to herpetofauna.	Comment noted. This comment was incorporated in the FEIS as suggested by the commenter. The name of the southern leopard frog was changed to Atlantic Coast leopard frog.
59	PE-001	**Biological Resources / Reptiles and Amphibians**	Although Kiviat and MacDonald (2002) summarized reports from other sources suggesting that the northern water snake is fairly common in the Meadowlands, I have not seen any during my almost 20 years of Meadowlands field work. Therefore, the statement on DEIS page J-2 should be qualified. Many herpetofaunal species are known elsewhere to be sensitive to contaminants and other environmental conditions present in the Meadowlands, and this may account for the lack of diversity and abundance of today's herpetofauna. Because many New Jersey herpetofauna are SGCN, the DEIS should indulge in a discussion of how the construction of flood protection features can avoid harming the herpetofauna and their habitats, and how these features can be designed to provide more or improved habitats for herpetofauna, e.g., in rain gardens.	Comment noted. Changes were made to the EIS to delete the northern water snake from the list of common herpetofauna on page J-2 of **Appendix J**. Additionally, the history of contamination was added to **Section 3.14.3.1** of the EIS as another factor contributing to limited amphibian presence in the Meadowlands District. **Section 4.14.4** of the EIS describes how the Proposed Project could address these factors, such as by restoring East Riser Ditch, creating new wetland habitats, improving water quality, etc. Additionally, the Biological Resources impact analysis in **Section 4.14** of the EIS details the mitigation measures and BMPs that would be incorporated during construction to avoid or minimize impacts.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
60	PE-001	Biological Resources / Reptiles and Amphibians	Preliminary species lists presented to the CAG at an earlier stage of the DEIS studies mentioned a possible sighting of an eastern hog-nosed snake. Did the herpetofaunal survey team search for this snake, and what was the final verdict regarding its identification?	Comment noted. The biological field surveys did not document any eastern hognose snakes. Additionally, this species was not included in species lists presented to the Citizen Advisory Group (CAG). No change to the EIS has been made.
61	PE-001	Biological Resources / Fish	I appreciate the efforts to survey fishes in some of the wetlands and creeks that have mostly been excluded from previous fish studies in the Meadowlands. On page J-64, the mosquitofish (*Gambusia* sp.) should be identified to species. If the preparers don't have voucher specimens, they should return to the sampling sites this summer and catch a few mosquitofish for expert identification. There is an introduced western mosquitofish that has been widely released in New Jersey for mosquito control, and an eastern species that would be an interesting find and probably of conservation concern in the Meadowlands.	Comment noted. This comment was incorporated in the FEIS as suggested by the commenter. The EIS was revised to specify the mosquitofish as western mosquitofish (*Gambusia affinis*). While no voucher specimens were collected for the Proposed Project, discussions with personnel from the NJDEP Division of Fish and Wildlife (NJDFW) Bureau of Freshwater Fisheries (who have consulted the Philadelphia Academy of Natural Sciences) revealed that the eastern mosquitofish is likely only found in Cape May County, NJ, approximately 100 miles south of the Project Area. The native range of eastern mosquitofish is generally mapped as Florida to Delaware. Additionally, they stated that the mosquitofish stocked by NJDFW for the last 25 years are western mosquitofish, which have unexpectedly been able to overwinter. Electrofishing surveys in 2016 (not part of the Proposed Project biological studies) found western mosquitofish in 21 locations, but no eastern mosquitofish were collected.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
62	PE-001	Biological Resources / Fish	The scientific name should be added for the golden shiner.	Comment noted. This comment was incorporated in the FEIS as suggested by the commenter. The golden shiner species name in **Table J1-10** of **Appendix J** was hidden due to a table formatting error, which has been corrected.
63	PE-001	Biological Resources / Fish	Among the species listed (J-63 to J-64), American eel, American shad, mummichog, and striped killifish are SGCN. I take issue with the SGCN listing of mummichog, given the abundance and ubiquitous distribution of this species in New Jersey tidal marshes. However, the other species merit particular concern, American eel most especially. All SGCN should be discussed in detail and the potential ways in which the flood protection engineering may harm or help these species should be analyzed.	Comment noted. Consistent with other groups of species, the analysis did not focus on individual species since impacts are often similar between species. Additionally, the American eel, American shad, and striped killifish were not observed during the field studies. No change to the EIS has been made.
64	PE-001	Biological Resources / Wetland Assessments	The EPW wetland assessment methodology suffers from serious problems, two of which I'll mention. First, there is a "wildlife habitat" component. Wildlife habitat is different for different species of animals. This component of EPW is meaningless for wildlife as it addresses only a small part of animal life that is favored by, e.g., vegetational diversity (some species are favored by vegetational monotony, or by a single plant species, or by non-vegetated habitat). Second, EPW down-scales wetlands with substantial cover of nonnative plants. In northeastern urban tidal and formerly tidal marshes, this does not make sense. These marshes, particularly in the Meadowlands including the study area, are often extensively dominated by nonnative Phragmites (*Phragmites australis* subspecies *australis*). Nonnative Phragmites provides many important ecosystem services, including sediment accretion and stabilization where sea level is rising. Nonnative Phragmites also provides important biodiversity support, and Phragmites marshes can be managed to shift the habitat to favor or disfavor various animal and plant species (see Weis and Weis 2003, Kiviat 2005, 2007, 2010, 2013 about both biodiversity support and non-habitat ecosystem services). Wetlands in the study area should not be judged on the basis of their vegetational diversity or the coverage of Phragmites, as this inaccurate judgment can be used as a rationalization for altering or destroying wetlands that in the current state provide valuable services.	Comment noted. The Evaluation for Planned Wetlands (EPW) is widely used by the USACE in the New York Region. The field scientists followed the guidelines of the EPW in calculating wetland values. Please note that the wetland mapping and calculations performed to date are preliminary and they will be refined during the design and permitting processes. Federal and State regulations will guide the permitting process, including mitigation, construction methods, etc. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
65	PE-001	Biological Resources / Proposed Habitat Improvements	Improvements to habitats (not necessarily just wetlands) are suggested in DEIS section 4 without detail. Removal of nonnative plants and planting of native plants is mentioned numerous times with the statement that this would improve habitat and resilience. It is not specifically discussed which nonnative plants would be removed and how that would be done. Removal of nonnative Phragmites, for example, would probably make wetlands less, rather than more, resilient to storms and flooding, because Phragmites is as good or better than other plants at building and anchoring wetland soils. Whether this management would improve habitat depends on details of management and which species are targeted for habitat improvement (e.g., muskrat, ducks, secretive marsh birds, dragonflies). Most of the prior attempts to remove nonnative plants in the Meadowlands have used herbicides which are toxic to animals as well as nontarget plants, and the impacts on Meadowlands wildlife have not been assessed. Moreover, most vegetation management projects have only been maintained for a few years although such projects require perpetual maintenance.	Comment noted. Habitat improvements would be finalized during the final design phase if a Build Alternative is selected in the ROD. NJDEP is required to establish an O&M Plan for the Proposed Project in accordance with the CDBG-DR funding. The plan will identify the entities that would perform on-going maintenance, such as vegetation management, following construction. The State has begun establishing an O&M subcommittee to assist in the development of this plan.No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
66	PE-001	Biological Resources / Impacts	I have been unable to discern the exact ways in which impacts (Consequences) to biological resources were analyzed for the DEIS. It's hard to tell whether, and where, there may be greenspaces (including well developed street tree cover) that are being proposed for development of flood protection infrastructure, and the percentage alteration figures in the DEIS are hard to interpret. In other words, how were the results of the biological surveys and literature review juxtaposed with the proposed flood protection engineering to predict how biodiversity overall, or particular species (such as floating marsh pennywort, black-crowned night-heron, or bats) would be affected? Without additional explanation and information, the collection of biological data is an expensive exercise with limited utility for planning. Well-intentioned projects can cause great harm to biodiversity if adequate, site-specific, up-to-date information is not available for project siting, planning, and design (Kiviat 2014).	Comment noted. The proposed footprint for each Build Alternative is illustrated in **Section 2.5** of the DEIS. The biological surveys were used in two primary ways. First, the diverse and early collection of biological data was incorporated into the design of the Build Alternatives so that disruption of sensitive and high-quality habitats could be avoided to the extent possible. Second, the biological surveys were used to supplement existing data to develop the baseline (i.e., affected environment) of biological resources in the Project Area (see **Section 3.14** of the DEIS). During the impact analysis, it was determined that the Proposed Project would have generally standard, less than significant impacts (e.g., limited clearing of vegetation, temporary species displacement, noise/vibration disturbance, etc. in a comparably small portion of the overall Project Area that is primarily comprised of developed/disturbed areas) that would impact habitats and groups of species similarly. Therefore, to avoid repetition, impacts on biological resources were analyzed in five primary groups: terrestrial (upland) habitats, aquatic habitats, terrestrial wildlife, aquatic wildlife, and special status species. As the Proposed Project progresses, all required permitting would be conducted to further minimize and mitigate impacts to biological resources, in consultation with Federal and State authorities, according to specific concerns about the alternative selected. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
67	PE-001	Biological Resources	A large amount of effort went into the studies and preparation of the DEIS, for which the agencies and consulting firms are to be commended. Some of the environmental and engineering work seems particularly useful and well done. However, many important biological considerations are missing, rendering the DEIS very incomplete in this sphere. There are errors in the species lists and data tables that call into question the quality of the data (in part because it's unclear to what extent these errors were field identification errors or clerical errors). It is difficult to tell how the biological data have been used to analyze impacts. I can only conclude that biodiversity and biological resources are not getting their due despite the widely acknowledged importance of the Meadowlands as a hotspot for urban biodiversity and its potential conservation, as well as the general knowledge that many kinds of wildlife and plants are declining and require conservation attention in both urban and non-urban environments (see, e.g., Kiviat and Johnson 2013).	Comment noted. Please see the response to Comment #46. The NJDEP remains committed to pursuing a Proposed Project that can meet the purpose and need while minimizing adverse impacts, and maximizing beneficial impacts, to the Project Area's diverse ecological resources. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
68	PE-002	Proposed Action	A recent drainage study entitled, Main Street Drainage Study, Borough of Little Ferry, County of Bergen, New Jersey – Drainage Evaluation Report. Prepared for the County of Bergen by T&M Associates, Inc., September 2014. T&M Project No.: BERG00220, showed that Main Street, Little Ferry (east of Liberty Street) experiences severe flooding under mild to moderate storm conditions. Main Street is a low lying area with an antiquated and undersized drainage infrastructure. The proposed improvements to drainage infrastructure to alleviate flooding included: a) Increasing drainage system pipe sizes to better convey the 25-year rainfall event away from the street and into the two existing pump stations (eastern end of Main Street and Willow Lake). b) Upgrading the existing pump stations, as needed. c) Rerouting a portion for the study area runoff to Willow Lake to make better use of its available storage. The above mentioned improvements have not been implemented due to high cost, complex construction logistics and conflicts with underground utilities. During the evaluation phase of the RBDM three alternatives, the drainage issue on Main Street was proposed to be addressed by means of a new pump station and force main. It appears however, that drainage improvements on Main Street are not included in the selected Alternative 3 - Build Plan. Proposed green infrastructure improvements to Willow Lake, such as rain gardens and native planting will have no beneficial effect on flooding of Main Street as they do not increase the storage/conveyance capacity of the existing drainage system. The drainage study cited has been provided to the RBDM project team.	Comment noted. The referenced drainage study was reviewed during the alternatives development and screening processes. However, these features were not included in the final Build Alternatives. The alternatives development and screening processes are summarized in **Section 2.3** of the EIS and detailed in the Feasibility Study Report. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
69	**PE-002**	**Cumulative Effects**	The County of Bergen has been working with the Borough of Moonachie on a project to perform improvements at the intersection of Moonachie Rd./Washington Ave. and Moonachie Ave./Empire Blvd. Construction of this project is anticipated to be completed in 3 to 4 years. RBDM shall coordinate with the County to prevent conflicts with the proposed Green Infrastructure at same location.	Comment noted. This comment was incorporated in the FEIS as suggested by the commenter. **Appendix C** and **Section 5.5** of the EIS were updated to include the Moonachie Road/Washington Avenue and Moonachie Avenue/Empire Boulevard Intersection Improvements project. BMPs and mitigation measures noted in the EIS (throughout **Section 4.0**) recommend coordination with project proponents, service providers, and applicable agencies to ensure productive collaboration, including avoidance of conflicts.
70	**PE-002**	**Cumulative Effects**	The County of Bergen is currently in the process of implementing its Backflow Preventer Project in the Boroughs of Carlstadt, Little Ferry, and Moonachie. The County anticipates completion of the project prior to the end of 2019. The location and specifications of the backflow preventers have been provided to AECOM and the RBDM project team as well as ongoing meetings to ensure that the RBDM project avoids any duplication of benefits with the Bergen County Backflow Preventer project.	Comment noted. This comment was incorporated in the FEIS as suggested by the commenter. **Appendix C** and **Section 5.5** of the EIS were updated to include the Backflow Preventer Project. BMPs and mitigation measures noted in the EIS (throughout **Section 4.0**) recommend coordination with project proponents, service providers, and applicable agencies to ensure productive collaboration, including avoidance of duplication of benefits.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
71	PE-003	Proposed Action	In preparing the DEIS, the NJDEP has thoroughly analyzed the potential physical, cultural, environmental, and socioeconomic impacts of the Meadowlands Project on residents and businesses with the project area. Throughout the planning process, NJDEP and its design team have implemented best practices for effective community engagement, including consultation with the Citizens Advisory Group that it created, frequent community meetings, briefings, and open houses for the public, multiple methods for gaining community input, effective visualizations of the project as it evolved from concept to design drawings, online sharing of the status of the project, collaboration with community groups, and frequent consultation with residents whose years of hunting, fishing, trapping and boating in the Meadowlands estuary enabled them to highlight biodiversity change in the project area for the project team's experts. Through these activities, citizens developed a greater understanding of the need for the project and, in turn, the project team gained important insights into creating a successful design. Rebuild by Design endorses the Meadowlands Project and offers whatever assistance it can to advance final design toward construction and implementation.	Comment noted. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
72	PE-004	Cumulative Effects	The BCSA Group has been conducting a Superfund Remedial Investigation/Feasibility Study under an agreement with the USEPA. This study will support the USEPA's selection of a Phase 1 remedy for the BCSA site later this year. Based on the BCSA Group's review of the DEIS, some of the proposed flood mitigation work would or could occur in areas where the BCSA Group may be conducting remedial actions under the direction of the USEPA. To ensure that the two projects are coordinated, three considerations would be appropriate to address: • The technical analysis completed by NJDEP to date is limited with regard to details that can be related specifically to the proposed Phase 1 remedy near the East Riser Tide Gate. The DEIS notes the possibility of impacts but provides no detail on the potential extent of such impacts or how such impacts may be avoided or mitigated. Therefore, to ensure coordination of the work associated with both projects, the BCSA Group recommends continued close coordination between the NJDEP/Bureau of Flood Resilience (BFR), USEPA, and the BCSA Group to identify potential conflicts and impacts and mitigate or avoid those impacts. This coordination should include continued coordination of the NJDEP/BFR modeling analysis with the modeling completed by the BCSA Group. • Sequence the RBD work so that construction on the tidal side of the East Riser Tide Gate occurs late in the RBD construction schedule, as that would provide more opportunity to coordinate with the likely Phase 1 remedy schedule. • The operation and maintenance (O & M) of the constructed flood management project could impact the Phase 1 remedy design and maintenance. Therefore, the BCSA Group encourages the NJDEP/BFR: - to secure funding for the maintenance of what is constructed, and - to coordinate the O&M of the constructed flood management project with the O & M of other flood control structures, such as the existing tide gates.	Comment noted. As stated in the Mitigation Measures and BMPs discussions throughout **Sections 4.16.4** and **4.20.4**, NJDEP is committed to continuing close coordination with the BSCA PRP Group during the final design process to ensure the Proposed Project does not adversely impact the ongoing BCSA PRP Group remediation project. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
73	**PE-004**	**Editorial**	Page 448 of the PDF (p. 3-272), line 5877: "will be studied as part of the BCSA" should be "will be addressed as part of the remedy selected for the BCSA."	Comment noted. This comment was incorporated in the FEIS as suggested by the commenter.
74	**PE-004**	**Editorial**	Page 1211 of the PDF (p. C-5): The "Summary of Action" for the BCSA states that "USEPA is leading a group of trustees (representing 180 potentially responsible entities) to study and clean up the watershed." This sentence is incorrect. The corrected sentence should read: "USEPA is overseeing an RI/FS by a group of over 100 potentially responsible entities under CERCLA, to result in a selected Phase 1 remedy for the Berry's Creek waterways." In the subsequent sentence, "restored" should be "remediated."	Comment noted. This comment was incorporated in the FEIS as suggested by the commenter.
75	**PE-005**	**Proposed Action / Green Infrastructure**	One initial purpose of the Meadowlands RBD project was to effect flood mitigation at a regional scale while enhancing natural habitats. However, the plan shows significantly less natural habitat enhancement than added stormwater and flood control infrastructure. While infrastructure does control flooding well, it does little to enhance the environment or provide natural methods for reversing the damage of flooding over time. We hope that AECOM, NJDEP, and the participating municipalities voluntarily add more Green Infrastructure projects to enhance the existing design and incorporate natural ways to mitigate flooding issues. Green Infrastructure is not only a cost-effective option to help mitigate flooding, but also a valuable way to include the communities in the process of remediating the flooding issues that have plagued them for so long. As you have no doubt witnessed, the affected communities are actively involved in this project and wish for nothing but successful results. We hope that you will continue to work with them as openly going forward as you have so far.	Comment noted. NJDEP recommends Alternative 3 as the Preferred Alternative. The Alternative 3 *Build Plan* includes all of the green infrastructure systems described in **Section 2.5.3.1** of the DEIS. There are 41 green infrastructure systems proposed in five drainage areas that would capture stormwater from approximately 6.6 acres of existing roadways. Three new parks would also be constructed, which would be designed to manage stormwater onsite and include native habitat plantings and created/enhanced wetlands. Additionally, open space improvements to existing parks and municipal properties would include permeable pavement, native plantings, open space, and rain gardens. Please refer to **Section 2.5.3.1** and **Section 2.5.4.1** of the DEIS for further descriptions of these components. As the Proposed Project moves into the final design phase, NJDEP will continue to evaluate how best to incorporate green infrastructure and natural habitats within the proposed parks and open spaces. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
76	PE-005	**Cumulative Effects / Contaminated Sites Coordination**	Another concern for the future of the Meadowlands is the many contaminated sites within the project area that will likely be impacted through planned green and/or grey infrastructure projects. As many familiar with the Meadowlands know, the industrial history of the area has left an indelible mark on the waters and wetlands with over twenty contaminated sites, several existing and pending Superfund locations, and many long-buried contaminants. It is important to include the work being done and the work planned for the future in each of the phases for the RBD project. All of the work being done to better the health of the Meadowlands must be a coordinated effort to ensure efficiency as well as effectiveness. Without thorough coordination, we run the risk of crippling one project for the sake of another; and no one would benefit from that scenario, especially not the Meadowlands or its surrounding residents.	Comment noted. **Appendix C** includes all projects planned for future work including associated timeframes and estimated dates of completion through 2030, which accounts for the Proposed Project's construction and early operational phases. As discussed in the Mitigation Measures and BMPs for Hazards and Hazardous Materials (**Section 4.20.4** of the DEIS) for each Build Alternative, the NJDEP would coordinate during design and construction of the Proposed Project with the parties responsible for completing remediation of properties adjacent to, or within 200 feet of, the Proposed Project in order to minimize potential conflicts. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
77	PE-005	Funding	Our final concern is funding, for both construction and long-term maintenance of the three project phases. A comparison of costs and benefits should focus on the phases individually, not overall. As the project stands now, only phase one is funded. The two additional phases and continued maintenance are a relatively unknown equation and cannot be reasonably evaluated under a cost benefit analysis. Construction of the second two phases alone is a considerable cost and the future maintenance of the green and grey infrastructure proposed is a heavy burden for any one municipality to shoulder. Without assured funding, there is no certainty that the future of the project is secure or that any one phase is sufficient to meet project goals should the other phases remain incomplete. Each phase should therefore be considered as individual projects for the purposes of cost benefit analysis and then considered as part of a whole project. It is too important to the success of the overall project goals to leave so much of the future funding uncertain.	Comment noted. Based on the available funds from the $150 million grant from HUD, NJDEP developed a reasonable cost estimate for each alternative that includes reasonable assumptions based on the best available information (please refer to the Feasibility Study Report for more information on the Proposed Project's website at www.rbd-meadowlands.nj.gov). Build Alternatives are required to have a positive benefit-cost ratio and independent utility (i.e., they cannot be dependent on future funding or projects). Accordingly, the Alternative 3 *Build Plan* would function as a stand-alone project; the *Future Plan* could be implemented over time to supplement the *Build Plan*, but is not required to realize the benefits of the *Build Plan*. Additionally, as stated in **Section 2.5.4.1**, the Alternative 3 *Future Plan* would require additional analysis before it could be implemented. In this EIS, it is evaluated as a reasonably foreseeable project in the cumulative impacts analysis (**Section 5.0**). Further, the NJDEP would facilitate development of an O&M plan with all applicable stakeholders to identify long-term roles and responsibilities. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
78	FA-001	Agency Involvement / Coordination	FTA concurs that the three action alternatives analyzed in the DEIS, including Alternative 3 (the Preferred Alternative) would not require detrimental acquisition of fixed NJ TRANSIT commuter rail property assets or interfere with current or proposed Hudson Bergen Light Rail service, subject to coordination with NJ TRANSIT (as required) for installation of flood gates across or near NT TRANSIT rail operations and facilities. None of the alternatives would require permanent major street or road closures or alterations that could have significant adverse impacts on bus routes, para-transit services or access to rail stations. FTA therefore concurs with the preliminary DEIS analysis and conclusion that all of the analyzed Project alternatives except the "No Build" alternative analyzed will have less than significant adverse on transportation (including transit) during construction and beneficial long-term effects to transit if implemented. Implementation of the Preferred Alternative 3 would provide flood protection benefits not only to fixed transit facilities but also to significant areas and populations served by transit. FTA's concurrence on the beneficial long-term effects is conditioned on successful coordination and concurrence between NJ DEP and NJ TRANSIT (and potentially the MTA Metro-North Railroad) over installation and operation of proposed floodgates across NJ TRANSIT Meadowlands Sports Complex track south of State Route 120 adjacent near the proposed Berry's Creek storm surge barrier. Closure of the floodgates would need to be limited to just before and during coastal flood surge events when transit rail service would be temporarily suspended. Such closures would need to be coordinated with NJ TRANSIT to ensure that pre-storm evacuation of transit passengers and railroad rolling stock is not jeopardized.	Comment noted. As specified in the Mitigation Measures and BMPs in the DEIS (**Section 4.7.4** and **Table 6.4-2**): • Coordination with NJ Transit would occur on potential monitoring needs and road, lane, and sidewalk closures; • Operation of the NJ Transit railroad line closure gate would be coordinated with NJ Transit prior to and during flooding events to minimize delays and disruptions to transit services; • Gate closure would be conducted in accordance with NJ Transit procedures; and • Coordination with NJ Transit and local businesses in the Borough of Carlstadt regarding the closure of the railroad bridge over East Riser Ditch would occur prior to its removal and replacement. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
79	FA-002	Agency Involvement / Coordination	The US Fish and Wildlife Service, New Jersey Field Office (NJFO) has previously provided comments on the Project in a letter dated June 2, 2016, and in four electronic e-mails dated February 27 and 28, 2018. The June 2, 2016, letter was provided to the NJDEP to identify "…the scope of issues to be addressed and for identifying the significant issues related to a proposed action." (40 CFR Part 1501.7 Scoping). A review of the DEIS Section prepared by the NJDEP and titled Appendix A: Agency and Stakeholder Correspondence indicates that the Service's June 2, 2016, letter and the four electronic e-mails are not referenced. The Department requests that the NJDEP include the four correspondences from the NJFO in the Final Environmental Impact Statement (FEIS) and provide a discussion on the merits of each of the issues raised by the NJFO in both the FEIS and Record of Decision (ROD).	Comment noted. This comment was incorporated in the FEIS as suggested by the commenter. Prior USFWS correspondence was added to Appendix A of the FEIS. Comments provided on June 2, 2016 during the Public Scoping Period were addressed in the RBDM Public Scoping Summary Report. While the scope of the Proposed Project has changed substantially since that time (e.g., none of the proposed Build Alternatives would require filling 100 acres of wetlands), the general concerns in those comments, such as impacts to wetlands, aquatic habitats, contaminated sites, and induced flooding, among others, were considered during the development of the DEIS and identification of BMPs and mitigation measures. Concerns expressed in email correspondence (dated February 27 and 28, 2018) relating to Losen Slote are generally within the scope of the Feasibility Study Report. Also per email correspondence, the DEIS included a thorough alternatives analysis of the human environment, including traffic and noise impacts during construction and the anticipated ongoing impacts of O&M. Finally, the DEIS included a cumulative impacts analysis of the Proposed Project in conjunction with over 120 other projects. NJDEP will continue to update and consult with the Meadowlands Interagency Mitigation Advisory Council throughout the permitting phase.
80	FA-003	Editorial	The FAA has no comments on the DEIS, other than there is a typo in the order referenced throughout. It is FAA Order 5050.4B (uppercase, not lowercase). Thanks for incorporating our previous conversations so well into the document.	Comment noted. This comment was incorporated in the FEIS as suggested by the commenter. This reference was corrected globally.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
81	FA-004	**Proposed Action / Build Alternatives**	The Proposed Project and Alternatives chapter is very thorough and understandable. However, EPA recommends including a sentence or two that describes the process for placing components in specific locations. For example, the DEIS states that Alternative 2 would include improvements to five existing open spaces. Without going into great detail, indicate the considerations that went into selecting only five and those particular five, such as total surface area and/or accessibility. Also, for Alternative 3 state what dictated the exception of the four features from the Build Plan.	Comment noted. This comment was incorporated in the FEIS as suggested by the commenter. Proposed component locations were chosen based on a variety of factors, including flood reduction potential, available land, potential to impact other resource areas, estimated cost, and proximity to intended beneficiaries. A sentence regarding this was added to **Section 2.5**. Exclusion of features from the Alternative 3 *Build Plan* was primarily dictated by the benefit-cost ratio and required timeline for Proposed Project completion (September 2022); a sentence regarding this has been added to **Section 2.5.4.1**.
82	FA-004	**Editorial**	With regard to readability, Table 2.6-1: Impact Summary and Comparison is not necessarily needed in Chapter 2 since impacts are addressed elsewhere in the document.	Comment noted. **Table 2.6-1** was retained to provide a concise summary of potential impacts immediately following the description of the proposed action and alternatives. No change to the EIS was made.
83	FA-004	**Mitigation Measures and BMPs**	EPA recommends the use of clean diesel vehicles for construction activities associated with the project. Specifically, we recommend that diesel controls, cleaner fuel, and cleaner construction practices for on-road and off-road equipment used for transportation, soil movement, or other construction activities be required. This includes strategies and technologies that reduce unnecessary idling, including auxiliary power units, the use of electric equipment, and strict enforcement of idling limits; and the use of clean diesel through add-on control technologies like diesel particulate filters and diesel oxidation catalysts, repowers, or newer, cleaner equipment. For more information on diesel emission controls in construction projects, please see: http://www.northeastdiesel.org/pdf/NEDC-Construction-Contract-Spec.pdf.	Comment noted. Air Quality Mitigation Measures and BMPs in **Section 4.9.4.2** of the EIS include the use of Ultra Low Sulfur Diesel in permanent, stationary sources and mention implementing controls on heavy construction equipment and vehicles, such as minimizing operating and idling time. Changes to the EIS have been made to include the additional clean diesel measures recommended by the commenter (see Air Quality Mitigation Measures and BMPs in **Section 4.9.4.**).

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
84	FA-004	Air Quality	In Section 4.9/Appendix H, the calculations of construction emissions in the General Conformity Applicability Analysis relies on emissions factors from the Air Emissions Guide for Air Force Mobile Sources. EPA recommends the use of the MOVES model for on-road sources and NONROAD model (now incorporated in MOVES, or emission factors provided in NONROAD documentation) for non-road sources.	Based on the information provided below, it was initially determined that the emissions from the Proposed Project activity would be insignificant and calculations would not be necessary. Further, the use of MOVES is unlikely to change the ***less than significant*** conclusion since it would only result in lowering the predicted emissions further. For the Alternative 3 *Build Plan*: • The estimated vehicular trips over the life of the Proposed Project are approximately 7,000, and the maximum estimated vehicles during the morning peak hour were estimated at 54 vehicles total, with a maximum of 31 vehicles at one intersection (**Section 4.7.4.4**). • The impact of traffic was considered so low that there was no requirement to perform level of service (LOS) analysis during the transportation analysis. This means there was no change to LOS as a result of the Proposed Project and the resulting vehicular traffic (**Sections 4.7.3** and **4.7.4.3**). • Vehicle miles travelled (VMT) for dump trucks were estimated at 1,453 miles total during the peak year (CY 2020) and 2,412 miles total for the entirety of the Proposed Project (**Appendix H**). Calculations were performed as backup using the *Air Emissions Guide for Air Force Mobile Sources* guidance document to estimate the amount of criteria emissions from projected VMT and nonroad heavy equipment usage. *[Response continues on next page.]*

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
84	FA-004	Air Quality	*[See full comment on previous page.]*	*[Response continues from previous page.]* Emission factors from *Air Emissions Guide for Air Force Mobile Sources* are obtained from the EPA Office of Transportation Air Quality and were derived from *Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition*, EPA 420-R-019, NR-010e, December 2005, and *Exhaust Emission Factors for Nonroad Engine Modeling: Compression-Ignition*, EPA 420-P-04-009, NR-009c, April 2004. The emission factors are composite emission factors that represent the national mix of model years and technology types believed to be in existence in 2007. They represent in-use emissions, and take into account NONROAD model deterioration and transient adjustment factors across the model years. EPA MOVES14a model incorporates NONROAD 2008 emission factors. Since the NONROAD2008 is accounting for new exhaust and evaporative emission controls, the newer version predicts substantially less HC and CO, and somewhat less NOx and PM emissions than emissions predicted using *Air Emissions Guide for Air Force Mobile Sources* with the use of comparable inputs. Therefore, the estimated emissions using *Air Emissions Guide for Air Force Mobile Sources* are more conservative in nature when compared to MOVES14a. The use of MOVES is unlikely to change the ***less than significant*** conclusion since it would only result in lowering the predicted emissions further. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
85	FA-004	Agency Involvement / Coordination	EPA staff working on the Berry's Creek Study Area (BCSA) Proposed Plan, as well as representatives of the BCSA Potentially Responsible Party Group, have met with NJDEP staff working on the RBD Meadowlands Flood Protection Project on a regular basis during the development of the two projects. Continued coordination will be essential throughout the design process to ensure that the two projects work effectively together, especially given that the RBD Meadowlands project anticipates the BCSA project to remediate certain areas of sediment (to be determined) in the vicinity of the East Riser Tide Gate in order for the RBD project to install energy dissipation structures in those areas. In order for the BCSA team to conduct such work in time for the RBD team to complete its work according to the HUD grant deadlines, EPA requests that the design details for the East Riser Gate Pump Station be provided early in the design process, while at the same time, planning the construction of any structures in Berry's Creek for the last phases of construction. EPA's Berry's Creek team also has concerns with respect to the construction and operation of a taintor gate structure in Berry's Creek that is part of the future plan. Details are insufficient at this time to provide meaningful comment on the structure, but it should be clear that coordination between EPA and NJDEP for the gate will be important should it move forward at a later time.	Comment noted. The BCSA project's cumulative effect on the Proposed Project is discussed in **Section 5.0** of the DEIS. The Proposed Project would be conducted in consultation with applicable regulatory agencies and in accordance with Federal, State, and local laws and regulations. As stated in the Mitigation Measures and BMPs discussions throughout **Sections 4.16.4** and **4.20.4**, NJDEP will continue to coordinate and consult with the USEPA, as well as the BCSA PRP Group as the Proposed Project moves forward. No change to the EIS has been made.
86	FA-004	Cumulative Effects	EPA submitted comments on the pre-draft Cumulative Effects chapter. The revised Cumulative Effects chapter presented in the DEIS is significantly more effective at conveying potential impacts from the project when considering other past, present, and reasonably foreseeable future actions occurring in and around the project area. The section is thorough and inclusive, and presents the information in a well-organized manner.	Comment noted. No change to the EIS has been made.
87	FA-004	Proposed Action	EPA rates the DEIS an EC-1 or "Environmental Concerns — Adequate." Environmental concerns exist primarily because of the Berry's Creek Superfund site, even though we know you are working closely with the EPA project manager to address any issues.	Comment noted. No change to the EIS has been made.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
88	FA-005	Permitting and Compliance	We have reviewed the Draft Environmental Impact Statement (DEIS) for the Rebuild by Design (RBD) Meadowlands Flood Protection Project proposed for Bergen County, NJ. In our February 27, 2018 email to Ms. Kim McEvoy providing comments on the pre-public version of the DEIS, we stated that an essential fish habitat (EFH) consultation would be required for this project and that an EFH assessment was necessary. The public DEIS does not include an EFH assessment, but includes a statement that the assessment will be completed during the permitting phase of the project. In general, for projects where National Environmental Policy Act (NEPA) documents such as environmental impact statements (EIS) or environmental assessments (EA) are being developed, the EFH consultation should take place during the draft EIS/EA phase so that the results of the consultation can be included in the final NEPA document. We offer the following information to clarify the EFH consultation process so that a full and complete EFH assessment can be developed for this project and the required EFH consultation can be completed efficiently: EFH has been designated within the project area for a number of federally managed fish species including Atlantic butterfish (*Peprilus triacanthus*), Atlantic herring (*Clupea harengus*), bluefish (*Pomatomus saltatrix*), black sea bass (*Centropristis striata*), red hake (*Urophycis chuss*), summer flounder (*Paralichthys dentatus*), windowpane flounder (*Scophthalmus aquosus*), and winter flounder (*Pseudopleuronectes americanus*). The Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires federal agencies to consult with us on any action or proposed action authorized, funded, or undertaken by the agency that may adversely affect EFH identified under the MSA. The EFH regulations, 50 CFR Section 600.920, outline that consultation procedure and require the preparation of an EFH assessment by the federal action agency. While our regulations also allow a federal action agency such as the US Department of Housing and Urban Development (HUD) to designate a non-federal representative to conduct the EFH consultation, it is important to note that the federal action agency remains ultimately responsible for compliance with sections 305(b)(2) and 305(b)(4)(B) of the MSA. The EFH final rule published in the Federal Register on January 17, 2002 defines an adverse effect as "any impact which reduces the quality and/or quantity of EFH" and further states that: *[Comment continues on next page.]*	Comment noted. The EFH Assessment was submitted to NOAA for review and concurrence. The submitted EFH Assessment is included in the FEIS as **Appendix Q** and is summarized in **Section 4.14** of the FEIS.

#	Commenter Code[2]	Main Topic	Comment	Response to Comment[3]
88	FA-005	Permitting and Compliance	*[Comment continues from previous page.]* An adverse effect may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystems components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from action occurring within EFH or outside EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions. Because this project will adversely affect EFH and the DEIS does not include an EFH assessment, further EFH consultation by the federal action agency or its non-federal designee is necessary in order to comply with the EFH provisions of the MSA. As HUD's non-federal designee, the task of initiating the EFH consultation and submitting an EFH assessment to us has been delegated to the New Jersey Department of Environmental Protection (NJDEP). As stated above, EFH assessments should be included in draft NEPA documents or as a separate document submitted prior to or concurrent with the draft NEPA document so that any EFH conservation recommendations can be incorporated into the final document. Since an EFH assessment was not included in the DEIS, an assessment should be provided to us separately so that the EFH consultation can be completed before the FEIS is issued. In order to initiate an EFH consultation, a full and complete EFH assessment must be provided to us. Required components of an assessment include: (1) a description of the proposed action, (2) an analysis of the potential adverse effects of the action on EFH and the managed species, (3) the conclusions of the federal agency (or non-federal designee) regarding the effects of the action on EFH, and (4) proposed mitigation, if applicable. If appropriate and depending on the scale of the proposed action, the assessment should also include the results of an on-site inspection, the views of recognized experts on the habitat or species affected, a literature review, an analysis of alternatives to the proposed action, and any other relevant information. Our website at: https://www.greateratlantic.fisheries.noaa.gov/habitat/index.html has additional information on EFH and the preparation of EFH assessments. We are also available to answer any questions you or your staff may have on EFH, preparing an assessment or evaluating effects.	See response to Comment #88 on previous page.

This Page has been Intentionally Left Blank.

Appendix Q: Essential Fish Habitat Assessment Report

This Page has been Intentionally Left Blank.

Essential Fish Habitat (EFH) Assessment Report
For the Rebuild by Design Meadowlands Flood Protection Project

August 2018

Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro and the Township of South Hackensack, Bergen County, New Jersey

REBUILD BY DESIGN
MEADOWLANDS

Prepared by AECOM for the State of New Jersey Department of Environmental Protection

Español 中文:繁體版 Việt-ngữ 한국어 Tagalog
Português العربية Kreyòl ગુજરાતી Italiano Polski
www.renewjerseystronger.org

Table of Contents

1.0 Introduction 1
1.1 Project Area Description 1
1.2 Alternatives Description 7
2.0 Affected Environment / EFH Species Overview 11
2.1 Wetlands 11
2.1.1 Low Marsh / Estuarine Intertidal Emergent Wetlands 12
2.1.2 High Marsh 12
2.2 Open Water 12
2.2.1 West Riser Ditch 13
2.2.2 East Riser Ditch 13
2.2.3 Berry's Creek 13
2.2.4 Moonachie Creek 13
2.2.5 Peach Island Creek 14
2.2.6 Losen Slote 14
2.3 Sediment Contamination 14
2.4 EFH Species Overview 15
3.0 Impacts 19
3.1 Alternative 1: Structural Flood Reduction 19
Table 4 describes the in-water activities associated with Alternative 1 and associated direct and indirect impacts. 19
3.2 Alternative 2: Stormwater Drainage Improvement 21
3.3 Alternative 3: Hybrid 22
3.4 Impact Summary by EFH Species and NOAA Trust Species 23
4.0 Avoidance, Minimization and Mitigation 26
5.0 Conclusion 35
6.0 Works Cited 37

List of Tables

Table 1: Summary of In-Water Activities for Build Alternatives 8
Table 2: NJDEP Wetlands Acreage in the Project Area 11
Table 3: Summary of Designated EFH Managed Species and Life Stages within Tidally Influenced Portions of the Hackensack River 17
Table 4: Anticipated Alternative 1 Wetland and WOUS Impacts 19
Table 5: Potential Impacts of Alternative 1 20
Table 6: Anticipated Alternative 2 Wetland and WOUS Impacts 21
Table 7: Potential Impacts of Alternative 2 21
Table 8: Anticipated Alternative 3 Wetland and WOUS Impacts 22
Table 9: Potential Impacts of Alternative 3 (*Build Plan*) 23
Table 10: Summary of Potential Impacts to EFH-Designated Species and NOAA Trust Species 24
Table 11: Mitigation Measures/BMPs Identified to Avoid, Minimize, and Mitigate Potentially Adverse Effects Under Alternatives 1, 2, and 3 29

List of Figures

Figure 1: Rebuild by Design Meadowlands Flood Protection Project Area 3
Figure 2: USFWS NWI Map 4
Figure 3: NJDEP Wetlands and Open Waters 5
Figure 4: Tidal Control Structures in the Project Area 6

Attachments

Attachment 1: Proposed Project Figures
Attachment 2: NOAA EFH Worksheets for Alternatives 1, 2, and 3 (*Build Plan*)

Acronyms and Abbreviations

BCSA	Berry's Creek Study Area
BCUA	Bergen County Utilities Authority
BMP	Best management practice
CDBG-DR	Community Development Block Grant – Disaster Recovery
CFR	Code of Federal Regulations
cfs	Cubic feet per second
E&S	Erosion and Sediment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
I-80	Interstate 80
LOP	Line of Protection
MAB	Mid-Atlantic Bight
MERI	Meadowlands Environmental Research Institute
MHW	Mean high water
MRI	Marsh Resources Inc.
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NAVD 88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NJDCA	New Jersey Department of Community Affairs
NJDEP	New Jersey Department of Environmental Protection
NJSEA	New Jersey Sports and Exposition Authority
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWI	National Wetlands Inventory
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated byphenyl
ppt	parts per thousand
PRP	Potentially Responsible Parties
SCP	Scientific Chemical Processing
SLR	Sea Level Rise
SVAP	Stream Visual Assessment Protocol
SVOC	Semi-volatile organic compound
SWPPP	Stormwater Pollution Prevention Plan
UOP	Universal Oil Products
US	United States
USACE	US Army Corps of Engineers
USC	US Code
USCG	US Coast Guard
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
VOC	Volatile Organic Compound
WOUS	Waters of the United States

This Page has been Intentionally Left Blank.

1.0 Introduction

The proposed Rebuild by Design Meadowlands Flood Protection Project (the Proposed Project) is located in Bergen County, New Jersey in the floodplain of the Hackensack River. The Project Area includes all or portions of the Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack and has the following approximate boundaries: the Hackensack River to the east; Paterson Plank Road (State Route 120) and the southern boundary of the Borough of Carlstadt to the south; State Route 17 to the west; and Interstate 80 (I-80) and the northern boundary of the Borough of Little Ferry to the north. Approximately 76 percent (4,129 acres) of the 5,405 total acres of the Project Area is within the New Jersey Meadowlands District regional planning area.

The United States (US) Department of Housing and Urban Development (HUD) allocated Community Development Block Grant – Disaster Recovery (CDBG-DR) funding to the State of New Jersey, specifically the New Jersey Department of Community Affairs (NJDCA), to plan, design, and implement this Proposed Project. The New Jersey Department of Environmental Protection (NJDEP), on behalf of the NJDCA, is the Lead Agency and decision-maker concerning this Proposed Project in accordance with 42 US Code (USC) 5304(g) and HUD regulations at 24 Code of Federal Regulations (CFR) Part 58. The NJDEP is the Responsible Entity for completing all required environmental reviews, including Endangered Species Act and Magnuson-Stevens Fishery Conservation and Management Act (MSA) consultation, through a Memorandum of Agreement (MOA) with the NJDCA.

This Essential Fish Habitat Assessment (EFH) has been prepared to initiate the EFH consultation process for the Proposed Project with the US Department of Commerce (USDOC) National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) pursuant to the MSA. The EFH Assessment considers the alternatives presented and evaluated in the Environmental Impact Statement (EIS) that is being prepared for the Proposed Project pursuant to NEPA. The EFH Assessment discusses the affected environment, including wetlands and aquatic habitats; identifies fish species within the Project Area for which EFH has been designated (i.e., EFH species), or that are NOAA-trust resources; and evaluates potential impacts to these species and their EFH.

EFH is defined under the MSA, as amended, as “those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity.” EFH designations emphasize the importance of habitat protection to healthy fisheries and serve to protect and conserve the habitat of marine, estuarine, and anadromous finfish, mollusks, and crustaceans. EFH includes both the water column (including its physical, chemical, and biological growth properties) and the underlying substrate (including sediment, hard bottom, and other submerged structures). Under the EFH definition, necessary habitat is that which is required to support a sustainable fishery and the managed species’ contribution to a healthy ecosystem. EFH is designated for a species’ complete lifecycle, including spawning, feeding, and growth to maturity, and may be specific for each life stage (e.g., eggs, larvae, adult). EFH designations have been defined for specific life stages based on their occurrence in tidal freshwater, estuarine, and marine waters.

1.1 Project Area Description

The Project Area, as shown in **Figure 1**, includes approximately 5,405 acres to the west of the Hackensack River. Major roads within and near the Project Area include Paterson Plank Road, State Route 17, I-80, Washington Avenue, Moonachie Avenue, and US Route 46. The Project Area, part of the New York metropolitan area, is composed of both relatively dense suburban development and large natural areas. Residential areas (11 percent of Project Area) are clustered mostly in the northeastern portion of the Project Area in the Borough of Little Ferry, eastern Borough of Moonachie, and the

Township of South Hackensack. Teterboro Airport and additional, primarily airport-related, industrial and commercial areas encompass much of the northwestern portion (9 percent) of the Project Area. Industrial and commercial land uses (30 percent of Project Area) are concentrated primarily in the southern portion of the Project Area in the Boroughs of Carlstadt, Moonachie, and the Township of South Hackensack. Roads, railroads, cemeteries and other land use types encompass 15 percent of the Project Area. Wetlands and waterways comprise the remaining 35 percent of the Project Area.

Undeveloped areas are largely dominated by wetlands associated with the Hackensack River in the southern and eastern portions of the Project Area (portions of the Borough of Carlstadt, the Township of South Hackensack, and the Borough of Little Ferry). The Hackensack River is a saline/estuarine river, tidally connected to Newark Bay. Approximately 1,200 acres (approximately 20 of the Project Area) of wetland-dominated areas in the Project Area consist of the Marsh Resources, Inc. (MRI) Wetland Mitigation Bank and the Richard P. Kane Natural Areas and Wetland Mitigation Bank. The location and distribution of wetlands throughout the Project Area, based on both the US Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) and NJDEP wetland mapping data, are shown on **Figure 2** and **Figure 3**, respectively.

The Proposed Project is located within the New Jersey Meadowlands District (see **Figure 1**). The Meadowlands District is an essential component of the New York/New Jersey Harbor Estuary and part of the largest wetland ecosystem in northern New Jersey (USFWS 1997). The overall Meadowlands District area is estimated to have once contained approximately 17,000 acres of wetlands and waterways, but as a result of draining and filling, many of the historic wetland areas have been converted to development, and less than half (approximately 8,400 acres) remain today. This land conversion has disrupted the natural hydrology of the area and, in conjunction with the low elevation of the Project Area (mostly below 10 feet North American Vertical Datum of 1988 [NAVD 88] (MERI 2014)), complexity of tidal influence, and inadequate stormwater management systems (NJSEA 2004), has led to recurring flooding problems and the need for the Proposed Project.

The hydrology of the Project Area, like that of the entire Meadowlands District, is characterized by extensive changes to tidally influenced drainages. This is due to the historic construction of dikes, tide gates, dams, berms, and roadways, and the subsequent failure of water control structures along the Hackensack River (Kiviat and MacDonald 2004). The Oradell Dam, constructed in 1922, along with water supply withdrawals from the Oradell Reservoir, curtail freshwater inputs into the lower Hackensack River, increasing tidal effects and facilitating the movement of saline waters further upriver. As many as 30 flood control structures, including tide gates and culverts, are located along the Hackensack River and its tributaries in the vicinity of the Project Area. **Figure 4** shows the tidal control structures within the Project Area.

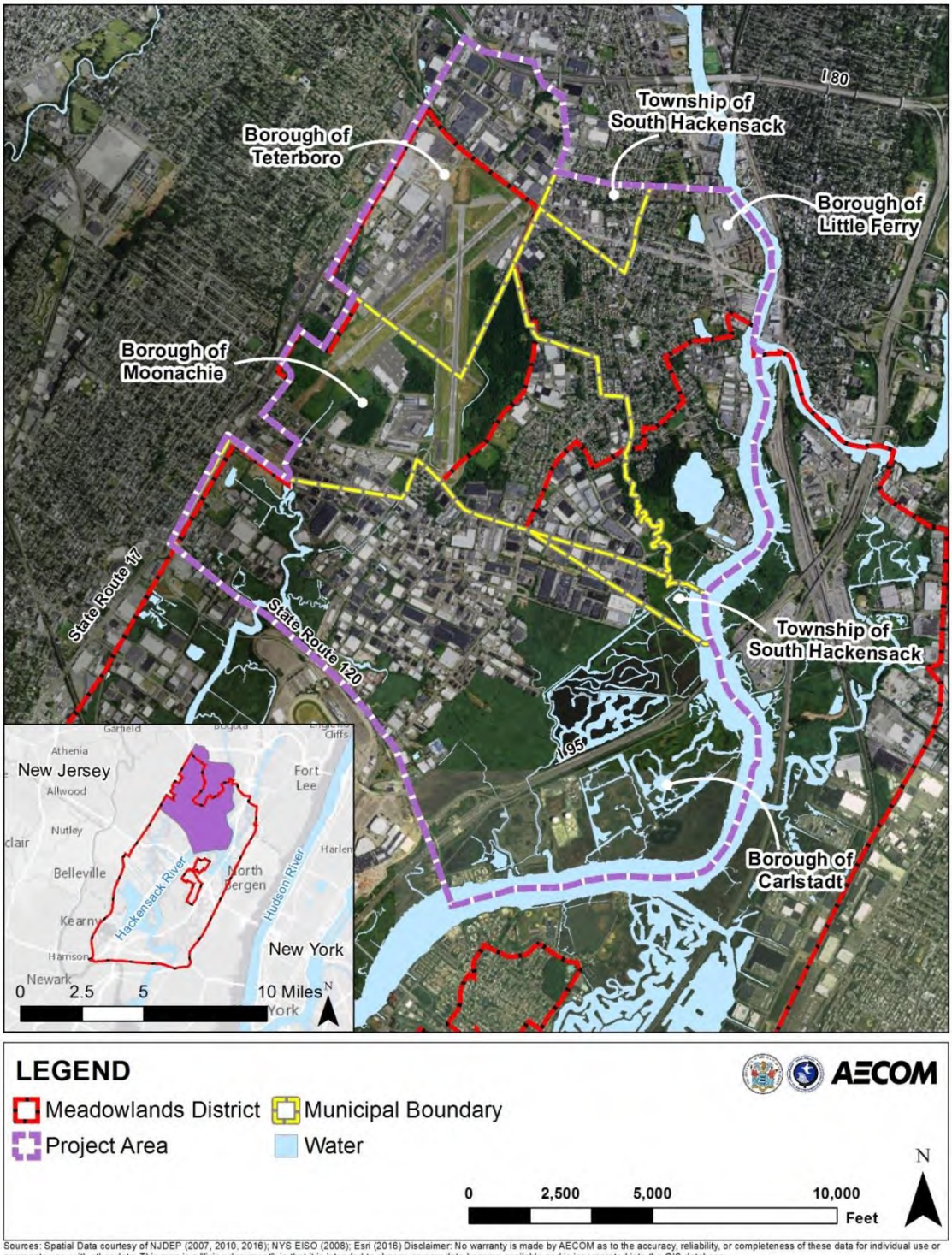


Figure 1: Rebuild by Design Meadowlands Flood Protection Project Area

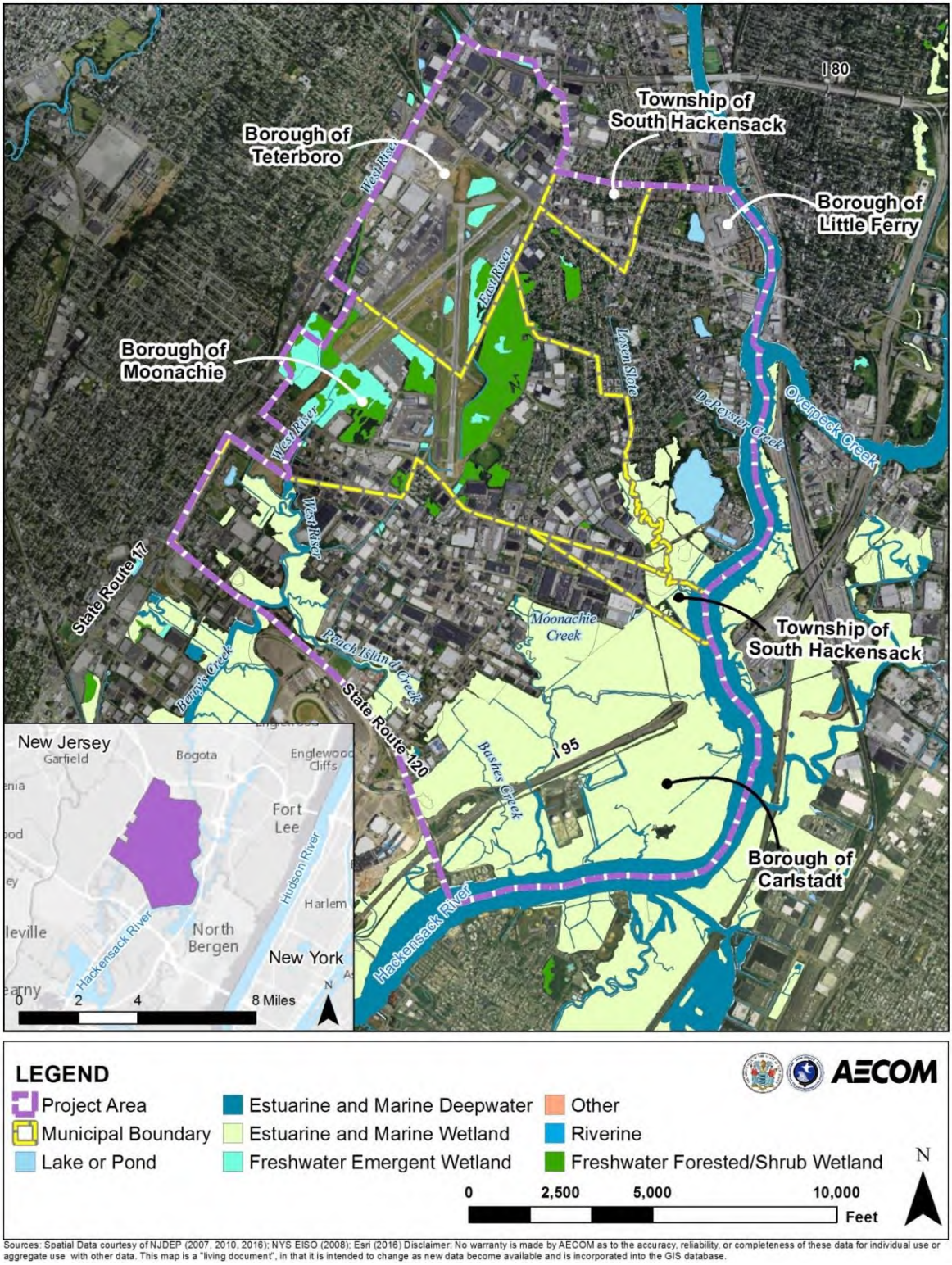


Figure 2: USFWS NWI Map

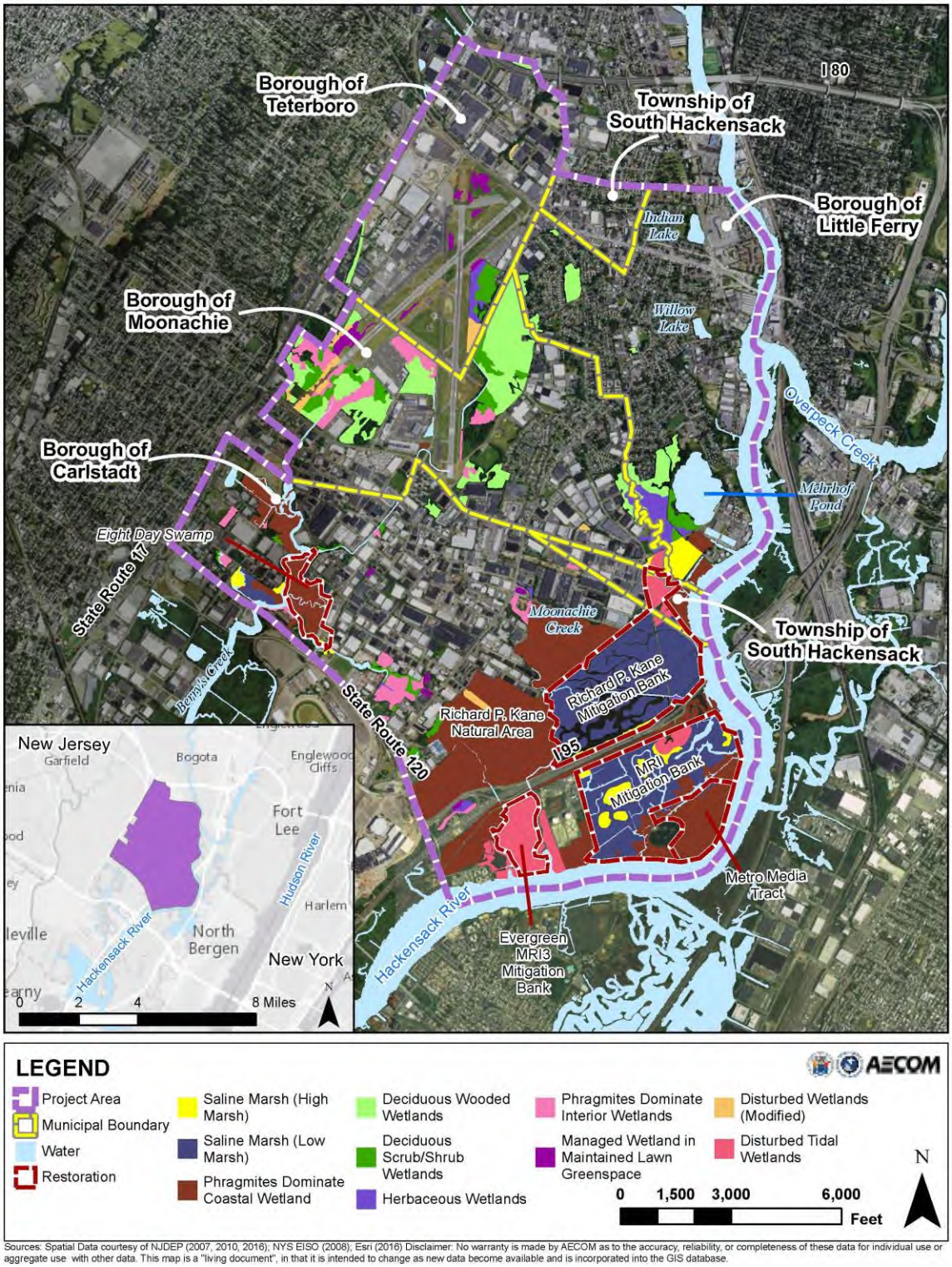


Figure 3: NJDEP Wetlands and Open Waters

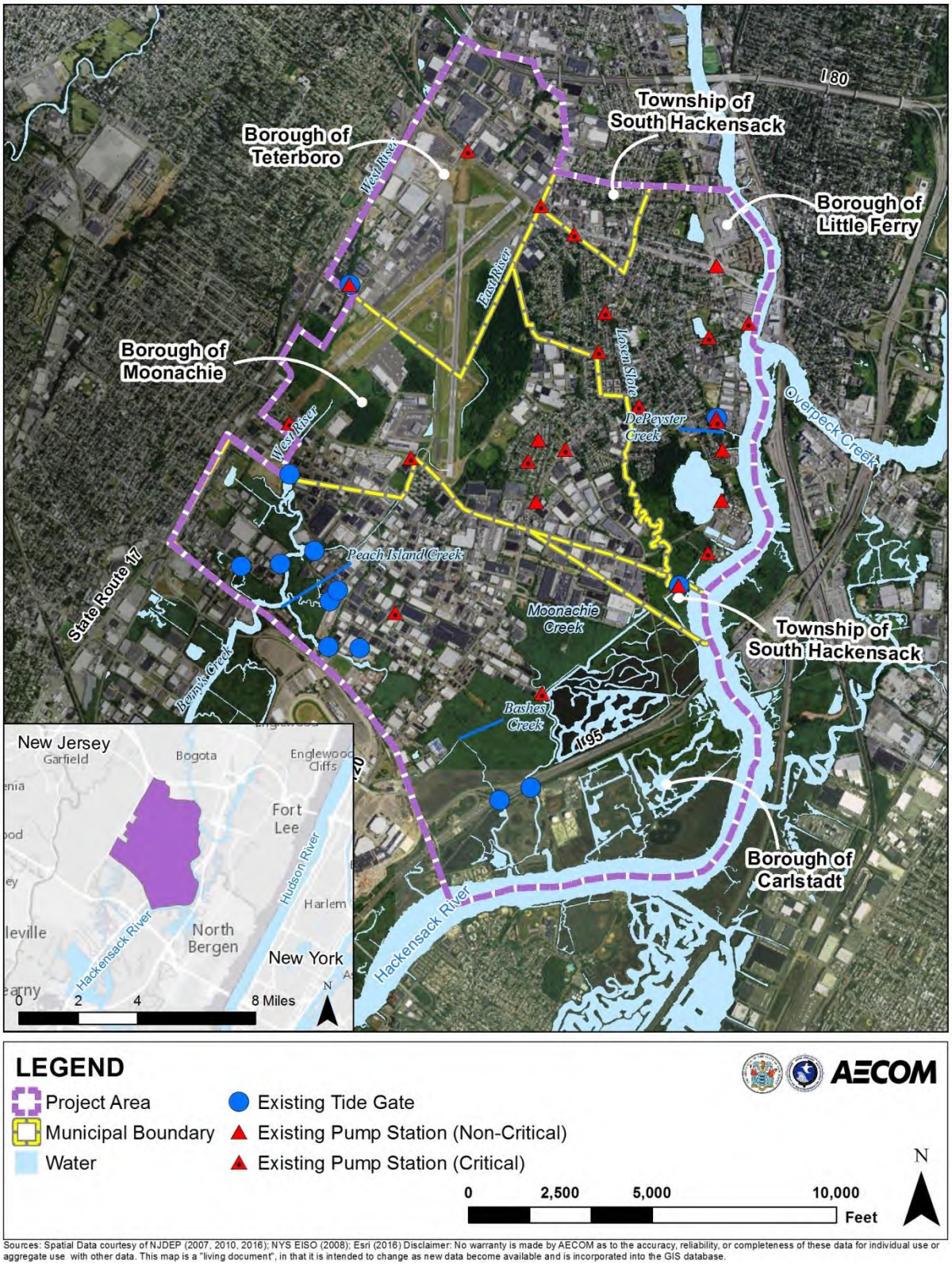


Figure 4: Tidal Control Structures in the Project Area

1.2 Alternatives Description

Because the Project Area is susceptible to chronic flooding due to the nature of the landscape, low elevation, and poor stormwater infrastructure, the Proposed Project focuses on implementing flood risk reduction measures that would reduce the flood risk within the Project Area attributable to both inland and coastal flooding, designed around maximizing the utility of each existing land use.

The Proposed Project would implement a wide variety of infrastructure components within the Project Area to address a current need and operate in an integrated manner with other proposed or existing flood reduction infrastructure. To achieve this goal, the NJDEP developed a variety of potential solutions and concepts that include various infrastructure features designed to maximize the benefits to the Project Area while minimizing overall costs and adverse environmental effects. To this end, the NJDEP identified three Build Alternatives, as well as a No Action Alternative, to be carried forward for analysis within the EIS; these Build Alternatives are detailed in **Section 2.5** of the EIS. This EFH Assessment analyzes the potential impacts on EFH that would result from Alternative 1, Alternative 2, and Alternative 3 (*Build Plan*).

Alternative 1 would implement a structural line of protection (LOP) around the Project Area that would guard against flooding from the Hackensack River and Berry's Creek during coastal storm surges. Public realm and ecological benefits would also be incorporated, as appropriate. The LOP would consist of a Northern, Central, and Southern Segment, as well as a storm surge barrier along Berry's Creek. The four main geographic components of the Alternative 1 LOP are described in detail in the EIS, and shown graphically in **Attachment 1**.

Alternative 2 would reduce flooding in the Project Area that results from under-performing stormwater drainage infrastructure. This would be accomplished through new construction of both grey and green infrastructure in key locations throughout the Project Area to improve stormwater drainage, as illustrated in the Alternative 2 figures provided in **Attachment 1**.

The Alternative 3 (*Build Plan*) would also implement stormwater drainage improvements in the Project Area very similar to Alternative 2. The Alternative 3 *Build Plan* would consist of all of the Alternative 2 components, with the exceptions of Fluvial Park, DePeyster Creek Park, Losen Slote pump station C, and Losen Slote force main C (see Alternative 2 figures provided in **Attachment 1** for the locations of these excluded features).

In accordance with the CDBG-DR funding requirements, the Proposed Project must be complete and functional by September 2022. Therefore, construction of the implemented alternative would likely begin in late 2019. A 3-year construction program would be anticipated, with construction commencing in late 2019 and reaching completion in the late summer of 2022. Under Alternative 1, the peak construction year would be 2021, while the peak year would be 2020 under Alternatives 2 and 3. Under each alternative, construction would most likely occur under multiple concurrent contracts due to the geographic separation of the various components throughout the Project Area.

The flood reduction features included in the Build Alternatives would primarily be implemented on land, but, by their nature, would also require some work in, or adjacent to, waters and/or wetlands in the Project Area, which would consequently impact EFH. **Table 1** summarizes the in-water aspects of each Build Alternative, highlighting the various features/components with the potential to affect EFH directly or indirectly, and the estimated construction duration. Please note that many of the Proposed Project components would be constructed concurrently; therefore, the durations identified below are not

necessarily additive. As noted previously, please refer to **Section 2.5** of the EIS for a complete description of each Build Alternative. Please note that while the Alternative 1, 2, and 3 components represent the current design, certain details (e.g., the arrangement of or features in each park) could change during the final design process.

Table 1: Summary of In-Water Activities for Build Alternatives

Build Alternative	Components	Construction Duration	In-Water Activities
1	LOP: Northern Segment	9 to 18 months	The Northern Segment LOP would primarily be constructed above the mean high water line (MHW). However, due to spatial constraints in some locations (e.g., proximity of buildings to the Hackensack River), the LOP would need to be constructed within the Hackensack River in some locations. In these situations, associated fill would be balanced with commensurate bank cuts.
	Fluvial Park	5 months	Fluvial Park would include approximately 1.1 acres of tidal wetland creation/enhancement. Additionally, an elevated walkway (supported by piles) would extend over both the wetland and open water, and bridge the unnamed tidal ditch on the northern edge of the park to connect with the walkway along the Northern Segment of the LOP.
	LOP: Central Segment	24 to 30 months	The Cantilever Riverwalk would also be primarily constructed above the MHW line, but could require fill in the Hackensack River in certain areas. Additionally, it would include a proposed boat dock and kayak launch at its northern end. At the southern end of the Bergen County Utilities Authority (BCUA) property, a new tide gate is proposed where the LOP crosses an existing short, unnamed tidal ditch. Finally, between the proposed tide gate and Losen Slote tide gate, minor tidal wetland impacts could result from installation of the LOP along existing berms adjacent to tidal wetlands.
	LOP: Southern Segment	12 to 18 months	The southern segment of the LOP would primarily be constructed along existing berms and above the MHW line, but could result in minor temporary wetland impacts during the construction process.
	Berry's Creek Storm Surge Barrier	Total: 24 to 30 months; Phase 1: 12 to 15 months (pump station and west gate); Phase 2: 6 to 9 months (east gate); Phase 3: 6 months (mechanical/electrical work & startup)	A surge barrier would be constructed across the full span of Berry's Creek just south of Paterson Plank Road, a 1,000-cubic-feet-per-second (cfs) pump station would be installed to accommodate water bypass, and an energy dissipation structure would be installed at the pump station outfall location. This surge barrier would only close immediately prior to large potential storm surge events (i.e., if the National Weather Service issues a coastal flood warning). Berms would be constructed to tie the surge barrier into the 7-foot elevation contour; these berms would be located in tidal wetlands.

Build Alternative	Components	Construction Duration	In-Water Activities
2	Fluvial Park	Phase 1: 5 months	Similar to Alternative 1, Fluvial Park under Alternative 2 would include approximately 1.0 acre of created/enhanced tidal wetlands and an elevated walkway over tidal wetland and tidal open water habitat. Additionally, a kayak launch would be installed at the park.
	Riverside Park	Phase 1: 2.5 months	Riverside Park would include creation/enhancement of 0.1 acre of tidal wetland and an elevated walkway. An existing boat dock would be improved, and a boat launch would be installed.
	DePeyster Creek Park	Phase 3: 7.5 months	DePeyster Creek Park would enhance a shallow embayment and intertidal marsh at the confluence of DePeyster Creek and the Hackensack River. It would also include an elevated walkway over tidal wetland and tidal open water habitats.
	Caesar Place Park	Phase 3: 4 months	Caesar Place Park would enhance and expand the existing non-tidal wetland on site, including approximately 1.5 acres of forested wetland and 1.6 acres of emergent non-tidal wetland. An elevated walkway would meander through the park.
	East Riser Ditch Channel Improvements	Phase 1: 17 months	East Riser Ditch (non-tidal) would be dredged between the existing East Riser Ditch tide gate and Moonachie Avenue. Approximately 20,200 cubic yards of sediment would be removed and disposed of offsite. Further, the railroad bridge and culverts beneath Amor Avenue and West Commercial Avenue would be removed and replaced. Finally, a 500-cfs pump station and new forebay inlet would be installed immediately upstream of the East Riser Ditch tide gate, and an energy dissipation structure would be installed immediately downstream of the tide gate.
	Losen Slote pump stations A and C and associated force mains	Phase 3: 8 months	Two new pump stations would be installed upstream of Losen Slote tide gate to convey water downstream during heavy precipitation events. The force mains would both discharge back into Losen Slote between East Park Street and Birch Street. The discharge outfalls would include energy dissipation structures.
3	Riverside Park	Phase 1: 2.5 months	Same as Alternative 2.
	Caesar Place Park	Phase 3: 4 months	Same as Alternative 2.
	East Riser Ditch Channel Improvements	Phase 1: 17 months	Same as Alternative 2.
	Losen Slote pump station A and force main	Phase 3: 8 months	Under Alternative 3, only Losen Slote pump station A and force main would be constructed along Losen Slote; the design would be the same as that for Alternative 2.

This Page has been Intentionally Left Blank.

2.0 Affected Environment / EFH Species Overview

This section characterizes the components of wetland and aquatic habitat that function as EFH and could potentially be affected by the Proposed Project. The information in this section provides the basis for the assessment of impacts from the Proposed Project's three Build Alternatives.

2.1 Wetlands

Wetland types in the Project Area are illustrated in the USFWS NWI Map (**Figure 2**) and the NJDEP Wetlands and Open Waters map (**Figure 3**). Estuarine emergent wetlands comprise the majority of the wetlands in the Project Area, occupying approximately 840.4 acres. These wetlands are now the most common and widely distributed wetland type within the Meadowlands District (Tiner et al. 2005) due to the gradual reduction in freshwater flow of the Hackensack River since the construction of Oradell Dam and other dams. Conversely, palustrine (freshwater) wetlands, now restricted almost entirely to the upper Berry's Creek sub-basin, occupy only 367.4 acres within the Meadowlands District. **Table 2** provides a summary of the wetlands by type in the Project Area. Total wetland acreages within the overall Project Area were calculated from NJDEP wetlands mapping data (NJDEP 2015).

Table 2: NJDEP Wetlands Acreage in the Project Area

NWI Classification	NJDEP Classification	Total Acres in Project Area
Estuarine Intertidal Emergent	Saline Marsh (High Marsh)	46.7
	Saline Marsh (Low Marsh)	288.3
	Phragmites Dominate Coastal Wetlands	505.4
Freshwater Forested	Deciduous Wooded Wetlands	193.0
Freshwater Scrub/Shrub	Deciduous Scrub/Shrub Wetlands	65.6
Freshwater Emergent	Herbaceous Wetlands	35.6
	Phragmites Dominate Interior Wetlands	73.2
Modified	Managed Wetlands in Maintained Lawn Greenspace	20.4
	Disturbed Wetlands (Modified)	17.6
	Disturbed Tidal Wetlands	92.7
Estuarine Deepwater	Open Water	484.8
Riverine		
Lake		
Totals		**1823.3**

(NJDEP 2015)

The functions and values of wetlands and watercourses in the Project Area were evaluated using the Evaluation of Planned Wetlands (EPW) method (Bartoldus, et al. 1994) and the Stream Visual Assessment Protocol (SVAP) (NRCS 1988). Based on the EPW, wetlands in the Project Area are generally highly functional for shoreline bank erosion control, sediment stabilization, and improving water quality, but have low value for fish and wildlife habitat. While this is also true for common reed (*Phragmites australis*) marsh communities, they scored lower for each wetland function and value than other wetland habitat communities. Based on stream evaluations using SVAP, all watercourses in the Project Area, with the exception of the lower reach of Losen Slote, received a poor rating. The lower reach of Losen Slote

received a fair rating. Overall, the watercourses were rated poor due to a high degree of alteration (channelization, sedimentation, erosion, etc.) from the urban development, poor aquatic habitat, and contamination, among other factors. Further discussion of the EPW and SVAP techniques, preliminary results, and detailed scoring information are provided in **Appendix L** of the EIS.

Wetlands and aquatic habitats within the Project Area that have tidal exchange with Hackensack River have the potential to provide EFH and are described below. Functional tide gates on many of the tributaries in the Project Area prevent normal tidal exchange and essentially prevent fish migration upstream and eliminate the capacity of these areas to function as EFH. The habitat descriptions below follow the overall NWI Mapping classification system.

2.1.1 Low Marsh / Estuarine Intertidal Emergent Wetlands

These brackish marshes range from freshwater to saline or nearly saline depending on freshwater inputs. Historically, dikes and levees isolated many of these areas from tidal flow and sediment supply, resulting in land subsidence. This facilitated aggressive colonization by common reed, which typically dominates the vegetative community of these areas. There are substantial parcels of brackish marsh surrounding lower Berry's Creek; common reed is dominant, with patches of native high and low marsh grasses (*Spartina spp.).* In addition, three wetland mitigation banks within the Project Area, in the Borough of Carlstadt, represent approximately 474 acres of restored brackish low salt marsh (see **Figure 3**). These three wetland mitigation banks are the Evergreen MRI3 Wetland Mitigation Bank, MRI Mitigation Bank, and the Richard P. Kane Wetland Mitigation Bank. Native vegetation is dominant in the restored areas, including smooth cordgrass (*Spartina alterniflora*). The Richard P. Kane Wetland Mitigation Bank also has extensive mudflats that are exposed during low tide. At the MRI Wetland Mitigation Banks, the low marsh areas are dominated by smooth cordgrass, dwarf spike rush (*Eleocharis parvula*), and marsh fleabane (*Pluchea purpurascens*).

Common reed dominates in the majority of the brackish marshes in the Project Area and is generally located to the north of the New Jersey Turnpike, west of Moonachie Creek, and north of the Kane Mitigation Bank. Wetlands classified as "Disturbed" by NWI and "Modified" by NJDEP are typically dominated by common reed.

2.1.2 High Marsh

High salt marshes flood during monthly spring high tides and during storm and wind-driven tides. High salt marsh dominated by native vegetation is rare in the Meadowlands District. Historically, farmers converted much of this habitat type to agricultural land. In the past 100 years, invasive common reed has colonized native high salt marsh habitat and displaced native species. However, approximately 10 acres of native high salt marsh are present in Berry's Creek Marsh and within the MRI Mitigation Bank. These high marsh areas are dominated by saltmarsh hay (*Spartina patens*), spikegrass (*Distichlis spicata*), and groundsel tree (*Baccharis halmifolia*). Common reed is encroaching on some of the high marsh areas in the MRI Phase 1 and 2 parcels (MERI 2015). This coastal community is also found along the Hackensack River in the Borough of Little Ferry, where groundsel tree and Jesuit's bark (*Iva frutescens*) are the dominant coastal shrubs and purple loosestrife (*Lythrum salicaria*) and goldenrods (*Solidago* spp.) are dominant herbaceous species.

2.2 Open Water

The Project Area includes several tributaries that flow either directly or indirectly to the Hackensack River. Several of these tributaries have one or more tide gates installed for flood control (see **Figure 4**).

The tide gates are one directional, allowing freshwater to flow downstream during low tide and preventing semi-diurnal tidal exchange upstream of the gate. The Hackensack River, as well as those tributaries without tide gates or downstream of them, are brackish estuarine waters subject to semi-diurnal tidal signals. Salinity typically ranges between less than 1 and 25 parts per thousand (ppt), depending on the volume of freshwater input.

Deep water estuarine habitats are open water habitats permanently submerged by at least 6.6 feet (2 meters) of water at low tide (Cowardin, et al. 1979). Estuarine deep water occurs throughout the Hackensack River and its major tidal tributaries. Shallow water estuarine habitats are open-water habitats characterized by substrate elevations between Mean Low Water (MLW) and 6.6 feet below MLW (Cowardin, et al. 1979). Typically, these areas are situated between estuarine deep water habitats and mudflats. Additional description of the rivers and creeks in the Project Area are provided below.

2.2.1 West Riser Ditch

The overall length of West Riser Ditch within the Project Area is 3 miles from headwaters to its confluence with Berry's Creek. A tide gate located approximately 0.3 mile south of Moonachie Avenue separates West Riser Ditch from Berry's Creek. For the purpose of this project, West Riser Ditch is considered to be the non-tidal portion of the ditch upstream of the tide gate. Due to the tide gate, West Riser Ditch does not have semi-diurnal tidal influence and does not provide EFH.

2.2.2 East Riser Ditch

The overall length of East Riser Ditch is 4.2 miles from its headwaters to its confluence with Berry's Creek. A tide gate at this confluence prevents semi-diurnal tidal fluctuation in the ditch and precludes its function as EFH.

2.2.3 Berry's Creek

The tidal portion of Berry's Creek extends from its confluence with the Hackensack River upstream to the tide gate that separates West Riser Ditch. The overall length of Berry's Creek from the junction of West Riser Ditch to its confluence with the Hackensack River is approximately 5 miles. Berry's Creek is a major tributary to the Hackensack River. Major tributaries that flow to Berry's Creek from the Project Area include Peach Island Creek, West Riser Ditch, and East Riser Ditch. Several larger wetland complexes also contribute to these tributaries and Berry's Creek itself. The lower portion of Berry's Creek from just south of Paterson Plank Road to the Hackensack River, including Berry's Creek Canal, are outside of the Project Area.

The creek ranges in depth from approximately 1-foot in the upper reaches to as deep as 15 feet in the canal that is downstream of the Project Area. Fisheries surveys were performed within Berry's Creek. Review of the data indicated the species assemblage is comprised of species tolerant of disturbed conditions (See EIS Appendix J) and brackish waters. Consistent with the Hackensack River and other tidal waters in the Project Area, Berry's Creek is in the mixing zone of the estuary, with salinity typically varying between less than 1 and 25 ppt, depending on the volume of freshwater input. Portions of Berry Creek and adjoining tributaries have contaminated sediments; these waters are a designated Superfund site. Additional information on sediment contamination is provided at the end of this section.

2.2.4 Moonachie Creek

Moonachie Creek is approximately 2.2 miles in length and is non-tidal for much of this length. A tide gate installed at the culvert underneath the New Jersey Turnpike removes tidal influences from the

upper reaches of the creek. Moonachie Creek provides EFH downstream of the tide gate and turnpike; this segment is approximately 0.5 mile in length and flows through a smooth cordgrass marsh before reaching the Hackensack River.

2.2.5 Peach Island Creek

Peach Island Creek is a small tributary to Berry's Creek totaling 1 mile in length. West of the Gotham Parkway bridge, a tide gate over the stream divides the western tidal and eastern non-tidal sections of the creek. The stream begins in a common reed marsh north of Paterson Plank Road and flows west parallel to the road. Industrial and commercial properties are situated along Paterson Plank Road and Gotham Parkway adjacent to Peach Island Creek. The riparian area of the creek has some small upland berms with trees but the surrounding area is mainly common reed marsh. The stream has been straightened with restricted riprap banks.

2.2.6 Losen Slote

With an overall length of 2.3 miles, Losen Slote originates north of US Route 46 as a culverted and channelized stream running through commercial and residential neighborhoods in South Hackensack and Little Ferry. A tide gate installed roughly 500 feet upstream of its confluence with the Hackensack River prevents tidal influence in Losen Slote and, with the exception of the short tidal section, precludes its function as EFH. Common reed marsh dominates on both sides of the tidal segment of the creek.

2.3 Sediment Contamination

Three US Environmental Protection Agency (USEPA) Superfund sites are located within, or in close proximity to the Project Area: Scientific Chemical Processing (SCP), Ventron/Velsicol, and Universal Oil Products (UOP). The Berry's Creek Study Area (BCSA), essentially the Berry's Creek watershed, is a component of the Ventron/Velsicol Superfund site and encompasses the other two Superfund sites as well. In addition to contributions from these Superfund sites, historical industrial discharges, sewage treatment plant discharges, and landfills have resulted in contamination in the BCSA. Elevated concentrations of mercury and polychlorinated biphenyls (PCBs) are present in waterway and marsh sediments within the Upper Peach Island Creek and Upper Berry's Creek areas. USEPA and the NJDEP have begun investigating cleanup options for these sites but completion of cleanup activities is projected to take several more years.

Many of the creeks in the Project Area contain contaminated sediments. For example, sediments in Peach Island Creek also contain elevated levels of mercury, PCBs, metals, and other constituents that exceed New Jersey Ecological Screening Criteria in both freshwater and saltwater reaches. A review of data for West and East Riser Ditches, downstream of their respective tide gates, indicates that these remedial investigation results are in general agreement with nearby data from the BCSA. Concentrations of total mercury and total PCBs in DePeyster Creek sediments are similar to the average concentrations found within Peach Island Creek and Berry's Creek. Average sediment concentrations in Losen Slote are somewhat higher than in DePeyster Creek, but still at the low end of the range for the Berry's Creek sub-reaches (Berry's Creek Study Area Cooperating PRP Group 2016). Tide gates are present on Losen Slote, Peach Island Creek, and DePeyster Creek. No water or sediment quality data are available for the other two tributaries in the Project Area (Moonachie Creek and Bashes Creek).

Many other organic chemicals have been measured in sediments in the Project Area, including polycyclic aromatic hydrocarbons (PAHs), PCBs, dioxins/furans, semi volatile organic compounds

(SVOCs) and volatile organic compounds (VOCs). Several of these chemicals exceed New Jersey sediment severe effects levels for freshwater or New Jersey sediment effects range medium levels for marine sediments and, as a result, they are a potential cause for concern. More information on contamination in the Project Area is provided in the EIS.

2.4 EFH Species Overview

The following mid-Atlantic species with designated EFH within the Hudson-Raritan Estuary have life stages that can occur in the range of salinities present in the tidal Hackensack River portion of the Project Area:

- Atlantic butterfish (*Peprilus triacanthus*)
- Atlantic sea herring (*Clupea harengus*)
- Black sea bass (*Centropristis striata*)
- Bluefish (*Pomatomus saltatrix*)
- Clearnose skate (*Raja eglanteria*)
- Little skate (*Leucoraja erinacea*)
- Red hake (*Urophycis chuss*)
- Summer flounder (*Paralichthys dentatus*)
- Windowpane flounder (*Scophthalmus aquosus*)
- Winter flounder (*Pseudopleuronectes americanus*)
- Winter skate (*Leucoraja occellata*)

Three of these species – bluefish, summer flounder, and winter flounder – have been reported in fish surveys of the tidal Hackensack River (Bragin, et al. 2005). Juvenile bluefish are seasonally abundant (July through October) in the Hackensack River, and feed voraciously on forage species, such as mummichog (Bragin, et al. 2005, Candelmo, et al. 2010). Winter flounder spawn inshore (i.e., within tidal estuaries) and are one of the few estuarine fish species with large, adhesive, demersal eggs. Winter flounder spawn in the Hudson-Raritan Estuary between February and April when water temperatures are below 59°F, and generally prefer water depths of less than 20 feet over sand, mud, and gravel substrate (Pereira et al. 1999). After eggs are discharged by females, they are dispersed by tidal currents and adhere to bottom sediments. The likelihood of winter flounder spawning in the reach of the Hackensack River within the Project Area is low. Bragin et al. (2005) collected nine winter flounder during their survey of the Hackensack River between 2001 and 2003, and 38 were collected in a survey in 1987 and 1988. Four summer flounder were collected during the 2001 to 2003 survey, and only one was collected during the 1987 to 1988 survey. Nearly all individuals were collected well to the south of the Project Area during both surveys. Bragin et al. (2005) did not indicate the Hackensack River as potential spawning grounds for winter flounder; summer flounder and bluefish spawn offshore, and juveniles enter estuaries during mid-summer.

In addition to the EFH-managed species, the following NOAA-trust resource species which include non-managed, migratory, or forage fish species have been included in this EFH Assessment:

- Alewife (*Alosa pseudoharengus*)
- American eel (*Anguilla rostrata*)
- American shad (*Alosa sapidissima*)
- Atlantic menhaden (*Brevoortia tyrannus*)
- Atlantic silverside (*Menidia menidia*)

- Atlantic tomcod (*Microgadus tomcod*)
- Bay anchovy (*Anchoa mitchilli*)
- Blue crab (*Callinectes sapidus*)
- Blue mussel (*Mytilus edulis*)
- Blueback herring (*Alosa aestivalis*)
- Eastern oyster (*Crassotrea virginica*)
- Soft-shell clam (*Mya arenaria*)
- Striped bass (*Morone saxatilis*)
- White perch (*Morone americana*)

Other NOAA trust resource species, including quahog or hard clam (*Mercenaria mercenaria*) and horseshoe crab (*Limulus polyphemus*), have not been documented as present in the Project Area.

While anecdotal reports of Atlantic and shortnose sturgeon sightings in the Hackensack River have been documented as recently as 2006 near Secaucus, New Jersey (Carola 2006), the NMFS, in their response to the EFH consultation letter for the Proposed Project, indicated that, "There are no Endangered Species Act (ESA) listed species under NMFS jurisdiction present in the Hackensack River. As such, it will not be necessary for NMFS to be a cooperating agency for ESA review." Accordingly, ESA-listed species are not further evaluated in this assessment. A copy of this response letter, dated April 28, 2016, is included in **Appendix A** of the EIS.

Certain EFH-managed species designated within the Hudson-Raritan Estuary would not be expected to occur in the Project Area (i.e., the upper portion of the tidal Hackensack River) because they occur only in the seawater salinity zone (i.e., an area with salinity greater than or equal to 25 parts per thousand). Species with a designated EFH in the lower Hackensack River, but with an unspecified salinity zone, such as cobia (*Rachycentron canadum*), king mackerel (*Scomberomorus cavalla*), and Spanish mackerel (*Scomberomorus maculatus*), are unlikely to occur in the study area given their affinity for warmer, highly saline waters.

Table 3 presents a summary of designated EFH-managed species and NOAA-trust resource species, including their life stages, within the tidally influenced portions of the Hackensack River, including the Project Area. This information was obtained from the EFH designation table for the Hudson River/Raritan/Sandy Hook Bays, New York/New Jersey Estuary from the *NMFS Guide to Essential Fish Habitat Designations in the Northeastern United States* (NMFS 2016a) as well as the EFH Assessment Worksheet, as available on the NOAA Greater Atlantic Regional Fisheries Office website, which lists the NOAA-trust resource species. Species presence and habitat suitability is also based on the various surveys conducted in the Project Area, as summarized in **Appendix J** of The EIS.

Table 3: Summary of Designated EFH Managed Species and Life Stages within Tidally Influenced Portions of the Hackensack River

Common Name	Species Name	Actual Presence of Habitat in Project Area (Y/N)	Eggs	Larvae	Juveniles	Adults	Spawning Adults
EFH Managed Species							
Atlantic butterfish	*Peprilus triacanthus*	Y	NA	M	M,S	M,S	NA
Atlantic mackerel	*Scomber scombrus*	N	NA	NA	S	S	NA
Atlantic sea herring	*Clupea harengus*	N	NA	M,S	M,S	M,S	NA
Black sea bass	*Centropristis striata*	Y	NA	NA	M,S	M,S	NA
Bluefish	*Pomatomus saltatrix*	Y	NA	NA	M,S	M,S	NA
Clearnose skate	*Raja eglanteria*	Y	NA	NA	X	x	NA
Cobia	*Rachycentron canadum*	N	x	x	X	x	NA
Little skate	*Leucoraja erinacea*	Y	NA	NA	X	x	NA
King mackerel	*Scomberomorus cavalla*	N	x	x	X	x	NA
Red hake	*Urophycis chuss*	Y		M,S	M,S	M,S	NA
Scup	*Stenotomus chrysops*	N	S	S	S	S	NA
Spanish mackerel	*Scomberomorus maculatus*	N	x	x	X	x	NA
Summer flounder	*Paralichthys dentatus*	N		F,M,S	M,S	M,S	NA
Windowpane flounder	*Scophthalmus aquosus*	Y	M,S	M,S	M,S	M,S	M,S
Winter flounder	*Pseudopleuronectes americanus*	Y	M,S	M,S	M,S	M,S	M,S
Winter skate	*Leucoraja occelata*	Y	NA	NA	X	x	NA
NOAA Trust Resource Species							
Alewife	*Alosa pseudoharengus*	Y	Not Applicable				
American shad	*Alosa sapidissima*	Y	Not Applicable				
Atlantic menhaden	*Brevoortia tyrannus*	Y	Not Applicable				
Atlantic silverside	*Menidia menidia*	Y	Not Applicable				
Atlantic tomcod	*Microgadus tomcod*	Y	Not Applicable				
Bay anchovy	*Anchoa mitchilli*	Y	Not Applicable				
Blueback herring	*Alosa aestivalis*	Y	Not Applicable				
Striped bass	*Morone saxatilis*	Y	Not Applicable				
White perch	*Morone americana*	Y	Not Applicable				

F = Includes tidal freshwater salinity zone (0.0 ppt - 0.5 ppt).
M = Includes mixing water/brackish salinity zone (0.5 ppt - 25.0 ppt). The Project Area is within this zone.
S = Includes the seawater salinity zone (greater than 25.0 ppt).
ppt = parts per thousand.
x = Designated EFH but no salinity zone specified.
Source: (NMFS 2016a)

This Page has been Intentionally Left Blank.

3.0 Impacts

All three of the Build Alternatives considered would meet the purpose of and need for the Proposed Project. A discussion of the types of impacts, both direct and indirect, beneficial and adverse, to designated EFH-managed species and NOAA trust resource species and associated habitats is presented below for each of the Build Alternatives. Impacts to EFH are essentially associated with in-water activities; however, Proposed Project impacts upstream of EFH resources could still have an impact on those resources, particularly when upstream activities could impact water quality. Water quality related impacts, whether attributable to in-water or land-based activities upstream of or within the EFH, are factored into the assessment presented below. Wetland/open water impacts are quantified based on EFH function; direct disturbance to wetlands upstream of tide gates is not considered an impact to EFH.

Following the alternative-specific summary of potential impacts, potential impacts to each EFH species and NOAA trust resource species are provided. In addition, a NOAA EFH Assessment Worksheet was prepared for Alternatives 1, 2, and 3 based on the preliminary design / data available at this time (see **Attachment 2**).

3.1 Alternative 1: Structural Flood Reduction

The in-water activities associated with Alternative 1 would result in temporary and permanent impacts to wetlands and Waters of the United States (WOUS) that may provide EFH; potential impact acreages are listed in Error! Reference source not found. below. Potential impacts to wetland and WOUS would occur uring the implementation of the in-water activities described in **Table 4** and as illustrated in the figures provided in **Attachment 1**.

Table 4: Anticipated Alternative 1 Wetland and WOUS Impacts

Classification	Total Impact (Acres)	Permanent* Impact (Acres)	Temporary** Impact (Acres)
Tidal Emergent Wetlands	1.9	0.6	1.3
Tidal Open Water	1.5	1.0	0.5
Non-Tidal Open Water	0.0	0.0	0.0
Totals	**3.4**	**1.6**	**1.8**

* Permanent impacts represent a long-term impact (e.g., permanent loss of area or function).
** Temporary impacts represent a short-term impact (e.g., the total wetland area and function is restored fully upon completion of construction activities).

Table 5 describes the in-water activities associated with Alternative 1 and associated direct and indirect impacts.

Table 5: Potential Impacts of Alternative 1

Alternative 1 In-Water Activities	Potential Impacts
The Northern Segment LOP would primarily be constructed above the mean high water (MHW) line. However, due to spatial constraints in some locations (e.g., proximity of buildings to the Hackensack River), the LOP would need to be constructed within the tidal Hackensack River in some locations. In these situations, associated fill would be balanced with commensurate bank cuts.	***Direct:*** Loss of habitat as a result of fill activities would result in potential long-term impacts to aquatic habitats that may affect, and would be likely to adversely affect, EFH/EFH species. Construction related disturbances (including increased turbidity, physical disturbance, and noise/vibration) would be short-term, but during this time may affect, and are likely to adversely affect EFH/EFH species. During operation, minor hydrology alterations, would result in long term minimal impacts to aquatic habitat that may affect, and are likely to adversely affect, EFH/EFH species. Removal of invasive species and proposed habitat enhancements would provide long-term benefits to aquatic habitats and EFH/ EFH species. Approximately 1.1 acres of tidal wetlands would be created or enhanced. ***Indirect:*** Reductions in riparian habitat and increased human activity near aquatic habitats would be long-term. These activities may affect, but are unlikely to adversely affect, EFH/EFH species; The removal of invasive plants and improvements to wetlands, and to habitats from increased protection against coastal flooding and sea level rise (SLR), and decreasing turbidity, sedimentation, and nutrient/contaminant inputs would likely yield long-term benefits to aquatic habitats and EFH and EFH species.
Fluvial Park would include approximately 1.1 acres of tidal wetland creation/enhancement. Additionally, an elevated walkway (supported by piles) would extend over both the wetland and open water, and bridge the unnamed tidal ditch on the northern edge of the park to connect with the walkway along the Northern Segment of the LOP.	
The Cantilever Riverwalk would also be primarily constructed above the MHW line, but could require fill in the Hackensack River in certain areas. Additionally, it would include a proposed boat dock and kayak launch at its northern end. At the southern end of the BCUA property, a new tide gate is proposed where the LOP crosses an existing short, unnamed tidal ditch. Finally, between the proposed tide gate and Losen Slote tide gate, minor tidal wetland impacts could result from installation of the LOP along existing berms adjacent to tidal wetlands.	
The southern segment of the LOP would primarily be constructed along existing berms and above the MHW line, but could result in minor temporary wetland impacts during the construction process.	
A surge barrier would be constructed across the full span of Berry's Creek just south of Paterson Plank Road, a 1,000- cfs pump station would be installed to accommodate water bypass, and an energy dissipation structure would be installed at the pump station outfall location. This surge barrier would only close immediately prior to large potential storm surge events (i.e., if the National Weather Service issues a coastal flood warning). As such, it would not impede fish passage under normal conditions. Berms would be constructed to tie the surge barrier into the 7-foot elevation contour; these berms would be located in wetlands.	

Determination: *Alternative 1 may affect, and is likely to adversely affect, EFH and EFH species during construction due to construction related disturbances, loss of habitat from fill, and minor long-term hydrology alterations. Additionally, proposed habitat creation/enhancement would result in long-term beneficial impacts to EFH and EFH species.*

3.2 Alternative 2: Stormwater Drainage Improvement

The in-water activities associated with Alternative 2 would result in temporary and permanent impacts to wetlands and WOUS that may provide aquatic/EFH habitat; potential impact acreages are listed in Error! Reference source not found. below. Potential impacts to wetland and WOUS would occur during he implementation of the in-water activities described in **Table 6** and as illustrated in the figures provided in **Attachment 1**.

Table 6: Anticipated Alternative 2 Wetland and WOUS Impacts

Classification	Total Impact (Acres)	Permanent* Impact (Acres)	Temporary** Impact (Acres)
Tidal Emergent Wetlands	1.1	0.0	1.1
Tidal Open Water	1.9	0.2	1.7
Non-Tidal Open Water	3.5	0.1	3.4
Totals	**6.5**	**0.3**	**6.2**

* Permanent impacts represent a long-term impact (e.g., permanent loss of area or function).
** Temporary impacts represent a short-term impact (e.g., the total wetland area and function is restored fully upon completion of construction activities).

Table 7 describes the in-water activities associated with Alternative 2 and associated direct and indirect impacts.

Table 7: Potential Impacts of Alternative 2

Alternative 2 In-Water Activities	Potential Impacts
Similar to Alternative 1, Fluvial Park under Alternative 2 would include approximately 1.0 acre of created/enhanced tidal wetlands and an elevated walkway over tidal wetland and tidal open water habitat. Additionally, a kayak launch would be installed at the park.	***Direct:*** Construction related disturbances (including increased turbidity, physical disturbance, and noise/vibration) would be short-term, but may affect, and are likely to adversely affect, EFH /EFH species. Habitat and wetland enhancements would likely provide long-term benefits to aquatic habitats and EFH /EFH species. Additionally, approximately 7.2 acres of wetlands would be created or enhanced.
Riverside Park would include creation/enhancement of 0.1 acre of tidal wetland and an elevated walkway. An existing boat dock would be improved, and a boat launch would be installed.	
DePeyster Creek Park would enhance a shallow embayment and intertidal marsh at the confluence of DePeyster Creek and the Hackensack River. It would also include an elevated walkway over tidal wetland and tidal open water habitats.	

Alternative 2 In-Water Activities	Potential Impacts
Caesar Place Park would enhance and expand the existing non-tidal wetland on site, including approximately 1.5 acres of forested wetland and 1.6 acres of emergent non-tidal wetland. An elevated walkway would meander through the park.	***Indirect:*** Increased human activity near aquatic habitats may affect, but is not likely to have a substantial adverse affect, on populations of aquatic species. Anticipated reductions in sedimentation, turbidity, and nutrient/contaminant inputs in aquatic habitats would likely result in long term benefits to aquatic habitats and EFH/EFH species.
East Riser Ditch (non-tidal) would be dredged between the existing East Riser Ditch tide gate and Moonachie Avenue. Approximately 20,200 cubic yards of sediment would be removed and disposed of offsite. Further, the railroad bridge and culverts beneath Amor Avenue and West Commercial Avenue would be removed and replaced. Finally, a 500-cfs pump station and new forebay inlet would be installed immediately upstream of the East Riser Ditch tide gate, and an energy dissipation structure would be installed immediately downstream of the tide gate.	
Two new pump stations would be installed upstream of Losen Slote tide gate to convey water downstream during heavy precipitation events. The force mains would both discharge back into Losen Slote between East Park Street and Birch Street. The discharge outfalls would include energy dissipation structures in non-tidal water.	

Determination: *Alternative 2 may affect, and is likely to adversely affect, EFH and EFH species during construction due to temporary construction related disturbances. Additionally, proposed habitat creation/enhancement would result in long-term beneficial impacts to EFH and EFH species. Overall, Alternative 2 may affect, but would not have a substantial adverse effect, on EFH and EFH species.*

3.3 Alternative 3: Hybrid

The in-water activities associated with the Alternative 3 (*Build Plan*) would result in temporary and permanent impacts to wetlands and WOUS that may provide aquatic/EFH habitat; potential impact acreages are listed in **Table 8** below. Potential impacts to wetland and WOUS would occur during the implementation of the in-water activities described in **Table 9** and as illustrated in the figures provided in **Attachment 1**.

Table 8: Anticipated Alternative 3 Wetland and WOUS Impacts

Classification	Total Impact (Acres)	Permanent* Impact (Acres)	Temporary** Impact (Acres)
Tidal Emergent Wetlands	0.0	0.0	0.0
Tidal Open Water	0.3	0.2	0.1
Non-Tidal Open Water	3.5	0.1	3.4
Totals	**3.8**	**0.3**	**3.5**

* Permanent impacts represent a long-term impact (e.g., permanent loss of area or function).
** Temporary impacts represent a short-term impact (e.g., the total wetland area and function is restored fully upon completion of construction activities).

Table 9 describes the in-water activities associated with Alternative 3 (*Build Plan*) and associated direct and indirect impacts**.**

Table 9: Potential Impacts of Alternative 3 (*Build Plan*)

Alternative 3 In-Water Activities	Potential Impacts
Riverside Park would include creation/enhancement of 0.1 acre of tidal wetland and an elevated walkway. An existing boat dock would be improved, and a boat launch would be installed.	***Direct:*** Adverse impacts and beneficial effects would be slightly less than Alternative 2 due to fewer stormwater drainage improvements being constructed. Approximately 4.0 acres of aquatic habitats would be impacted (0.1 acre permanently, 3.9 acres temporarily). Additionally, approximately 3.5 acres of wetlands would be created or enhanced. Construction activities may affect, and are likely to adversely affect, EFH/EFH species. ***Indirect:*** Adverse and beneficial impacts would be slightly less than under Alternative 2 since Fluvial Park, DePeyster Creek Park, and the Losen Slote pump station C and its force main would not be constructed. Activities may affect, but are not likely to have a substantial adverse affect, on EFH/EFH species.
Caesar Place Park would enhance and expand the existing non-tidal wetland on site, including approximately 1.5 acres of forested wetland and 1.6 acres of non-tidal emergent wetland. An elevated walkway would meander through the park.	
East Riser Ditch (non-tidal) would be dredged between the existing East Riser Ditch tide gate and Moonachie Avenue. Approximately 20,200 cubic yards of sediment would be removed and disposed of offsite. Further, the railroad bridge and culverts beneath Amor Avenue and West Commercial Avenue would be removed and replaced. Finally, a 500-cfs pump station and new forebay inlet would be installed immediately upstream of the East Riser Ditch tide gate, and an energy dissipation structure would be installed immediately downstream of the tide gate.	
Under Alternative 3, only Losen Slote pump station A and force main would be constructed along Losen Slote (non-tidal); the design would be the same as that for Alternative 2.	

Determination: *Alternative 3 may affect, and is likely to adversely affect, EFH and EFH species during construction due to temporary construction related disturbances. Additionally, proposed habitat creation/enhancement would result in long-term beneficial impacts to EFH and EFH species. Overall, Alternative 3 may affect, but would not have a substantial adverse effect, on EFH and EFH species.*

3.4 Impact Summary by EFH Species and NOAA Trust Species

Consideration of life stage habitat requirements as compared to habitat conditions in the Project Area and potential direct and indirect impacts that would be incurred with each alternative were factored into the summary assessment of potential impacts to each EFH species that may be present in the project area. The results of this summary are presented in the **Table 10**.

Table 10: Summary of Potential Impacts to EFH-Designated Species and NOAA Trust Species

Common Name / Life Stage	Potential Impacts: Alternative 1	Potential Impacts: Alternative 2	Potential Impacts: Alternative 3
Atlantic butterfish J / A	A predominantly pelagic species, adults and juveniles are highly mobile and would move out of affected area. Due to the small footprint of disturbance in relation to the size of the estuary, this alternative is not likely to alter overall availability of prey species (including small fish and Crustacea (e.g., amphipods)). Temporary impacts to prey species would not be significant. May affect, but unlikely to adversely affect EFH species.	Less in-water work than Alternative 1; less direct impact to EFH and prey species. Not likely to adversely affect EFH species.	Same as Alternative 2.
Black sea bass J / A	Adults are unlikely to be present in substantial numbers as they prefer larger estuaries and deeper waters. Juveniles (young-of-the-year) are mobile, and prefer hard bottom substrates or structures, most substrates in Project Area are soft. Limited impact on forage fish is unlikely to adversely affect EFH species. May affect, but unlikely to adversely affect EFH species.	Less in-water work than Alternative 1; less direct impact to EFH and prey species. Not likely to adversely affect EFH species.	Same as Alternative 2.
Bluefish J / A	Adults are generally oceanic and are unlikely to be present in substantial numbers. Juveniles prefer sand substrate, which would not likely be impacted by Alternative 1. Limited impact on forage fish is unlikely to adversely affect EFH species. May affect, but unlikely to adversely affect EFH species.	Less in-water work than Alternative 1; less direct impact to EFH and prey species. Not likely to adversely affect EFH species.	Same as Alternative 2.
Clearnose skate J / A	May be present, but low density expected. Highly mobile and would move out of affected area. Limited impact on forage fish is unlikely to adversely affect EFH species. May affect, but unlikely to adversely affect EFH species.	Less in-water work than Alternative 1; less direct impact to EFH and prey species. Not likely to adversely affect EFH species.	Same as Alternative 2.
Little skate J / A	May be present, but low density expected. Highly mobile and would move out of affected area. Limited impact on forage fish is unlikely to adversely affect EFH species. May affect, but unlikely to adversely affect EFH species.	Less in-water work than Alternative 1; less direct impact to EFH and prey species. Not likely to adversely affect EFH species.	Same as Alternative 2.

Common Name / Life Stage	Potential Impacts: Alternative 1	Potential Impacts: Alternative 2	Potential Impacts: Alternative 3
Red hake L / J / A	Larvae and juveniles are found in the middle to outer continental shelf of the Mid-Atlantic Bight (MAB). Adults prefer deeper water (greater than 100-ft). Species are not expected to be present in the Project Area. May affect, but unlikely to adversely affect EFH species.	Less in-water work than Alternative 1; less direct impact to EFH. Not likely to adversely affect EFH species.	Same as Alternative 2.
Windowpane flounder E / L / J / A / SA	Potentially present; may be directly and indirectly impacted during in-water activities. Limited impact on forage fish is unlikely to adversely affect EFH species. May affect, but unlikely to adversely affect EFH species.	Less in-water work than Alternative 1; less direct impact to EFH and prey species. Not likely to adversely affect EFH species.	Same as Alternative 2.
Winter flounder E / L / J / A / SA	Potentially present; however, spawning and egg presence unlikely; may be directly and indirectly impacted during in-water activities. Limited impact on forage fish is unlikely to adversely affect EFH species. May affect, but unlikely to adversely affect EFH species.	Less in-water work than Alternative 1; less direct impact to EFH and prey species. Not likely to adversely affect EFH species.	Same as Alternative 2.
Winter skate J / A	Adults prefer water with salinity greater than 30 ppt and are not likely to be present in Project Area in substantial numbers. Juveniles prefer slightly lower salinities and are more likely than adults to be present in Project Area. Larger juveniles would be able to avoid in-water activities. Limited impact on forage fish is unlikely to adversely affect EFH species. May affect, but unlikely to adversely affect EFH species.	Less in-water work than Alternative 1; less direct impact to EFH and prey species. Not likely to adversely affect EFH species.	Same as Alternative 2.
NOAA Trust Species	Potentially present; may be directly and indirectly impacted during in-water activities. May affect, but unlikely to adversely affect NOAA Trust Species.	Less direct impact to EFH and less in-water work than Alternative 1. Not likely to adversely affect NOAA Trust Species.	Same as Alternative 2.

E = eggs; L = Larvae; J = Juvenile; A = Adult; SA = Spawning Adult

This Page has been Intentionally Left Blank.

4.0 Avoidance, Minimization and Mitigation

The Proposed Project would strive to protect and enhance ecological resources by protecting wetlands, EFH, and other aquatic resources/habitats that contribute to local and regional biodiversity and ecosystem resiliency. As such, NJDEP conducted a comprehensive alternatives screening and development process that considered numerous design concepts and alternatives. Through this process, these concepts were refined iteratively, and ultimately resulted in the three Build Alternatives analyzed in detail in the EIS.

To inform the refinement of the various concepts and alternatives considered, the NJDEP developed a Concept Screening Criteria Matrix, in conjunction with the Executive Steering Committee (ESC) and Citizen Advisory Group (CAG). The Concept Screening Criteria Matrix included an array of criteria by which the various concepts could be measured and compared. Individual screening criteria in the matrix were established based on the Proposed Project's purpose and need, including its goals and objectives; potential impacts to the natural environment and the community; and the Proposed Project's overall feasibility.

As noted above, several screening criteria related to potential impacts to the natural environment were considered in the alternatives screening and development process; they included avoidance and minimization of impacts related to hazardous waste sites, Berry's Creek Superfund Site remediation, transport of contaminants/contaminated sediment, water resources (water quality, wetlands, and WOUS), fisheries and EFH, protected species and habitats, and other sensitive ecological resources.

Potential adverse effects noted in this analysis would be further avoided and minimized during the final design and permitting phase of the Proposed Project through refinement of the disturbance footprint to further minimize permanent wetland impacts and the establishment of seasonal restrictions for in-water work. In addition, any unavoidable adverse effects to EFH, wetlands, and/or aquatic resources/habitats associated with the Proposed Project would be minimized with the implementation of the best management practices (BMPs) and mitigation measures identified in the EIS. **Table 11** provides a summary of the BMPs and mitigation measures identified in the EIS that would further minimize impacts to wetlands, EFH, and other aquatic resources/habitats.

This Page has been Intentionally Left Blank.

Table 11: Mitigation Measures/BMPs Identified to Avoid, Minimize, and Mitigate Potentially Adverse Effects Under Alternatives 1, 2, and 3

Technical Resource Area	Mitigation Measures and BMPs			
	Applicable to All Alternatives	**Applicable to Alternative 1**	**Applicable to Alternative 2**	**Applicable to Alternative 3**
Noise and Vibration	**During Design/Coordination/Pre-Construction:** • Potential impacts from vibration would be reevaluated, as needed, based on the final pile driving locations to ensure they do not substantially differ from the anticipated impacts identified in the EIS. • During the permitting process, potential impacts from underwater noise would be reevaluated based on final pile driving locations to ensure they do not substantially differ from the anticipated impacts identified in the EIS. • Contractors and subcontractors would be trained to raise awareness of noise-specific issues and noise-sensitive areas. Noise complaint and response procedures would be established. • A construction schedule that is adjusted to comply with local regulations would be developed. • The construction schedule would be communicated to the public, including days of the week and hours of the day when work would occur. • An approved noise mitigation plan would be developed with the New Jersey Sports and Exposition Authority (NJSEA). See **Section 4.8.4.2** for additional details on the noise mitigation plan. Additionally, a vibration monitoring plan and compliance monitoring program would be developed. **During Construction:** • Noise reducing and/or the quietest practicable construction methods and equipment, such as the use of noise shrouds around pile driving rigs and equipment equipped with mufflers and noise attenuation devices, would be used. All equipment would be properly maintained. • Contractors would place noise barriers between work areas and noise-sensitive receptors. See **Section 4.8.4.2** for additional details on noise barriers. • Contractors would utilize specific vibration control measures that can be implemented for pile driving activities, including predrilling or augering and maximizing the use of vibratory rather than impact pile driving. Additionally, contractors should consider the use of drilled piles instead of impact or vibratory pile driving. • Construction vehicles would be routed away from residential streets, to the extent possible. • Vehicle idling would be limited in accordance with New Jersey Administrative Code (NJAC) 7:27-14 and NJAC 7:27-15. • Contractors would work with the local municipalities to address any scheduling concerns. Contractors should plan construction activities to occur during daytime hours to eliminate impacts during more sensitive nighttime hours. • Contractors would describe and commit to the developed mitigation and monitoring plans. **During Operations:** • Stationary equipment, such as generators and compressors, would be enclosed and would use acoustical louvers and/or sound attenuators in the exterior walls of these enclosures to reduce noise emissions through the air inlet and outlet louvers of the pump station(s).	See “Applicable to All Alternatives” column.	See “Applicable to All Alternatives” column.	See “Applicable to All Alternatives” column.

Technical Resource Area	Mitigation Measures and BMPs			
	Applicable to All Alternatives	**Applicable to Alternative 1**	**Applicable to Alternative 2**	**Applicable to Alternative 3**
Biological Resources	**During Design/Coordination/Pre-Construction:** • Impacts to riparian zones, wetlands, and wetland buffers would be avoided and minimized to the extent practicable. As part of the permitting process, a compensatory mitigation plan would be developed to compensate for long-term unavoidable impacts to regulated wetlands and other WOUS associated with dredging, filling, or other permanent alteration. See **Section 4.14.4.2** for additional details on the mitigation plan. Wetland and waterbody impacts from construction dredge and fill activities would be coordinated with the NJDEP, US Army Corps of Engineers (USACE), and other applicable regulatory agencies during project permitting. • A bird management plan would be developed to address Proposed Project construction timing and location to avoid or minimize effects to bird species, including special status species. This bird management plan would include pre-construction nest surveys that would identify timing restrictions for construction activities. See **Section 4.14.4.2** for additional details on the bird management plan. • To reduce the risk of erosion, sedimentation, and associated water quality impacts, a project-specific Stormwater Pollution Prevention Plan (SWPPP) would be prepared in accordance with NJ Stormwater Management Act NJAC 7:8. See **Section 4.14.4.2** for examples of the measures and BMPs that could be included in the SWPPP. • The Bergen County Soil Conservation District would review and certify the Soil Erosion and Sediment (E&S) Control Plans as mandated by the Soil Erosion and Sediment Control Act, Chapter 251, Public Law 1975. • The EFH assessment would be reviewed and updated if needed to re-evaluate potential impacts to EFH that could result from construction work below mean high water.	See “Applicable to All Alternatives” column.	See “Applicable to All Alternatives” column.	See “Applicable to All Alternatives” column.

Technical Resource Area	Mitigation Measures and BMPs			
	Applicable to All Alternatives	**Applicable to Alternative 1**	**Applicable to Alternative 2**	**Applicable to Alternative 3**
Biological Resources	**During Construction:** • Impacts to riparian zones, wetlands, and wetland buffers would be avoided and minimized to the extent practicable. Temporarily impacted wetlands and buffers would be restored immediately following construction. The developed compensatory mitigation plan would be implemented. • The bird management plan would be implemented. • The SWPPP would be implemented. • The E&S Control Plans would be implemented. • To minimize the potential for introduction or proliferation of invasive species, construction BMPs that address activities such as soil disturbance, vegetation management and inspection, transport of materials, thoroughly cleaning construction equipment, and revegetation and restoration would implemented. • To reduce wildland fire risks and minimize the potential for ignition, construction BMPs that address activities such as equipment maintenance and cleaning and fire would be implemented. • In order to minimize the spatial extent and duration of construction impacts to aquatic habitat, EFH, and aquatic wildlife, BMPs such as silt curtains and turbidity barriers would be implemented, and construction would be conducted in accordance with Federal and State permits and any site-specific conditions specified therein. • To minimize potential for impacts to finfish during key migration periods, seasonal restrictions would be applied to in-water work in accordance with permit conditions. • Noise reducing and/or the quietest practicable construction methods and equipment, such as the use of noise shrouds around pile-driving rigs and equipment with mufflers and noise-attenuation devices, would be used. All equipment would be properly maintained. • Contractors would utilize specific vibration control measures that can be implemented for pile-driving activities, including predrilling or augering and maximizing the use of vibratory rather than impact pile driving. Additionally, contractors should consider the use of drilled piles instead of impact or vibratory pile driving. **During Operations:** • Stationary equipment, such as generators and compressors, would be enclosed and would use acoustical louvers and/or sound attenuators in the exterior walls of these enclosures to reduce noise emissions through the air inlet and outlet louvers of the pump station(s). • To minimize potential for impacts to finfish during key migration periods, seasonal restrictions would be applied to in-water work. • Activities that may introduce sediments into the water would not be conducted without appropriate sediment and erosion control measures in place.	See “Applicable to All Alternatives” column.	See “Applicable to All Alternatives” column.	See “Applicable to All Alternatives” column.

Technical Resource Area	Mitigation Measures and BMPs			
	Applicable to All Alternatives	**Applicable to Alternative 1**	**Applicable to Alternative 2**	**Applicable to Alternative 3**
Water Resources, Water Quality, WOUS	**During Design/Coordination/Pre-Construction:** • Impacts to riparian zones, wetlands, and transition areas (i.e., wetland buffers) would be avoided and minimized to the extent practicable, and a compensatory mitigation plan would be developed, as described under Biological Resources. • Coordination with the NJDEP, USACE, US Coast Guard (USCG), National Oceanic and Atmospheric Administration (NOAA), NJSEA, and other applicable regulatory agencies would be conducted, and all necessary permits obtained prior to construction. • Coordination with the USEPA and Berry's Creek Study Area (BCSA) Cooperating Potentially Responsible Parties (PRP) Group would be conducted during the final design process to ensure the Proposed Project does not adversely impact the ongoing BCSA PRP Group remediation project. • A project-specific SWPPP would be prepared, as described under Biological Resources. • The Bergen County Soil Conservation District would review and certify the Soil Erosion and Sediment Control Plans, as described under Biological Resources. **During Construction:** • Impacts to riparian zones, wetlands, and transition areas (i.e., wetland buffers) would be avoided and minimized to the extent practicable. Temporarily impacted wetlands and buffers would be restored immediately following construction. The developed compensatory mitigation plan would be implemented, as described under Biological Resources. • The prepared SWPPP would be implemented, as described under Biological Resources. • In order to minimize the spatial extent and duration of construction impacts to surface water flow, water quality, and sediment transport; wetland area, functions, and values; and groundwater flow and groundwater quality, BMPs (e.g., silt curtains, turbidity barriers, silt fencing, and hay bales) would be implemented, and construction would be conducted in accordance with Federal and State permits, and any conditions specified therein.	See "Applicable to All Alternatives" column.	See "Applicable to All Alternatives" column. *Additionally:* **During Design/Coordination/Pre-Construction:** • In order to minimize the spatial extent and duration of scour and sediment transport as a result of storm events, energy dissipation structures would be installed at the Losen Slote and East Riser Ditch pump station discharge locations.	Same as Alternative 2.

Technical Resource Area	Mitigation Measures and BMPs			
	Applicable to All Alternatives	**Applicable to Alternative 1**	**Applicable to Alternative 2**	**Applicable to Alternative 3**
Hydrology and Flooding	**During Design/Coordination/Pre-Construction:** • The mitigation measures set forth in Water Resources would be implemented. **During Construction:** • The mitigation measures set forth in Water Resources would be implemented.	See "Applicable to All Alternatives" column. *Additionally:* **During Design/Coordination/Pre-Construction:** • The potential for induced flooding would be addressed during the final stages of the design and modeling processes in order to either eliminate them (i.e., through more refined modeling data) or reduce them to less-than-significant levels (i.e., induced flooding only in existing environmental areas in accordance with regulatory requirements). **During Construction:** • Adequate construction planning, including identification of potential emergency measures, would be implemented to avoid potential increased storm surge flooding in the Project Area while construction of the LOP is occurring along existing berms.	See "Applicable to All Alternatives" column. *Additionally:* **During Design/Coordination/Pre-Construction:** • The mitigation measures set forth in Water Resources under Alternative 2 would be implemented.	Same as Alternative 2.
Coastal Zone Management	**During Design/Coordination/Pre-Construction:** • The mitigation measures set forth in Biological Resources, Water Resources, and Cultural and Historical Resources would be implemented. **During Construction:** • Intertidal and subtidal impacts in the Hackensack River (below mean high water), wetland impacts, filling, and riparian and wetland buffers would be minimized to the extent possible, and coordination with the NJDEP, USACE, USCG, NOAA, NJSEA, and other applicable regulatory agencies would be conducted, as appropriate, to ensure proper mitigation and compliance with applicable regulations regarding in-water construction activities (e.g., 33 CFR 110.155). • The mitigation measures set forth in the Biological Resources section of the EIS would be implemented. Any sensitive habitats for endangered or threatened wildlife or plants that would be temporarily disturbed would be identified during the permitting process and appropriate mitigation measures, including timing restrictions and other measures as necessary, would be followed to protect sensitive populations and habitats. • The mitigation measures set forth in the Water Resources and Cultural and Historical Resources sections of the EIS would be implemented. **During Operations:** • The mitigation measures set forth in the Biological Resources, Water Resources, and Cultural and Historical Resources sections of the EIS.	See "Applicable to All Alternatives" column. *Additionally:* **During Design/Coordination/Pre-Construction:** • Coordination with the Little Ferry Marina and Riverside Boat Works would occur to develop a plan to reduce disruptions to these marinas, and to incorporate long-term access for these marinas into the design.	See "Applicable to All Alternatives" column. *Additionally:* **During Design/Coordination/Pre-Construction:** • Coordination with Riverside Boat Works would occur to develop a plan to reduce disruptions to this marina, and to incorporate long-term access for this marina into the design.	Same as Alternative 2.

Technical Resource Area	Mitigation Measures and BMPs			
	Applicable to All Alternatives	**Applicable to Alternative 1**	**Applicable to Alternative 2**	**Applicable to Alternative 3**
Hazards and Hazardous Materials	**During Design/Coordination/Pre-Construction:** • HUD would be consulted to design proposed park/recreation features in compliance with HUD acceptable separation distance requirements. • A Materials Management Plan would be developed to address how any contaminated soil, sediment, surface water, groundwater, or waste materials would be handled for off-site disposal or on-site reuse (in the case of soil). • Coordination with the NJDEP Division of Solid and Hazardous Waste would be required for any actions that involve work within a landfill. A Landfill Disruption Permit would be required. • Parties responsible for completing remediation of properties adjacent to, or within 200 feet of, the Proposed Project footprint would be notified of the design and schedule. • Coordination with the USEPA and BCSA Cooperating PRP Group would be conducted during the final design process to ensure the Proposed Project does not adversely impact the ongoing BCSA PRP Group remediation project. **During Construction:** • Construction contractors would be required to use, store, and transport hazardous materials in compliance with Federal, State, and local regulations. • The Materials Management Plan would be implemented. • A New Jersey Licensed Site Remediation Professional would oversee those portions of the Proposed Project that would be considered a Linear Construction Project as defined by the NJDEP, and the Proposed Project would comply with these and other provisions of Chapter 16 of the NJDEP Administrative Requirements for the Remediation of Contaminated Sites (NJAC 7:26C) as necessary. This could occur with linear landscape features that cross more than one property. **During Operations:** • Operations and maintenance (O&M) activities would need to address NJ Site Remediation and Reform Act requirements for contaminated sites.	See "Applicable to All Alternatives" column. *Additionally:* **During Design/Coordination/Pre-Construction:** • The proposed construction near Deluxe International Trucks, Inc. includes a floodwall and excavation along the Hackensack River. These actions could require additional pre-construction review of site-specific records, sampling and analysis of materials to be disturbed, and precautionary planning to ensure mitigation, if not prevention, of the release and spread of contamination during construction, operation, use, and maintenance of features in these areas. • Construction of the Berry's Creek storm surge barrier and closure gate would require work within and in close proximity (i.e., parcels within 200 feet) to Universal Oil Products and other contaminated sites and waterways, including those within the Berry's Creek Study Area. Design and operation of these features would need to consider disturbance to ongoing and planned remedial investigation and action and potential downstream impacts should the surge barrier result in scour and the spread of known contaminants in soil and sediment. **During Construction:** • The proposed construction near Deluxe International Trucks, Inc. could require the implementation of BMPs to ensure mitigation, if not prevention, of the release and spread of contamination in these areas. • Precautions could be needed near historic fill and the Little Ferry Landfill to ensure that activity does not expose workers, local residents, or ecological receptors to contamination through the release and spread of hazardous materials.	See "Applicable to All Alternatives" column. *Additionally:* **During Design/Coordination/Pre-Construction:** • The proposed construction at Willow Lake Park includes various green infrastructure features. These actions could require additional pre-construction review of site-specific records, sampling and analysis of materials to be disturbed, and precautionary planning to ensure mitigation, if not prevention, of the release and spread of contamination during construction, operation, use, and maintenance of these features. • Dredging and construction at East Riser Ditch and Losen Slote would require work within and in close proximity (i.e., parcels within 200 feet) to contaminated sites and waterways. Design and operation of these features would need to consider downstream impacts and disturbance to ongoing and planned remedial investigation should proposed features, such as pump stations, result in scour and the spread of known contaminants in soil and sediment. **During Construction:** • The proposed construction at Willow Lake Park could require the implementation of BMPs to ensure mitigation, if not prevention, of the release and spread of contamination. • Precautions could be needed near historic fill and the Little Ferry Landfill and Morris Park Avenue Corporation landfill to ensure that activity does not expose workers, local residents, or ecological receptors to contamination through the release and spread of hazardous materials.	Same as Alternative 2.

5.0 Conclusion

This assessment concludes that Build Alternative 1 may affect, and is likely to adversely affect, multiple EFH or EFH species. These impacts would result from both permanent impacts to tidal waters and wetlands and temporary construction work in and near water. However, the extent of in-water activities and permanent impacts are small in comparison to the available habitat in the region and the construction related impacts would likely result in minimal disturbance to EFH.

Build Alternatives 2 and 3 are very similar; each of these alternatives would result in 0.2 acre of permanent impacts to tidal waters. However, under Alternative 2, approximately 2.8 acres of temporary impacts to tidal waters and wetlands would occur in comparison to the approximately 0.1 acre of temporary impact under Alternative 3. As stated in **Section 4.0**, seasonal restrictions along with other BMPs and mitigation measures would be implemented to avoid and minimize temporary construction-related impacts. Overall, Build Alternatives 2 and 3 may affect, but would not have substantial adverse effects, on EFH and EFH species.

Over the long-term, the habitat enhancement aspects of the alternatives would provide benefits to EFH and EFH species, including improvements to water quality and, with those Build Alternatives that include tidal wetland creation and enhancement, increased availability to nursery habitat for EFH and forage species.

Although there is a history of contaminated sediment in the Project Area and vicinity, only a limited change in runoff, channel velocity and shear stress are predicted for any given alternative, relative to the No Action Alternative, as concluded by the comprehensive scour and deposition analysis conducted to support the EIS (see **Appendix I** of the EIS). This analysis further concluded that none of the Build Alternatives would be sufficient to markedly exacerbate the degree of resuspension of bottom sediments, as compared to current conditions. Consequently, project induced changes to sediment quality are not likely to adversely affect EFH.

The permanent impacts to wetlands and WOUS that function as EFH would be insignificant, particularly for the Alternative 3 *Build Plan* (0.2 acre), compared to the overall area of these habitats within the Project Area (i.e., greater than 1,800 acres) and broader estuary. These minor impacts would be offset by the benefits associated with habitat restoration and improvements that would be implemented as part of this Alternative. Impacts to water quality would be temporary and limited to the construction phase; these impacts would be avoided and minimized through BMP implementation, as noted in **Table 11**. With the stormwater management and green infrastructure measures included in each Build Alternative, the Proposed Project would yield overall long-term benefits to water quality and correspondingly to EFH, EFH species, and NOAA Trust Species.

This Page has been Intentionally Left Blank.

6.0 Works Cited

Berry's Creek Study Area Cooperating PRP Group. *Draft Remedial Investigation Report: Berry's Creek Study Area Remedial Investigation.* 2016.

Bragin, A.B., J. Misuik, C.A. Woolcott, K.R. Barrett, and R. Justino-Altresino. *A Fishery Resource Inventory of the Lower Hackensack River within the Hackensack Meadowlands District: A Comparative Study 2001-2003 vs. 1987-1988.* New Jersey Meadowlands Commission, Meadowlands Environmental Research Institute, 2005.

Candelmo, A., A. Deshpande, B. Dockburn, P. Weis, and J. S. Weis. "The effect of contaminated prey on feeding, activity, and growth of young-of-the-year bluefish, Pomatomus saltatrix, in the laboratory." *Estuaries and Coasts* 33 (2010): 1025-1038.

Carola, H.M. *Hackensack Watershed Field Notes.* 2006. http://www.hackensackriverkeeper.org/newsletters/Summer2006/15_Summer_2006.htm (accessed August 2016).

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. *Classification of wetlands and deepwater habitats of the United States.* Washington, D.C.: US Fish and Wildlife Service, 1979.

Kiviat, E., and K. MacDonald. "Biodiversity patterns and conservation in the Hackensack Meadowlands, New Jersey." *Urban Habitats* 2 (2004): 28-61.

MERI. *Elevation Finder.* 2014. http://arcgis5.njmeadowlands.gov/municipal/LiDAR-Elevation/ (accessed September 27 27, 2016).

—. *Meadowlands Environmental Site Investigation Compilation.* 2015. http://meri.njmeadowlands.gov/mesic/sites/existing-restoration-preservation-mitigation-sites.

NJDEP. *State of New Jersey Department of Environmental Protection Bureau of GIS .* February 17th, 2015. http://www.nj.gov/dep/gis/lulc12c.html (accessed September 27th, 2017).

NJSEA. "Meadowlands District Master Plan." New Jersey, 2004.

NMFS. *National Marine Fisheries Service (NMFS) Guide to Essential Fish Habitat Designations in the Northeastern United States.* 2016a. http://www.greateratlantic.fisheries.noaa.gov/hcd/webintro.html (accessed August 2016).

NRCS. *Stream Visual Assessment Protocol.* Technical Note 99-1, USDA - NRCS, 1988.

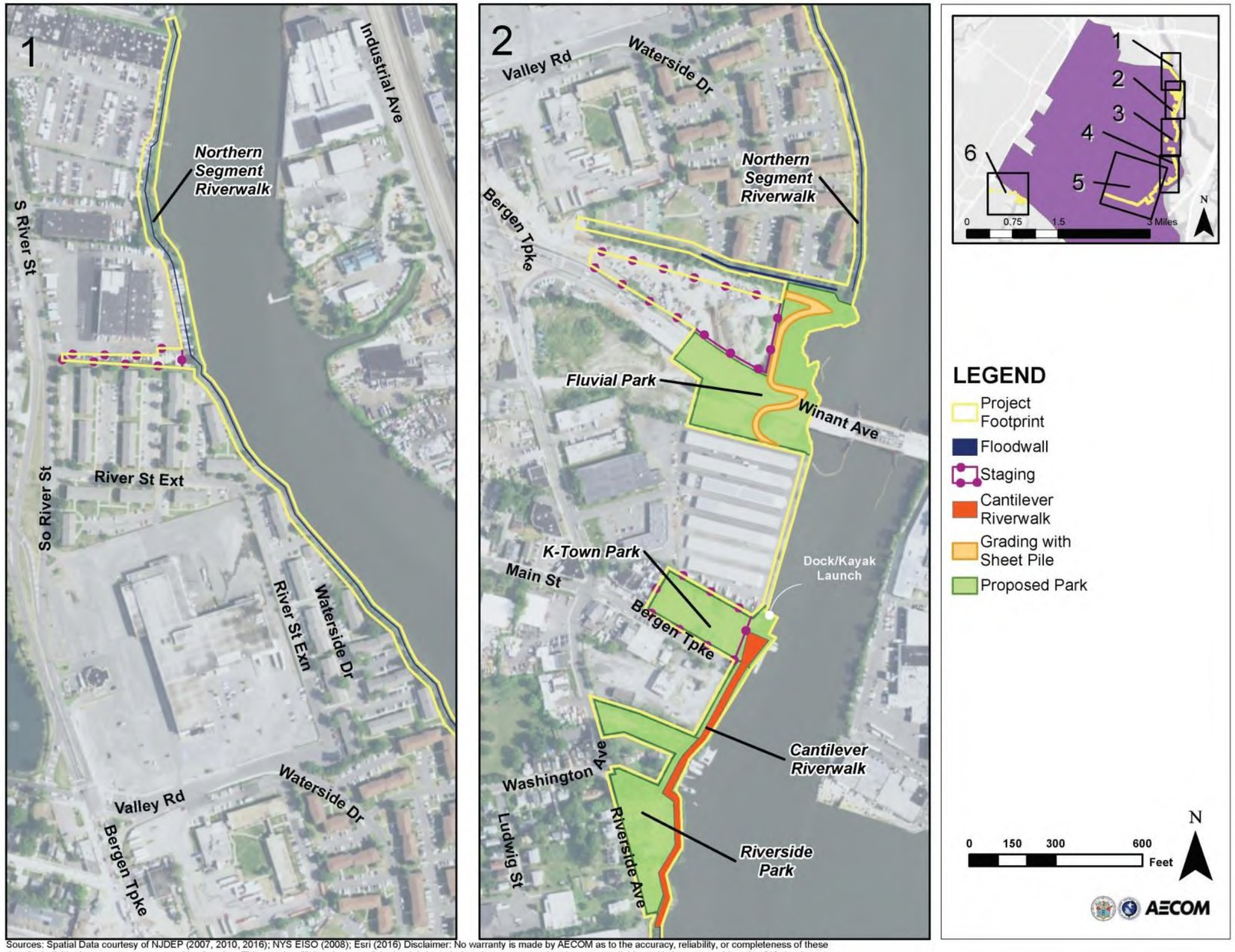
Pereira, J. J., R. Goldberg, and J. J. Ziskowski. *Winter flounder, Pseudopleuronectes americanus (Walbaum), Life History and Characteristics. Amendment #11 to the Northeast Multispecies Fishery Management Plan.* New England Fishery Managment Council, 1999.

USFWS. *Significant Habitats and Habitat Complexes of the New York Bight Watershed: Hackensack Meadowlands, Complex #19.* 1997. https://nctc.fws.gov/resources/knowledge-resources/pubs5/web_link/text/hm_form.htm (accessed April 29, 2016).

This Page has been Intentionally Left Blank.

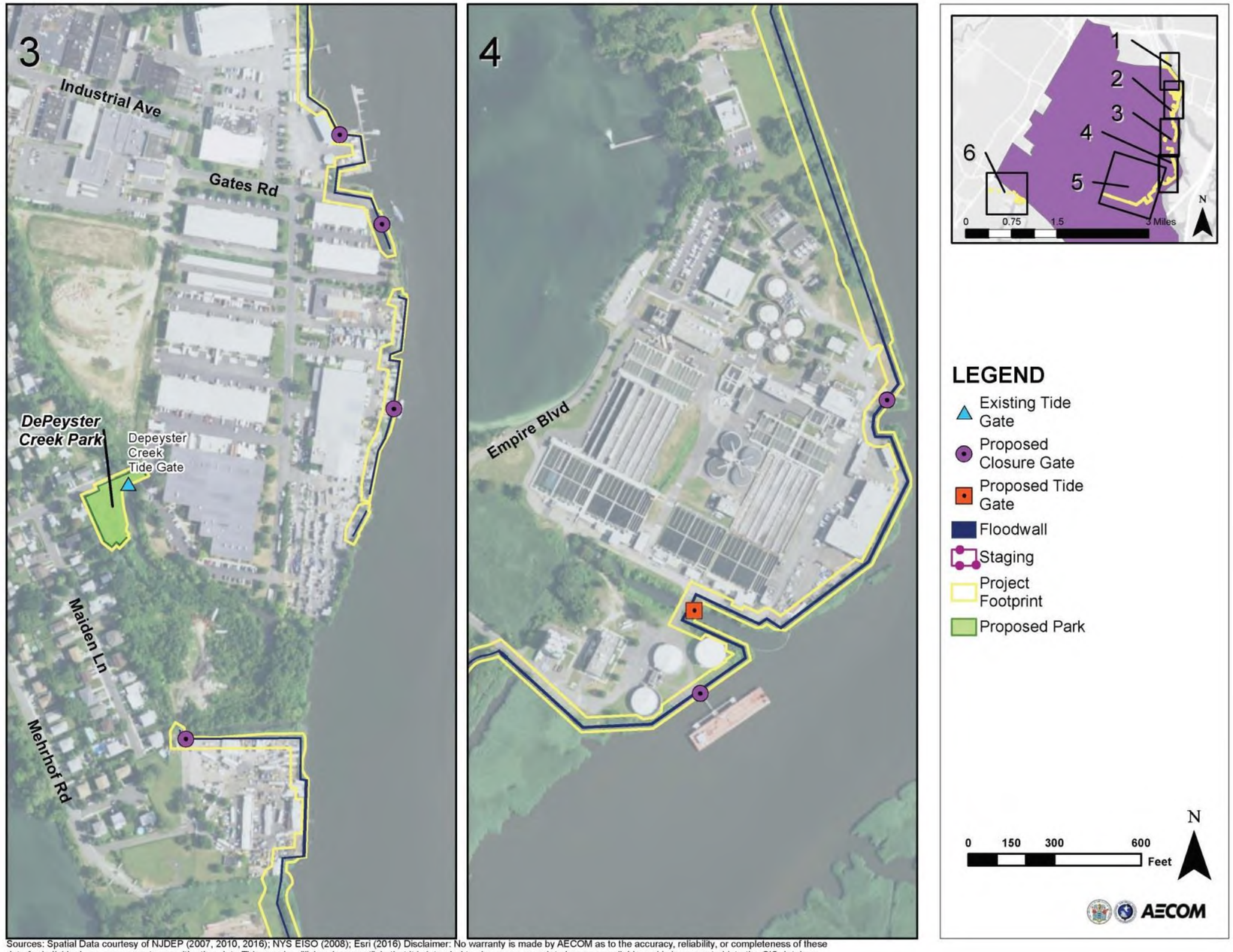
Attachment 1: Proposed Project Figures

This Page has been Intentionally Left Blank.



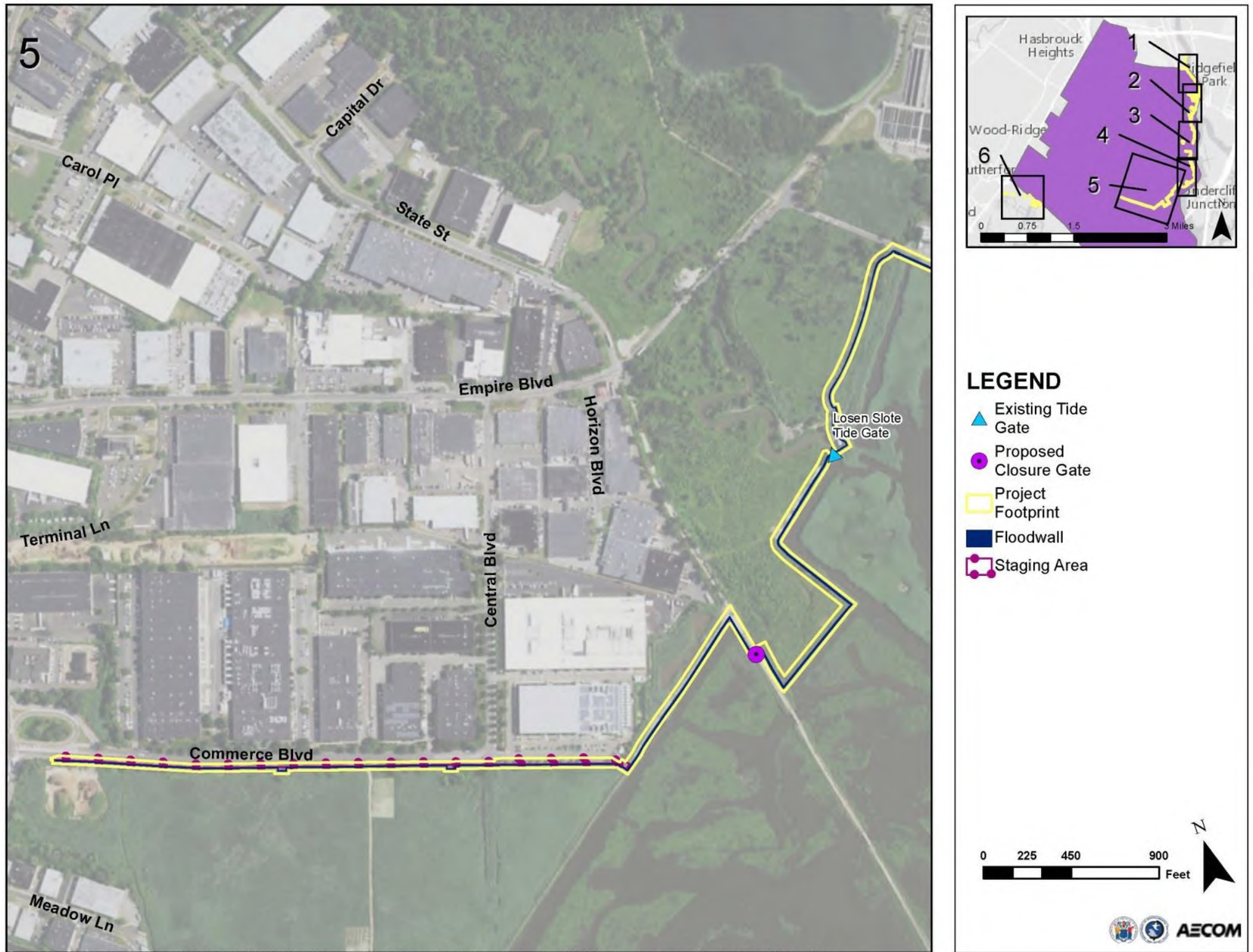
Sources: Spatial Data courtesy of NJDEP (2007, 2010, 2016); NYS EISO (2008); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate usewith other data.This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Alternative 1 LOP (Northern and Central Segments; Figure 1 of 4)



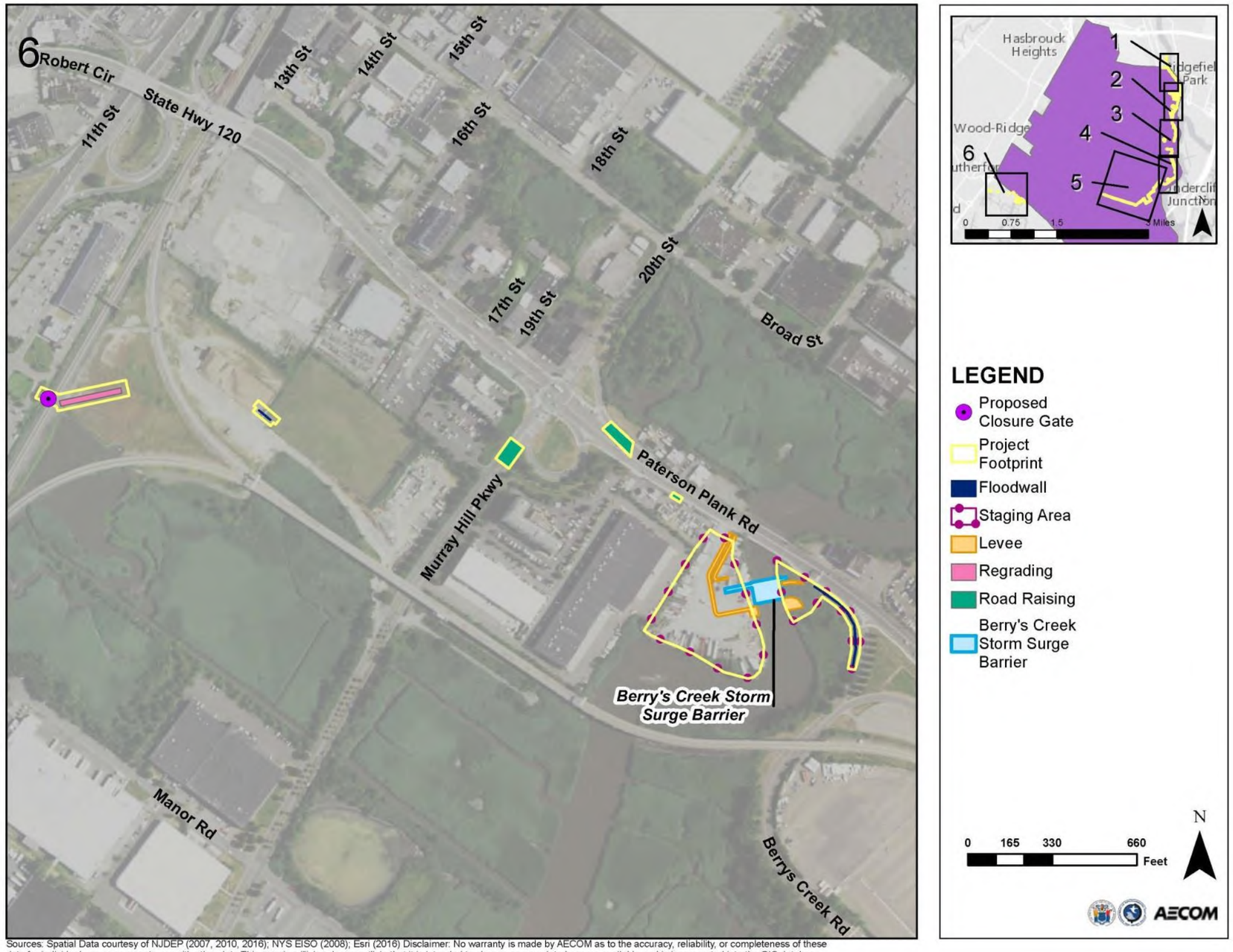
Sources: Spatial Data courtesy of NJDEP (2007, 2010, 2016); NYS EISO (2008); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate usewith other data.This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Alternative 1 LOP (Central Segment; Figure 2 of 4)



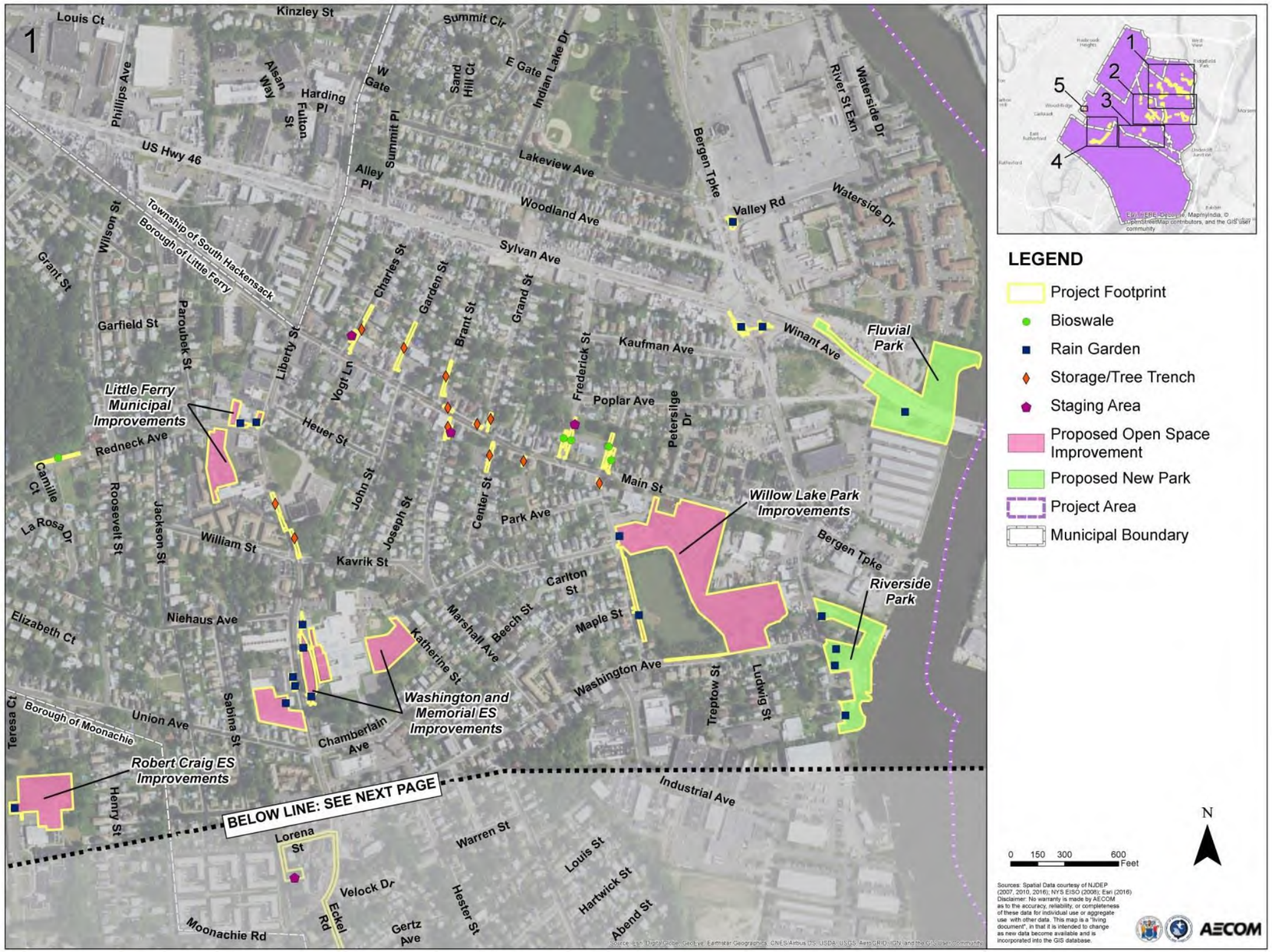
Sources: Spatial Data courtesy of NJDEP (2007, 2010, 2016); NYS EISO (2008); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate usewith other data.This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

Alternative 1 LOP (Central and Southern Segments; Figure 3 of 4)

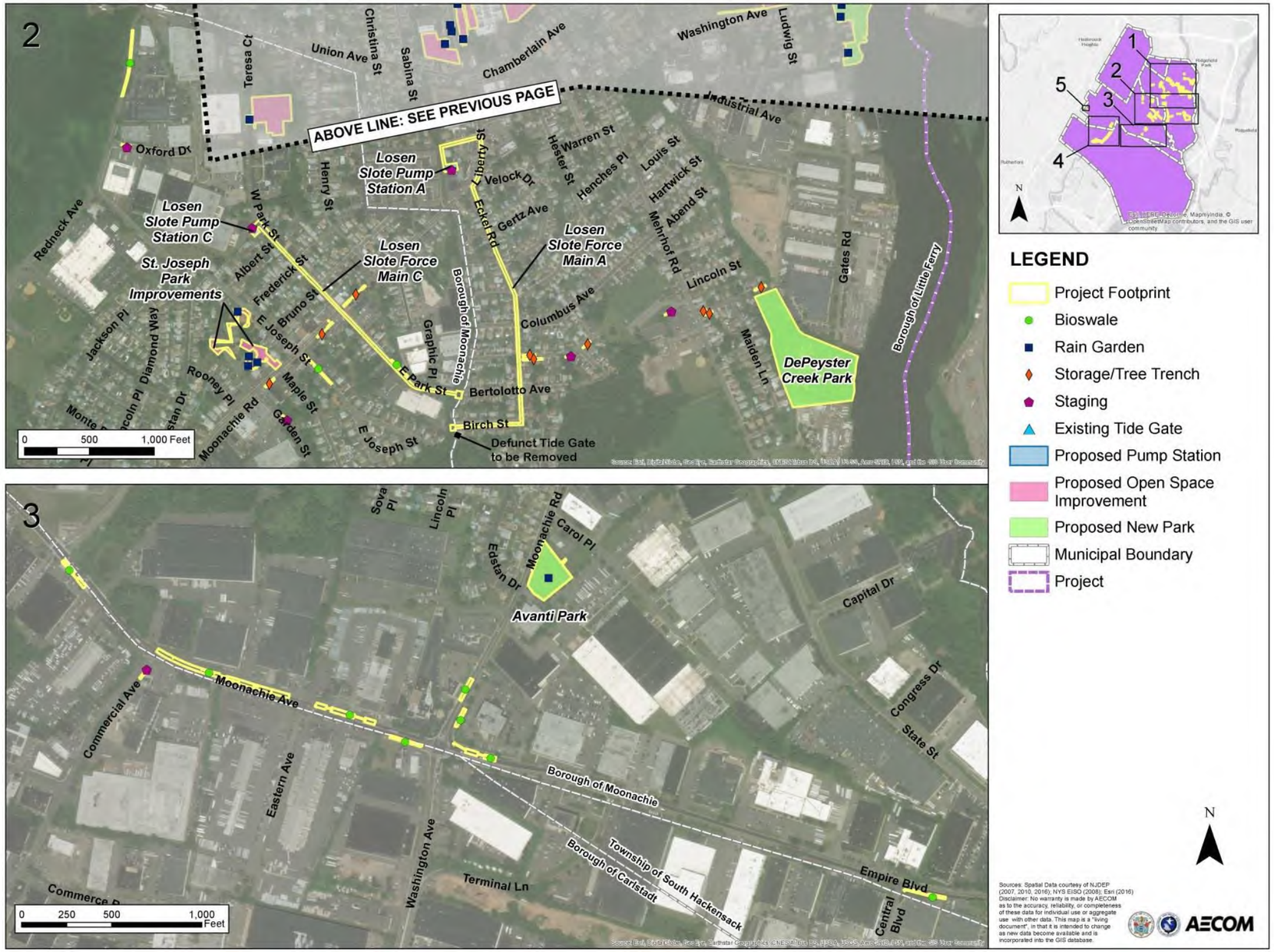


Sources: Spatial Data courtesy of NJDEP (2007, 2010, 2016); NYS EISO (2008); Esri (2016) Disclaimer: No warranty is made by AECOM as to the accuracy, reliability, or completeness of these data for individual use or aggregate usewith other data.This map is a "living document", in that it is intended to change as new data become available and is incorporated into the GIS database.

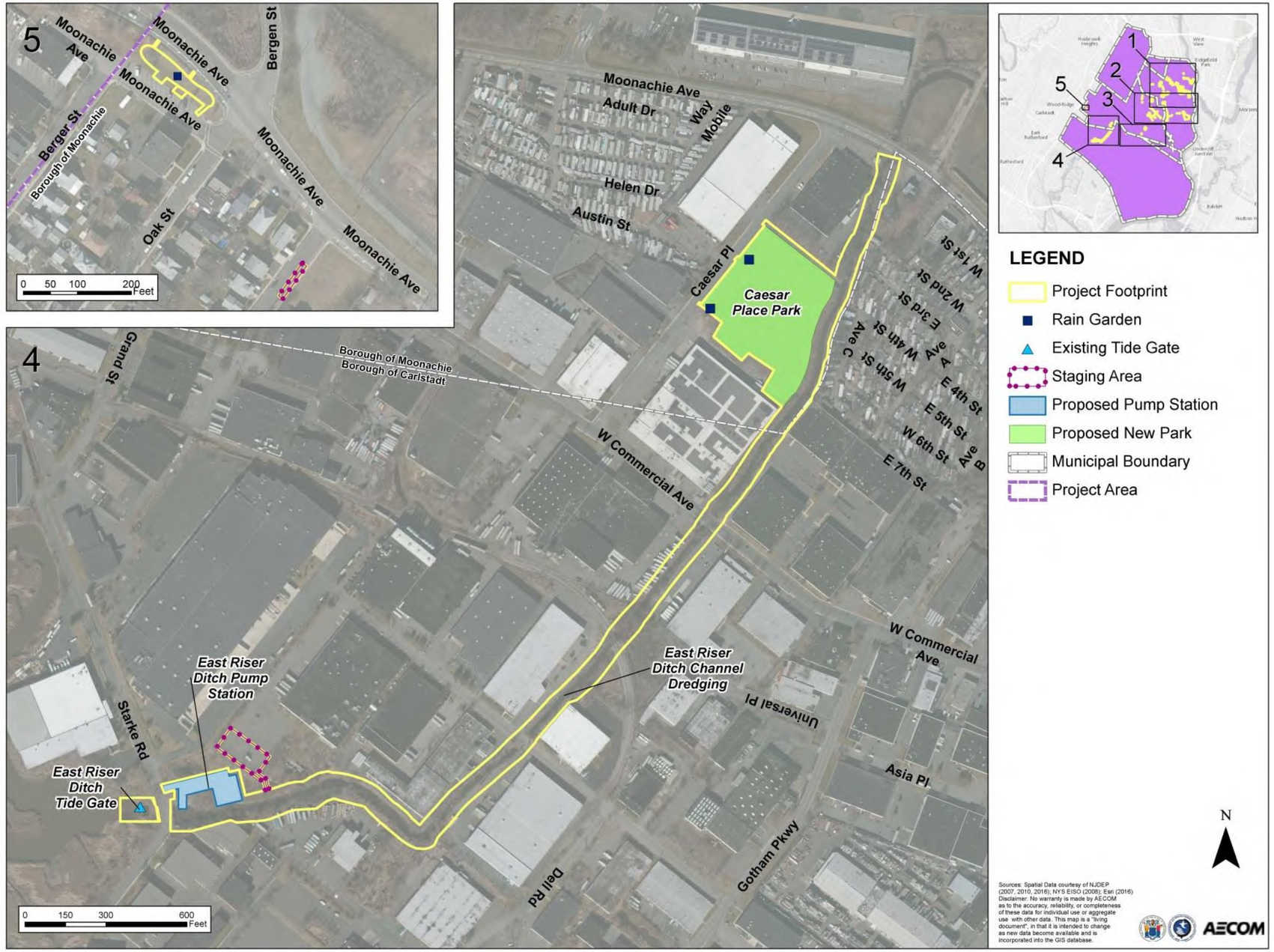
Alternative 1 LOP (Berry's Creek Storm Surge Barrier; Figure 4 of 4)



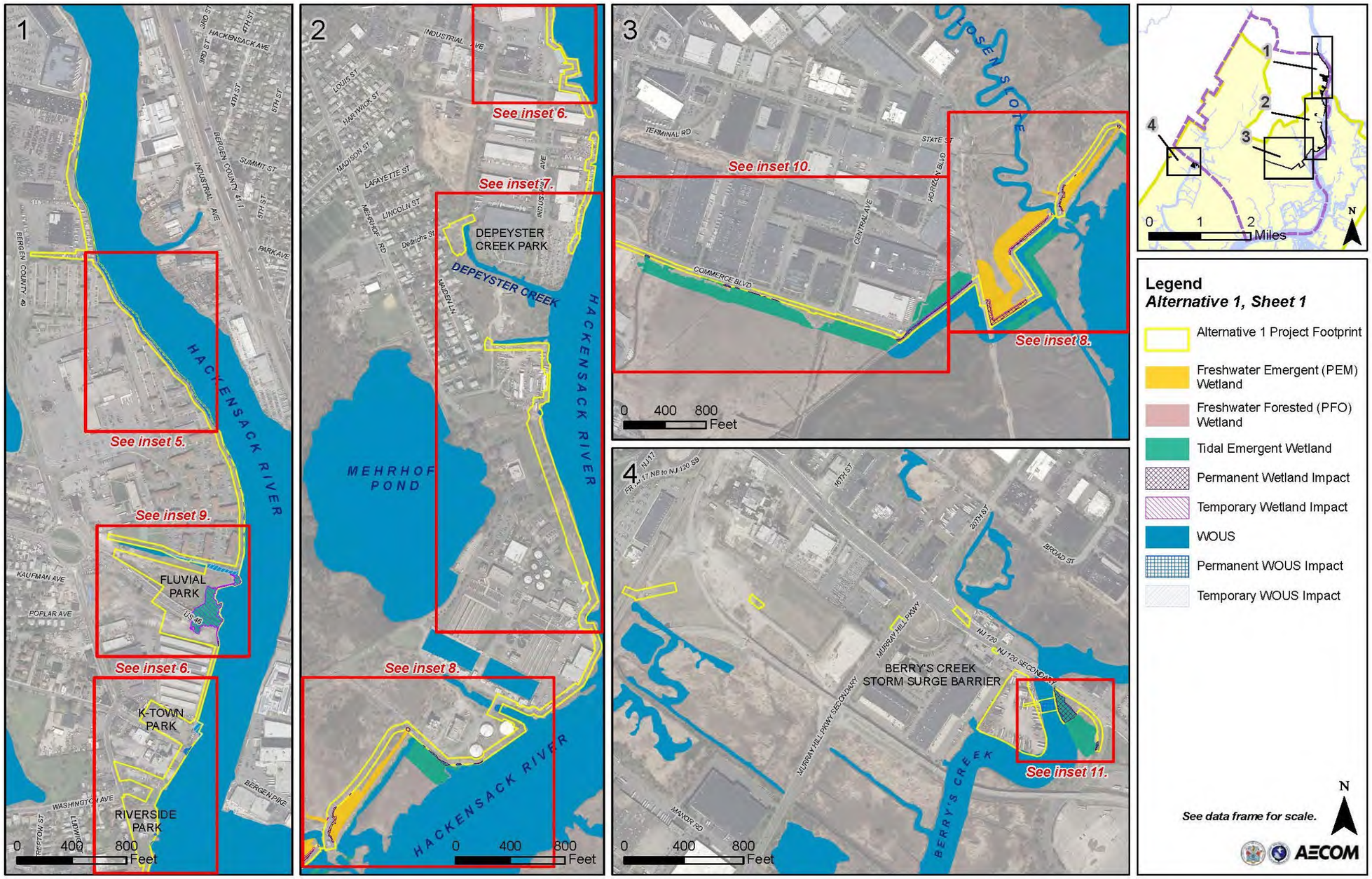
Alternative 2 Components (Figure 1 of 3)



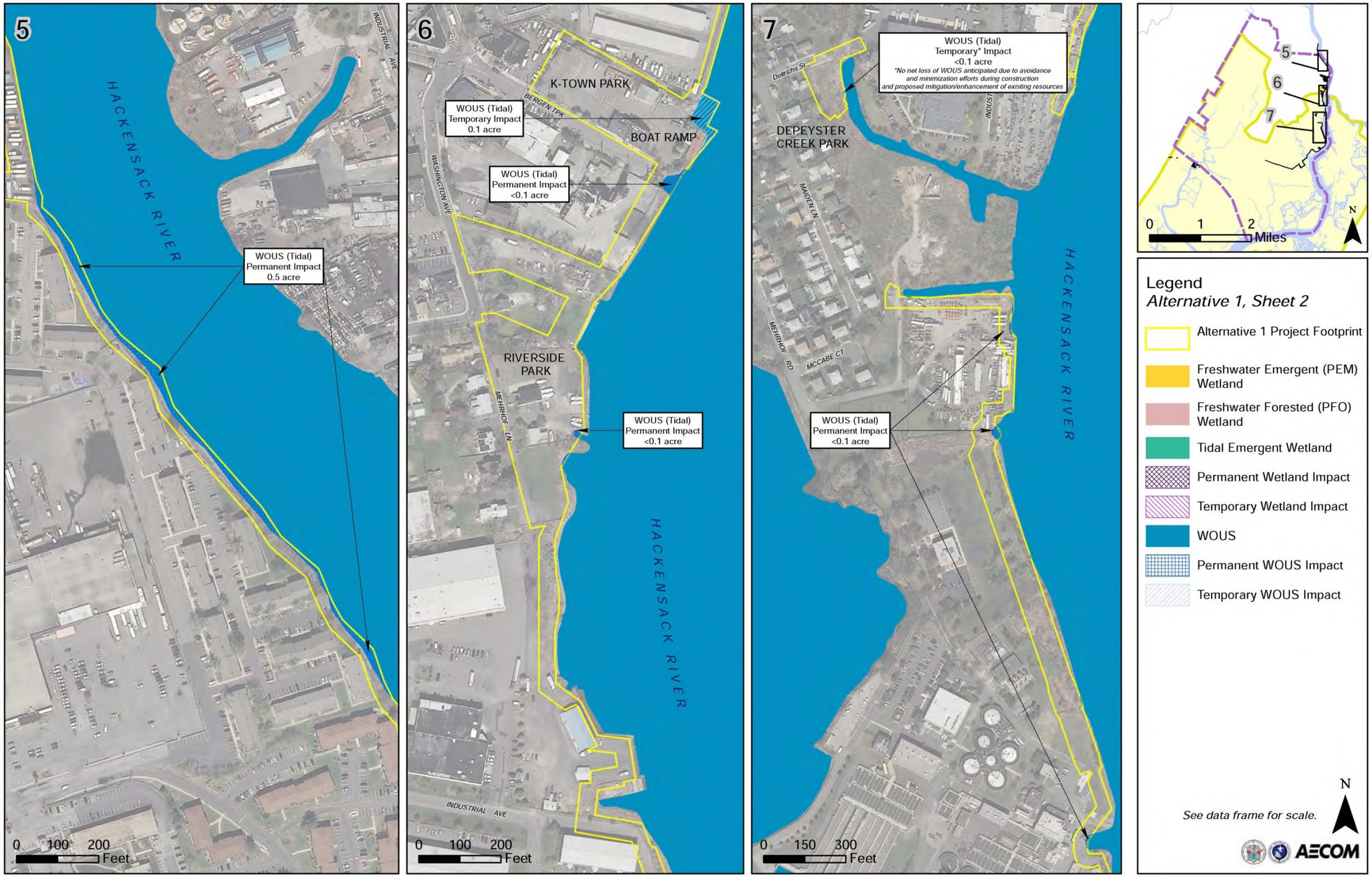
Alternative 2 Components (Figure 2 of 3)



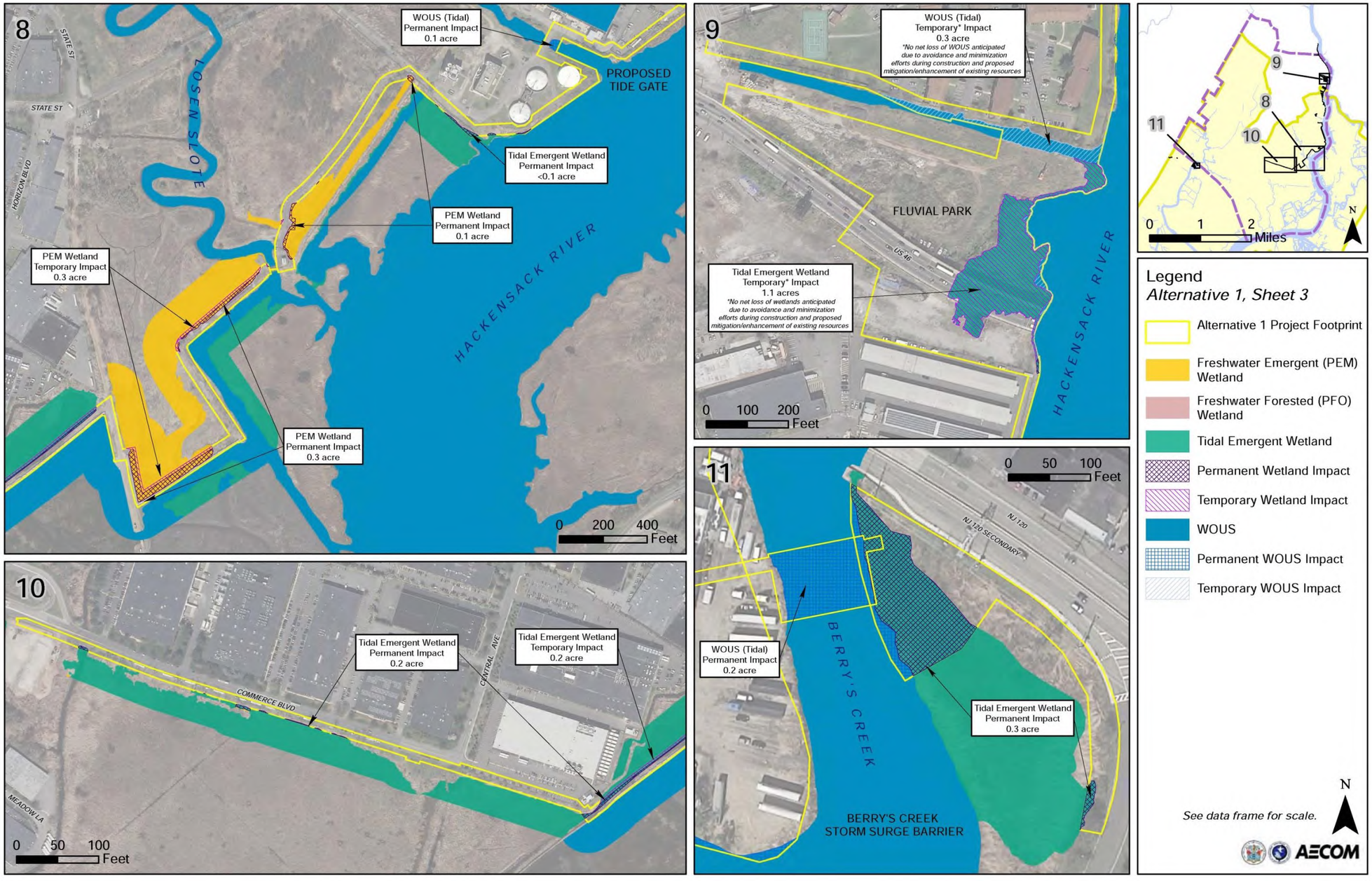
Alternative 2 Components (Figure 3 of 3)



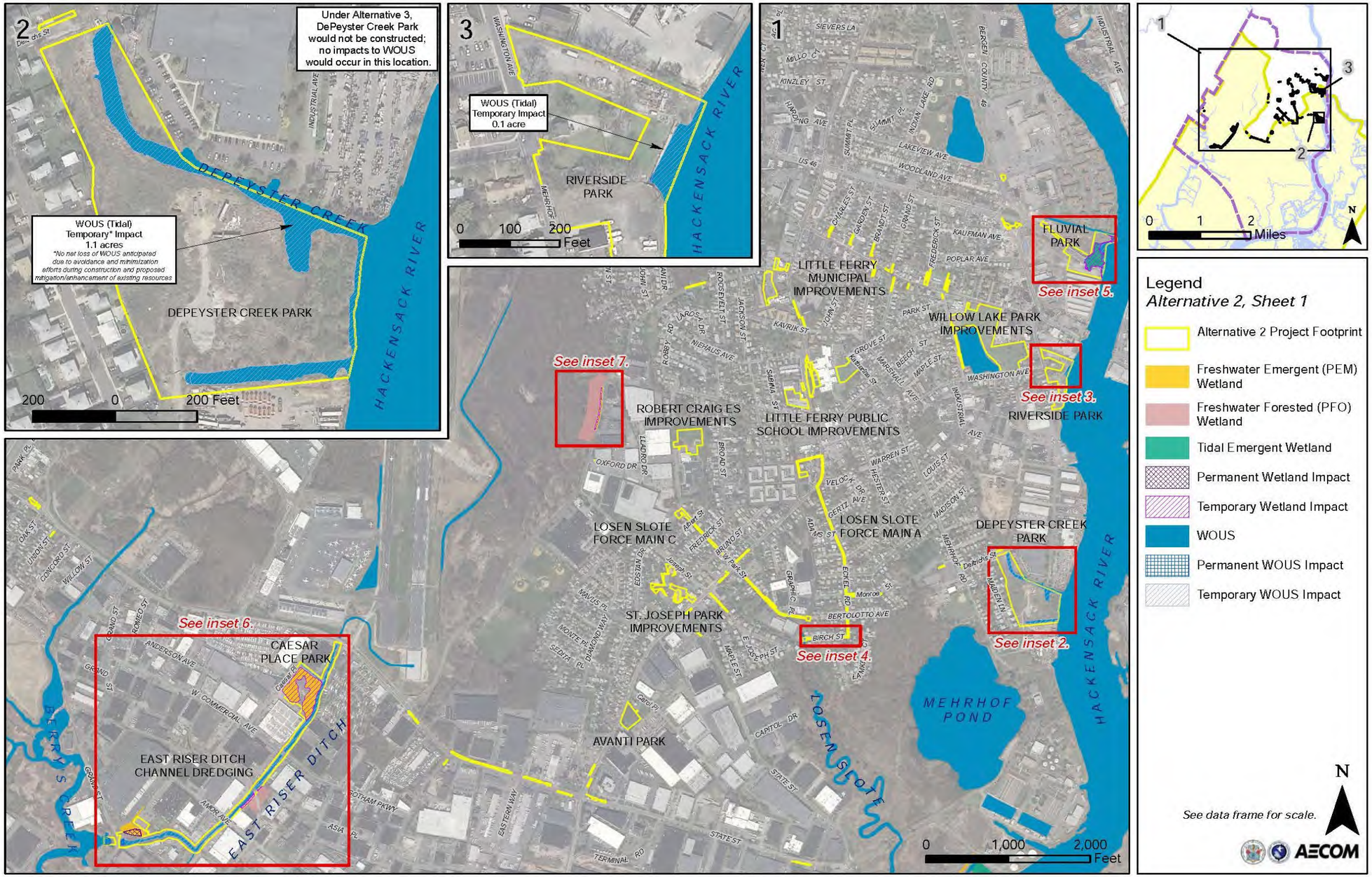
Anticipated Alternative 1 Wetland and WOUS Impacts (Sheet 1)



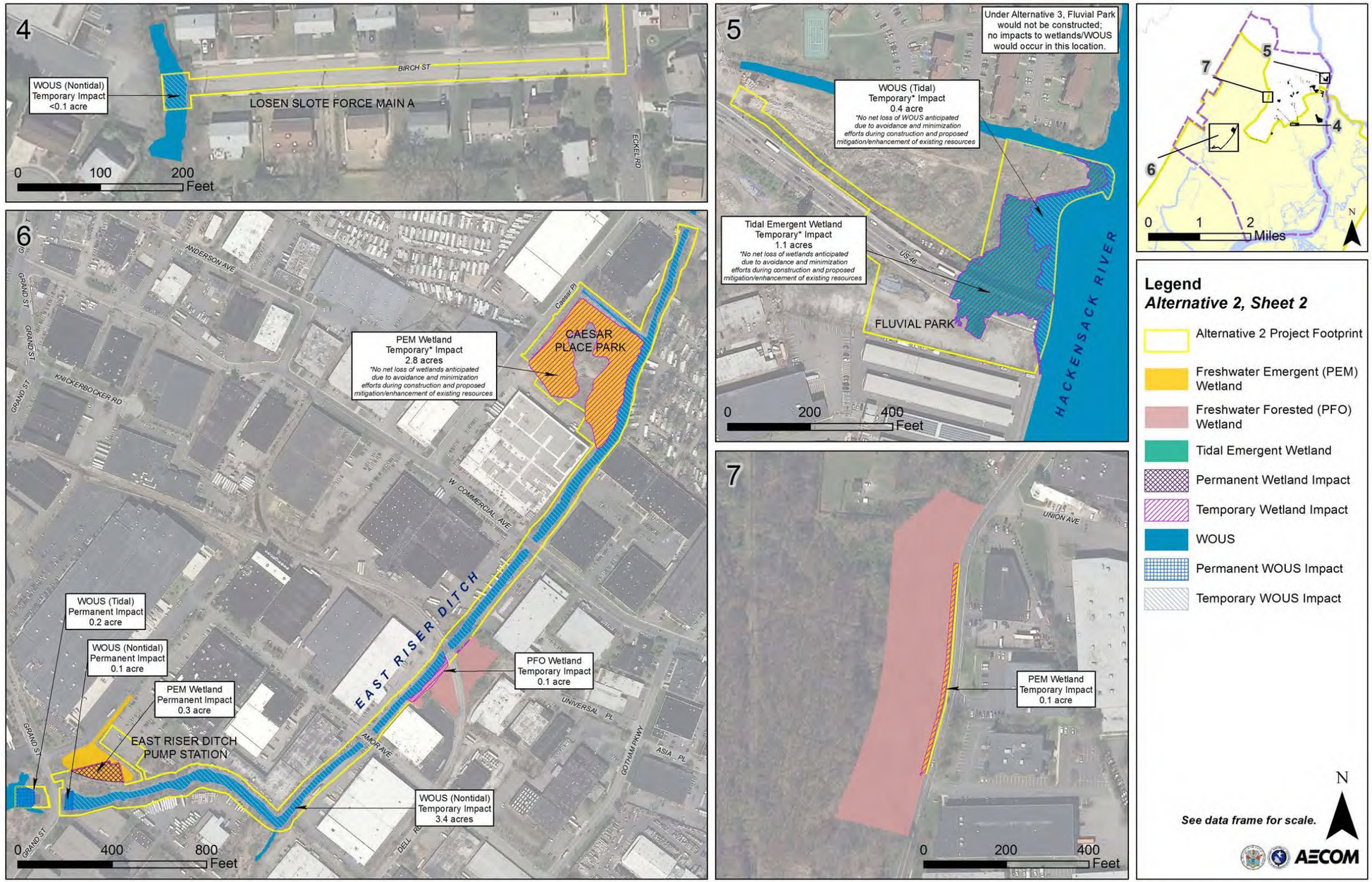
Anticipated Alternative 1 Wetland and WOUS Impacts (Sheet 2)



Anticipated Alternative 1 Wetland and WOUS Impacts (Sheet 3)



Anticipated Alternative 2 and Alternative 3 Wetland and WOUS Impacts (Sheet 1)



Anticipated Alternative 2 and Alternative 3 Wetland and WOUS Impacts (Sheet 2)

Attachment 2: NOAA Essential Fish Habitat Worksheets for Alternatives 1, 2 and 3

This Page has been Intentionally Left Blank.

NOAA FISHERIES
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
Essential Fish Habitat (EFH) Consultation Guidance
EFH ASSESSMENT WORKSHEET

Introduction:

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) mandates that federal agencies conduct an essential fish habitat (EFH) consultation with NOAA Fisheries regarding any of their actions authorized, funded, or undertaken that may adversely affect EFH. An adverse effect means any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

This worksheet has been designed to assist in determining whether a consultation is necessary and in preparing EFH assessments. This worksheet should be used as your EFH assessment or as a guideline for the development of your EFH assessment. At a minimum, all the information required to complete this worksheet should be included in your EFH assessment. If the answers in the worksheet do not fully evaluate the adverse effects to EFH, we may request additional information in order to complete the consultation.

An expanded EFH assessment may be required for more complex projects in order to fully characterize the effects of the project and the avoidance and minimization of impacts to EFH. While the EFH worksheet may be used for larger projects, the format may not be sufficient to incorporate the extent of detail required, and a separate EFH assessment may be developed. However, regardless of format, the analysis outlined in this worksheet should be included for an expanded EFH assessment, along with additional information that may be necessary. This additional information includes:

- the results of on-site inspections to evaluate the habitat and site-specific effects
- the views of recognized experts on the habitat or the species that may be affected
- a review of pertinent literature and related information
- an analysis of alternatives to the action that could avoid or minimize the adverse effects on EFH.

Your analysis of adverse effects to EFH under the MSA should focus on impacts to the habitat for all life stages of species with designated EFH, rather than individual responses of fish species. Fish habitat includes the substrate and benthic resources (e.g., submerged aquatic vegetation, shellfish beds, salt marsh wetlands), as well as the water column and prey species.

Consultation with us may also be necessary if a proposed action results in adverse impacts to other NOAA-trust resources. Part 6 of the worksheet is designed to help assess the effects of the action on other NOAA-trust resources. This helps maintain efficiency in our interagency coordination process. In addition, further consultation may be required if a proposed action impacts marine mammals or threatened and endangered species for which we are responsible. Staff from our Greater Atlantic Regional Fisheries Office, Protected Resources Division should be contacted regarding potential impacts to marine mammals or threatened and endangered species.

Instructions for Use:

Federal agencies must submit an EFH assessment to NOAA Fisheries as part of the EFH consultation. Your EFH assessment must include:

1) A description of the proposed action.
2) An analysis of the potential adverse effects of the action on EFH, and the managed species.
3) The federal agency's conclusions regarding the effects of the action on EFH.
4) Proposed mitigation if applicable.

In order for this worksheet to be considered as your EFH assessment, you must answer the questions in this worksheet fully and with as much detail as available. Give brief explanations for each answer.

Federal action agencies or the non-federal designated lead agency should submit the completed worksheet to NOAA Fisheries Greater Atlantic Regional Fisheries Office, Habitat Conservation Division (HCD) with the public notice or project application. Include project plans showing existing and proposed conditions, all waters of the U.S. on the project site, with mean low water (MLW), mean high water (MHW), high tide line (HTL), and water depths clearly marked and sensitive habitats mapped, including special aquatic sites (submerged aquatic vegetation, saltmarsh, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges), hard bottom habitat areas and shellfish beds, as well as any available site photographs.

For most consultations, NOAA Fisheries has 30 days to provide EFH conservation recommendations once we receive a complete EFH assessment. Submitting all necessary information at once minimizes delays in review and keeps review timelines consistent. Delays in providing a complete EFH assessment can result in our consultation review period extending beyond the public comment period for a particular project.

The information contained on the HCD Consultation website and NOAA's EFH Mapper will assist you in completing this worksheet. Please note that the Mapper is currently being up-dated with new designations and EFH maps and text descriptions for many species are temporarily missing. When you open the Mapper, read the WARNING that pops up when you click on the Greater Atlantic Region. It will direct you to a document with maps and text descriptions for each of the missing New England Species and to the Mapper's Data Inventory where a data layer for all the missing species is available for downloading into GIS software. Once the Mapper is up-dated, you can do a Location Query for your project location, but until then, the only way to easily generate a list of the missing species and life stages is to use your own GIS software. Before you fill out the worksheet, we recommend that you check with the appropriate HCD staff member to ensure that your list is complete and accurate. They will be able to answer any questions that you have.

Also note that a number of new Habitat Areas of Particular Concern (HAPCs) have been designated in the Greater Atlantic Region. HAPC maps will also be added to the Mapper the next time it is up-dated. Currently, they can be viewed by following the instructions on the warning page for the region. We expect the Mapper to be fully up-dated and functional later this spring.

EFH ASSESSMENT WORKSHEET FOR FEDERAL AGENCIES (modified 3/2016)

PROJECT NAME: Rebuild by Design Meadowlands (RBDM) Flood Protection Project

DATE: 08/20/2018

PROJECT NO.: Build Alternative 1 - Structural Flood Reduction

LOCATION (Water body, county, physical address):

Hackensack River; Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack; Bergen County, New Jersey

PREPARER: AECOM

Step 1: Use NOAA's EFH Mapper to generate the list of designated EFH for federally-managed species and life stages for the geographic area of interest. Use this list as part of the initial screening process to determine if EFH for those species occurs in the vicinity of the proposed action. The list can be included as an attachment to the worksheet. Make a preliminary determination on the need to conduct an EFH consultation.

1. INITIAL CONSIDERATIONS

EFH Designations	Yes	No
Is the action located in or adjacent to EFH designated for eggs? **List the species:** Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS).	✓	
Is the action located in or adjacent to EFH designated for larvae? **List the species:** Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS).	✓	
Is the action located in or adjacent to EFH designated for juveniles? **List the species:** Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS).	✓	

Is the action located in or adjacent to EFH designated for adults or spawning adults? List the species: Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS).	✓	

If you answered 'no' to all questions above, then an EFH consultation is not required - go to Section 5.

If you answered 'yes' to any of the above questions, proceed to Section 2 and complete the remainder of the worksheet.

Step 2: In order to assess impacts, it is critical to know the habitat characteristics of the site before the activity is undertaken. Use existing information, to the extent possible, in answering these questions. Identify the sources of the information provided and provide as much description as available. These should not be yes or no answers. Please note that there may be circumstances in which new information must be collected to appropriately characterize the site and assess impacts. Project plans that show the location and extent of sensitive habitats, as well as water depths, the HTL, MHW and MLW should be provided.

2. SITE CHARACTERISTICS

Site Characteristics	Description
Is the site intertidal, sub-tidal, or water column?	The Project Area is intertidal and subtidal.
What are the sediment characteristics?	The sediment is predominantly fine grained materials and sand. Contaminants are present, attributable to urban runoff and the Superfund sites in Project Area. Additional details are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Is there submerged aquatic vegetation (SAV) at or adjacent to project site? If so describe the SAV species and spatial extent.	No.
Are there wetlands present on or adjacent to the site? If so, describe the spatial extent and vegetation types.	Yes, intertidal wetlands primarily dominated by common reed (Phragmites sp.) are present in the Project Area. Additionally, some of the wetland mitigation bank areas in the Project Area have been restored with native salt marsh vegetation. Additional details are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS), and spatial extent is provided in the RBDM EIS.

Is there shellfish present at or adjacent to the project site? If so, please describe the spatial extent and species present.	Yes, blue mussel (Mytilus edulis), soft-shell clam (Mya arenaria), and eastern oyster (Crassostrea virginica) are present in the Project Area; however, the spatial extent is not known. Additional details are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS) and the Biological Resources Survey Report (Appendix J in the RBDM EIS).
Are there mudflats present at or adjacent to the project site? If so please describe the spatial extent.	Mudflats are present at the Kane Mitigation Bank (an existing restoration/preservation/mitigation site within the Township of South Hackensack and Borough of Carlstadt) during low tide, but are not characteristically found throughout the Project Area.
Is there rocky or cobble bottom habitat present at or adjacent to the project site? If so, please describe the spatial extent.	Rocky or cobble bottom habitat is not expected in the Project Area.
Is Habitat Area of Particular Concern (HAPC) designated at or near the site? If so for which species, what type habitat type, size, characteristics?	No.
What is the typical salinity, depth and water temperature regime/range?	Salinity in the Project Area is consistent with a mixing water/brackish salinity zone (0.5 ppt - 25.0 ppt). Based on navigation charts, water depths in the Project Area range from zero along edge of rivers and creeks to a maximum of 25 feet in-channel, with typical depths ranging from 10 to 15 feet. Water temperatures in the Project Area vary seasonally from approximately 32 to 70 degrees Fahrenheit.
What is the normal frequency of site disturbance, both natural and man-made?	The Project Area is characteristic of an urban estuary that experiences frequent human use and disturbance. Natural disturbance, mainly attributable to flooding, occurs periodically and infrequently.
What is the area of proposed impact (work footprint & far afield)?	Figures depicting disturbance areas and locations are provided in the RBDM EIS and the EFH Assessment Report (Appendix Q in the RBDM EIS).

Step 3: This section is used to describe the anticipated impacts from the proposed action on the physical/chemical/biological environment at the project site and areas adjacent to the site that may be affected.

3. DESCRIPTION OF IMPACTS

Impacts	Y	N	Description
Nature and duration of activity(s). Clearly describe the activities proposed and the duration of any disturbances.			Detailed descriptions of in-water activities are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Will the benthic community be disturbed? If no, why not? If yes, describe in detail how the benthos will be impacted.	✓		There would be a minimal footprint of impact to the benthic community; temporary and permanent actions would impact approximately 1.5 acres of tidal water and 1.9 acres of tidal wetlands total. Additional details are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Will SAV be impacted? If no, why not? If yes, describe in detail how the SAV will be impacted. Consider both direct and indirect impacts. Provide details of any SAV survey conducted at the site.		✓	No.
Will salt marsh habitat be impacted? If no, why not? If yes, describe in detail how wetlands will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?	✓		Approximately 0.6 acre of salt marsh habitat would be permanently impacted and 1.3 acres would be temporarily impacted. The dominant vegetation in the salt marsh habitat of the Project Area is common reed.

Will mudflat habitat be impacted? If no, why not? If yes, describe in detail how mudflats will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?	✓		A limited area of mudflat habitat along the shoreline of creeks and rivers would be impacted.
Will shellfish habitat be impacted? If so, provide in detail how the shellfish habitat will be impacted. What is the aerial extent of the impact? Provide details of any shellfish survey conducted at the site.	✓		A limited area of shellfish habitat would be impacted.
Will hard bottom (rocky, cobble, gravel) habitat be impacted at the site? If so, provide in detail how the hard bottom will be impacted. What is the aerial extent of the impact?		✓	No.
Will sediments be altered and/or sedimentation rates change? If no, why not? If yes, describe how.	✓		Sedimentation rates would be reduced, particularly in Berry's Creek where shear stresses would be reduced. Additional details are provided in the Sediment Scour and Deposition Analysis (Appendix I of the RBDM EIS).
Will turbidity increase? If no, why not? If yes, describe the causes, the extent of the effects, and the duration.	✓		Temporary increases in turbidity would be expected during construction and would be minimized thorough use of best management practices (BMPs). There would be no long-term increases in turbidity.

Will water depth change? What are the current and proposed depths?	☐	☑	No.
Will contaminants be released into sediments or water column? If yes, describe the nature of the contaminants and the extent of the effects.	☐	☑	No. Based on the Sediment Scour and Deposition Analysis (Appendix I of the RBDM EIS), sheer stresses in Berry's Creek would be reduced with Alternative 1.
Will tidal flow, currents, or wave patterns be altered? If no, why not? If yes, describe in detail how.	☐	☑	No.
Will water quality be altered? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration of the impact.	☑	☐	There would be short-term, minor impacts to water quality during construction. However, there would be long-term improvements to water quality due to habitat improvements and reductions in the floodwater transport of debris and contaminants.
Will ambient noise levels change? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration and degree of impact.	☑	☐	There would be short-term, temporary increases to noise levels during construction; however, there would be no permanent changes to noise levels near aquatic habitats.
Does the action have the potential to impact prey species of federally managed fish with EFH designations?	☑	☐	There would be a potential to impact the applicable prey species temporarily during construction and permanently through habitat loss; however, the permanent impact to aquatic habitat, including wetlands, would be small (1.6 acres).

Step 4: This section is used to evaluate the consequences of the proposed action on the functions and values of EFH as well as the vulnerability of the EFH species and their life stages. Identify which species (from the list generated in Step 1) will be adversely impacted from the action. Assessment of EFH impacts should be based upon the site characteristics identified in Step 2 and the nature of the impacts described within Step 3. NOAA's EFH Mapper should be used during this assessment to determine the ecological parameters/ preferences associated with each species listed and the potential impact to those parameters.

4. EFH ASSESSMENT

Functions and Values	Y	N	Describe habitat type, species and life stages to be adversely impacted
Will functions and values of EFH be impacted for:			
Spawning **If yes, describe in detail how, and for which species. Describe how adverse effects will be avoided and minimized.**	✓		With the implementation of BMPs and the seasonal restrictions to avoid and minimize impacts, there would be little to no adverse impact to managed fish species during spawning. Therefore, Alternative 1 may affect, but is unlikely to adversely affect, managed species during spawning. A species list is provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Nursery **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**	✓		Most of the tidal marsh that would be disturbed or lost during construction is dominated by common reed and provides very limited function as nursery habitat for juvenile fishes. Adverse impacts would be avoided to the extent practicable during design. Further, impacts would be minimized through use of BMPs to control sedimentation and maintain water quality during construction. Alternative 1 may affect, and is likely to adversely affect, nursery habitat for EFH or applicable prey species. A species list is provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Forage **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**	✓		Adverse impacts would be avoided to the extent practicable during design. Additionally, impacts would be minimized through use of BMPs to control sedimentation and maintain water quality during construction, and through the appropriate seasonal restrictions on in-water activities and activities that may affect water quality. Alternative 1 may affect, but is unlikely to adversely affect, managed species during foraging. A species list and a description of in-water activities is provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Shelter **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**		✓	No.

Will impacts be temporary or permanent? Please indicate in description box and describe the duration of the impacts.			Impacts would be both temporary and permanent. Further details are provided in Table 3.1 of the EFH Assessment Report (Appendix Q in the RBDM EIS).
Will compensatory mitigation be used? If no, why not? Describe plans for mitigation and how this will offset impacts to EFH. Include a conceptual compensatory mitigation plan, if applicable.	✓		Alternative 1 includes habitat restoration and the enhancement of wetlands. Additional compensatory mitigation, if required, would be developed during the design phase.

Step 5: This section provides the federal agency's determination on the degree of impact to EFH from the proposed action. The EFH determination also dictates the type of EFH consultation that will be required with NOAA Fisheries.

Please note: if information provided in the worksheet is insufficient to allow NOAA Fisheries to complete the EFH consultation additional information will be requested.

5. DETERMINATION OF IMPACT

Federal Agency's EFH Determination		
Overall degree of adverse effects on EFH (not including compensatory mitigation) will be: **(check the appropriate statement)**		**There is no adverse effect on EFH or no EFH is designated at the project site.** **EFH Consultation is not required.**
	✓	**The adverse effect on EFH is not substantial. This means that the adverse effects are either no more than minimal, temporary, or that they can be alleviated with minor project modifications or conservation recommendations.** **This is a request for an abbreviated EFH consultation.**
		The adverse effect on EFH is substantial. **This is a request for an expanded EFH consultation.**

Step 6: Consultation with NOAA Fisheries may also be required if the proposed action results in adverse impacts to other NOAA-trust resources, such as anadromous fish, shellfish, crustaceans, or their habitats as part of the Fish and Wildlife Coordination Act Some examples of other NOAA-trust resources are listed below. Inquiries regarding potential impacts to marine mammals or threatened/endangered species should be directed to NOAA Fisheries' Protected Resources Division.

6. OTHER NOAA-TRUST RESOURCES IMPACT ASSESSMENT

Species known to occur at site (list others that may apply)	Describe habitat impact type (i.e., physical, chemical, or biological disruption of spawning and/or egg development habitat, juvenile nursery and/or adult feeding or migration habitat). Please note, impacts to federally listed species of fish, sea turtles, and marine mammals must be coordinated with the GARFO Protected Resources Division.
alewife	Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS) for the assessment of impacts to NOAA Trust Resources species.
American eel	
American shad	
Atlantic menhaden	
blue crab	
blue mussel	
blueback herring	

Eastern oyster	
horseshoe crab	
quahog	
soft-shell clams	
striped bass	
other species:	

Useful Links

National Wetland Inventory Maps

EPA’s National Estuaries Program

Northeast Regional Ocean Council (NROC) Data

Mid-Atlantic Regional Council on the Ocean (MARCO) Data

Resources by State:

Maine
Eelgrass maps

Maine Office of GIS Data Catalog

Casco Bay Estuary Partnership

Maine GIS Stream Habitat Viewer

New Hampshire
New Hampshire's Statewide GIS Clearinghouse, NH GRANIT

New Hampshire Coastal Viewer

Massachusetts
Eelgrass maps

MADMF Recommended Time of Year Restrictions Document

Massachusetts Bays National Estuary Program

Buzzards Bay National Estuary Program

Massachusetts Division of Marine Fisheries

Massachusetts Office of Coastal Zone Management

Rhode Island
Eelgrass maps

Narraganset Bay Estuary Program

Rhode Island Division of Marine Fisheries

Rhode Island Coastal Resources Management Council

Connecticut

Eelgrass Maps

Long Island Sound Study

CT GIS Resources

CT DEEP Office of Long Island Sound Programs and Fisheries

CT Bureau of Aquaculture Shellfish

Maps CT River Watershed Council

New York

Eelgrass report

Peconic Estuary Program

NY/NJ Harbor Estuary

New Jersey

Submerged Aquatic Vegetation mapping

Barnegat Bay Partnership

Delaware

Partnership for the Delaware Estuary

Center for Delaware Inland Bays

Maryland

Submerged Aquatic Vegetation mapping

MERLIN

Maryland Coastal Bays Program

Virginia

Submerged Aquatic Vegetation mapping

NOAA FISHERIES
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
Essential Fish Habitat (EFH) Consultation Guidance
EFH ASSESSMENT WORKSHEET

Introduction:

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) mandates that federal agencies conduct an essential fish habitat (EFH) consultation with NOAA Fisheries regarding any of their actions authorized, funded, or undertaken that may adversely affect EFH. An adverse effect means any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

This worksheet has been designed to assist in determining whether a consultation is necessary and in preparing EFH assessments. This worksheet should be used as your EFH assessment or as a guideline for the development of your EFH assessment. At a minimum, all the information required to complete this worksheet should be included in your EFH assessment. If the answers in the worksheet do not fully evaluate the adverse effects to EFH, we may request additional information in order to complete the consultation.

An expanded EFH assessment may be required for more complex projects in order to fully characterize the effects of the project and the avoidance and minimization of impacts to EFH. While the EFH worksheet may be used for larger projects, the format may not be sufficient to incorporate the extent of detail required, and a separate EFH assessment may be developed. However, regardless of format, the analysis outlined in this worksheet should be included for an expanded EFH assessment, along with additional information that may be necessary. This additional information includes:

- the results of on-site inspections to evaluate the habitat and site-specific effects
- the views of recognized experts on the habitat or the species that may be affected
- a review of pertinent literature and related information
- an analysis of alternatives to the action that could avoid or minimize the adverse effects on EFH.

Your analysis of adverse effects to EFH under the MSA should focus on impacts to the habitat for all life stages of species with designated EFH, rather than individual responses of fish species. Fish habitat includes the substrate and benthic resources (e.g., submerged aquatic vegetation, shellfish beds, salt marsh wetlands), as well as the water column and prey species.

Consultation with us may also be necessary if a proposed action results in adverse impacts to other NOAA-trust resources. Part 6 of the worksheet is designed to help assess the effects of the action on other NOAA-trust resources. This helps maintain efficiency in our interagency coordination process. In addition, further consultation may be required if a proposed action impacts marine mammals or threatened and endangered species for which we are responsible. Staff from our Greater Atlantic Regional Fisheries Office, Protected Resources Division should be contacted regarding potential impacts to marine mammals or threatened and endangered species.

Instructions for Use:

Federal agencies must submit an EFH assessment to NOAA Fisheries as part of the EFH consultation. Your EFH assessment must include:

1) A description of the proposed action.
2) An analysis of the potential adverse effects of the action on EFH, and the managed species.
3) The federal agency's conclusions regarding the effects of the action on EFH.
4) Proposed mitigation if applicable.

In order for this worksheet to be considered as your EFH assessment, you must answer the questions in this worksheet fully and with as much detail as available. Give brief explanations for each answer.

Federal action agencies or the non-federal designated lead agency should submit the completed worksheet to NOAA Fisheries Greater Atlantic Regional Fisheries Office, Habitat Conservation Division (HCD) with the public notice or project application. Include project plans showing existing and proposed conditions, all waters of the U.S. on the project site, with mean low water (MLW), mean high water (MHW), high tide line (HTL), and water depths clearly marked and sensitive habitats mapped, including special aquatic sites (submerged aquatic vegetation, saltmarsh, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges), hard bottom habitat areas and shellfish beds, as well as any available site photographs.

For most consultations, NOAA Fisheries has 30 days to provide EFH conservation recommendations once we receive a complete EFH assessment. Submitting all necessary information at once minimizes delays in review and keeps review timelines consistent. Delays in providing a complete EFH assessment can result in our consultation review period extending beyond the public comment period for a particular project.

The information contained on the HCD Consultation website and NOAA's EFH Mapper will assist you in completing this worksheet. Please note that the Mapper is currently being up-dated with new designations and EFH maps and text descriptions for many species are temporarily missing. When you open the Mapper, read the WARNING that pops up when you click on the Greater Atlantic Region. It will direct you to a document with maps and text descriptions for each of the missing New England Species and to the Mapper's Data Inventory where a data layer for all the missing species is available for downloading into GIS software. Once the Mapper is up-dated, you can do a Location Query for your project location, but until then, the only way to easily generate a list of the missing species and life stages is to use your own GIS software. Before you fill out the worksheet, we recommend that you check with the appropriate HCD staff member to ensure that your list is complete and accurate. They will be able to answer any questions that you have.

Also note that a number of new Habitat Areas of Particular Concern (HAPCs) have been designated in the Greater Atlantic Region. HAPC maps will also be added to the Mapper the next time it is up-dated. Currently, they can be viewed by following the instructions on the warning page for the region. We expect the Mapper to be fully up-dated and functional later this spring.

EFH ASSESSMENT WORKSHEET FOR FEDERAL AGENCIES (modified 3/2016)

PROJECT NAME: Rebuild by Design - Meadowlands Flood Protection Project

DATE: 08/20/2018

PROJECT NO.: Build Alternative 2 = Stormwater Drainage Improvements

LOCATION (Water body, county, physical address):

Hackensack River; Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack; Bergen County, New Jersey

PREPARER: AECOM

Step 1: Use NOAA's EFH Mapper to generate the list of designated EFH for federally-managed species and life stages for the geographic area of interest. Use this list as part of the initial screening process to determine if EFH for those species occurs in the vicinity of the proposed action. The list can be included as an attachment to the worksheet. Make a preliminary determination on the need to conduct an EFH consultation.

1. INITIAL CONSIDERATIONS

EFH Designations	Yes	No
Is the action located in or adjacent to EFH designated for eggs? **List the species:** Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS).	✓	
Is the action located in or adjacent to EFH designated for larvae? **List the species:** Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS).	✓	
Is the action located in or adjacent to EFH designated for juveniles? **List the species:** Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS).	✓	

Is the action located in or adjacent to EFH designated for adults or spawning adults? List the species: Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS).	✓	

If you answered 'no' to all questions above, then an EFH consultation is not required - go to Section 5.

If you answered 'yes' to any of the above questions, proceed to Section 2 and complete the remainder of the worksheet.

Step 2: In order to assess impacts, it is critical to know the habitat characteristics of the site before the activity is undertaken. Use existing information, to the extent possible, in answering these questions. Identify the sources of the information provided and provide as much description as available. These should not be yes or no answers. Please note that there may be circumstances in which new information must be collected to appropriately characterize the site and assess impacts. Project plans that show the location and extent of sensitive habitats, as well as water depths, the HTL, MHW and MLW should be provided.

2. SITE CHARACTERISTICS

Site Characteristics	Description
Is the site intertidal, sub-tidal, or water column?	The Project Area is intertidal and subtidal.
What are the sediment characteristics?	The sediment is predominantly fine grained materials and sand. Contaminants are present, attributable to urban runoff and the Superfund sites in Project Area. Additional details are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Is there submerged aquatic vegetation (SAV) at or adjacent to project site? If so describe the SAV species and spatial extent.	No.
Are there wetlands present on or adjacent to the site? If so, describe the spatial extent and vegetation types.	Yes, intertidal wetlands primarily dominated by common reed (Phragmites sp.) are present in the Project Area. Additionally, some of the wetland mitigation bank areas in the Project Area have been restored with native salt marsh vegetation. Additional details are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS), and spatial extent is provided in the RBDM EIS.

Is there shellfish present at or adjacent to the project site? If so, please describe the spatial extent and species present.	Yes, blue mussel (Mytilus edulis), soft-shell clam (Mya arenaria), and eastern oyster (Crassostrea virginica) are present in the Project Area; however, the spatial extent is not known. Additional details are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS) and the Biological Resources Survey Report (Appendix J in the RBDM EIS).
Are there mudflats present at or adjacent to the project site? If so please describe the spatial extent.	Mudflats are present at the Kane Mitigation Bank (an existing restoration/preservation/mitigation site within the Township of South Hackensack and Borough of Carlstadt) during low tide, but are not characteristically found throughout the Project Area.
Is there rocky or cobble bottom habitat present at or adjacent to the project site? If so, please describe the spatial extent.	Rocky or cobble bottom habitat is not expected in the Project Area.
Is Habitat Area of Particular Concern (HAPC) designated at or near the site? If so for which species, what type habitat type, size, characteristics?	No.
What is the typical salinity, depth and water temperature regime/range?	Salinity in the Project Area is consistent with a mixing water/brackish salinity zone (0.5 ppt - 25.0 ppt). Based on navigation charts, water depths in the Project Area range from zero along edge of rivers and creeks to a maximum of 25 feet in-channel, with typical depths ranging from 10 to 15 feet. Water temperatures in the Project Area vary seasonally from approximately 32 to 70 degrees Fahrenheit.
What is the normal frequency of site disturbance, both natural and man-made?	The Project Area is characteristic of an urban estuary that experiences frequent human use and disturbance. Natural disturbance, mainly attributable to flooding, occurs periodically and infrequently.
What is the area of proposed impact (work footprint & far afield)?	Figures depicting disturbance areas and locations are provided in the RBDM EIS and the EFH Assessment Report (Appendix Q in the RBDM EIS).

Step 3: This section is used to describe the anticipated impacts from the proposed action on the physical/chemical/biological environment at the project site and areas adjacent to the site that may be affected.

3. DESCRIPTION OF IMPACTS

Impacts	Y	N	Description
Nature and duration of activity(s). Clearly describe the activities proposed and the duration of any disturbances.			Detailed descriptions of in-water activities are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Will the benthic community be disturbed? If no, why not? If yes, describe in detail how the benthos will be impacted.	✓		There would be a minimal footprint of impact to the benthic community; temporary and permanent actions would impact approximately 1.9 acres of tidal water and 1.1 acres of tidal wetlands total. Additional details are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Will SAV be impacted? If no, why not? If yes, describe in detail how the SAV will be impacted. Consider both direct and indirect impacts. Provide details of any SAV survey conducted at the site.		✓	No.
Will salt marsh habitat be impacted? If no, why not? If yes, describe in detail how wetlands will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?	✓		Approximately 1.1 acres of salt marsh habitat would be temporarily impacted; however, there would be no permanent impact to salt marsh habitat. The dominant vegetation in the salt marsh habitat of the Project Area is common reed.

Will mudflat habitat be impacted? If no, why not? If yes, describe in detail how mudflats will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?	✓		A limited area of mudflat habitat along the shoreline of creeks and rivers would be impacted.
Will shellfish habitat be impacted? If so, provide in detail how the shellfish habitat will be impacted. What is the aerial extent of the impact? Provide details of any shellfish survey conducted at the site.	✓		A limited area of shellfish habitat would be impacted.
Will hard bottom (rocky, cobble, gravel) habitat be impacted at the site? If so, provide in detail how the hard bottom will be impacted. What is the aerial extent of the impact?		✓	No.
Will sediments be altered and/or sedimentation rates change? If no, why not? If yes, describe how.	✓		Sedimentation rates would be reduced, particularly in Berry's Creek where shear stresses would be reduced. Additional details are provided in the Sediment Scour and Deposition Analysis (Appendix I of the RBDM EIS).
Will turbidity increase? If no, why not? If yes, describe the causes, the extent of the effects, and the duration.	✓		Temporary increases in turbidity would be expected during construction and would be minimized thorough use of best management practices (BMPs). There would be no long-term increases in turbidity.

Will water depth change? What are the current and proposed depths?	☐	☑	No.
Will contaminants be released into sediments or water column? If yes, describe the nature of the contaminants and the extent of the effects.	☐	☑	No, based on the Sediment Scour and Deposition Analysis (Appendix I of the RBDM EIS).
Will tidal flow, currents, or wave patterns be altered? If no, why not? If yes, describe in detail how.	☐	☑	No.
Will water quality be altered? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration of the impact.	☑	☐	There would be short-term, minor impacts to water quality during construction. However, there would be long-term improvements to water quality due to habitat improvements and reductions in the floodwater transport of debris and contaminants.
Will ambient noise levels change? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration and degree of impact.	☑	☐	There would be short-term, temporary increases to noise levels during construction; however, there would be no permanent changes to noise levels near aquatic habitats.
Does the action have the potential to impact prey species of federally managed fish with EFH designations?	☑	☐	There would be a potential to impact the applicable prey species temporarily during construction and permanently through habitat loss; however, the permanent impact to aquatic habitat, including wetlands, would be small (0.2 acre).

Step 4: This section is used to evaluate the consequences of the proposed action on the functions and values of EFH as well as the vulnerability of the EFH species and their life stages. Identify which species (from the list generated in Step 1) will be adversely impacted from the action. Assessment of EFH impacts should be based upon the site characteristics identified in Step 2 and the nature of the impacts described within Step 3. NOAA's EFH Mapper should be used during this assessment to determine the ecological parameters/ preferences associated with each species listed and the potential impact to those parameters.

4. EFH ASSESSMENT

Functions and Values	Y	N	Describe habitat type, species and life stages to be adversely impacted
Will functions and values of EFH be impacted for:			
Spawning **If yes, describe in detail how, and for which species. Describe how adverse effects will be avoided and minimized.**	✓		With the implementation of BMPs and the seasonal restrictions to avoid and minimize impacts, there would be little to no adverse impact to managed fish species during spawning. Therefore, Alternative 2 may affect, but is unlikely to adversely affect, managed species during spawning. A species list is provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Nursery **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**	✓		Most of the tidal marsh that would be disturbed or lost during construction is dominated by common reed and provides very limited function as nursery habitat for juvenile fishes. Adverse impacts would be avoided to the extent practicable during design. Further, impacts would be minimized through use of BMPs to control sedimentation and maintain water quality during construction. Alternative 2 may affect, and is likely to adversely affect, nursery habitat for EFH or applicable prey species. A species list is provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Forage **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**	✓		Adverse impacts would be avoided to the extent practicable during design. Additionally, impacts would be minimized through use of BMPs to control sedimentation and maintain water quality during construction, and through the appropriate seasonal restrictions on in-water activities and activities that may affect water quality. Alternative 2 would not likely adversely effect managed species during foraging. A species list and a description of in-water activities is provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Shelter **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**		✓	No.

Will impacts be temporary or permanent? Please indicate in description box and describe the duration of the impacts.			Impacts would be both temporary and permanent. Further details are provided in Table 3.2 of the EFH Assessment Report (Appendix Q in the RBDM EIS).
Will compensatory mitigation be used? If no, why not? Describe plans for mitigation and how this will offset impacts to EFH. Include a conceptual compensatory mitigation plan, if applicable.	✓		Alternative 2 includes habitat restoration and the enhancement of wetlands. Additional compensatory mitigation, if required, would be developed during the design phase.

<u>Step 5</u>: This section provides the federal agency's determination on the degree of impact to EFH from the proposed action. The EFH determination also dictates the type of EFH consultation that will be required with NOAA Fisheries.

Please note: if information provided in the worksheet is insufficient to allow NOAA Fisheries to complete the EFH consultation additional information will be requested.

5. DETERMINATION OF IMPACT

Federal Agency's EFH Determination		
Overall degree of adverse effects on EFH (not including compensatory mitigation) will be: **(check the appropriate statement)**		**There is no adverse effect on EFH or no EFH is designated at the project site.** **EFH Consultation is not required.**
	✓	**The adverse effect on EFH is not substantial. This means that the adverse effects are either no more than minimal, temporary, or that they can be alleviated with minor project modifications or conservation recommendations.** **This is a request for an abbreviated EFH consultation.**
		The adverse effect on EFH is substantial. **This is a request for an expanded EFH consultation.**

Step 6: Consultation with NOAA Fisheries may also be required if the proposed action results in adverse impacts to other NOAA-trust resources, such as anadromous fish, shellfish, crustaceans, or their habitats as part of the Fish and Wildlife Coordination Act Some examples of other NOAA-trust resources are listed below. Inquiries regarding potential impacts to marine mammals or threatened/endangered species should be directed to NOAA Fisheries' Protected Resources Division.

6. OTHER NOAA-TRUST RESOURCES IMPACT ASSESSMENT

Species known to occur at site (list others that may apply)	Describe habitat impact type (i.e., physical, chemical, or biological disruption of spawning and/or egg development habitat, juvenile nursery and/or adult feeding or migration habitat). Please note, impacts to federally listed species of fish, sea turtles, and marine mammals must be coordinated with the GARFO Protected Resources Division.
alewife	Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS) for the assessment of impacts to NOAA Trust Resources species.
American eel	
American shad	
Atlantic menhaden	
blue crab	
blue mussel	
blueback herring	

Eastern oyster	
horseshoe crab	
quahog	
soft-shell clams	
striped bass	
other species:	

Useful Links

National Wetland Inventory Maps

EPA’s National Estuaries Program

Northeast Regional Ocean Council (NROC) Data

Mid-Atlantic Regional Council on the Ocean (MARCO) Data

Resources by State:

Maine
Eelgrass maps

Maine Office of GIS Data Catalog

Casco Bay Estuary Partnership

Maine GIS Stream Habitat Viewer

New Hampshire
New Hampshire's Statewide GIS Clearinghouse, NH GRANIT

New Hampshire Coastal Viewer

Massachusetts
Eelgrass maps

MADMF Recommended Time of Year Restrictions Document

Massachusetts Bays National Estuary Program

Buzzards Bay National Estuary Program

Massachusetts Division of Marine Fisheries

Massachusetts Office of Coastal Zone Management

Rhode Island
Eelgrass maps

Narraganset Bay Estuary Program

Rhode Island Division of Marine Fisheries

Rhode Island Coastal Resources Management Council

Connecticut

Eelgrass Maps

Long Island Sound Study

CT GIS Resources

CT DEEP Office of Long Island Sound Programs and Fisheries

CT Bureau of Aquaculture Shellfish

Maps CT River Watershed Council

New York

Eelgrass report

Peconic Estuary Program

NY/NJ Harbor Estuary

New Jersey

Submerged Aquatic Vegetation mapping

Barnegat Bay Partnership

Delaware

Partnership for the Delaware Estuary

Center for Delaware Inland Bays

Maryland

Submerged Aquatic Vegetation mapping

MERLIN

Maryland Coastal Bays Program

Virginia

Submerged Aquatic Vegetation mapping

NOAA FISHERIES
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
Essential Fish Habitat (EFH) Consultation Guidance
EFH ASSESSMENT WORKSHEET

Introduction:

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) mandates that federal agencies conduct an essential fish habitat (EFH) consultation with NOAA Fisheries regarding any of their actions authorized, funded, or undertaken that may adversely affect EFH. An adverse effect means any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

This worksheet has been designed to assist in determining whether a consultation is necessary and in preparing EFH assessments. This worksheet should be used as your EFH assessment or as a guideline for the development of your EFH assessment. At a minimum, all the information required to complete this worksheet should be included in your EFH assessment. If the answers in the worksheet do not fully evaluate the adverse effects to EFH, we may request additional information in order to complete the consultation.

An expanded EFH assessment may be required for more complex projects in order to fully characterize the effects of the project and the avoidance and minimization of impacts to EFH. While the EFH worksheet may be used for larger projects, the format may not be sufficient to incorporate the extent of detail required, and a separate EFH assessment may be developed. However, regardless of format, the analysis outlined in this worksheet should be included for an expanded EFH assessment, along with additional information that may be necessary. This additional information includes:

- the results of on-site inspections to evaluate the habitat and site-specific effects
- the views of recognized experts on the habitat or the species that may be affected
- a review of pertinent literature and related information
- an analysis of alternatives to the action that could avoid or minimize the adverse effects on EFH.

Your analysis of adverse effects to EFH under the MSA should focus on impacts to the habitat for all life stages of species with designated EFH, rather than individual responses of fish species. Fish habitat includes the substrate and benthic resources (e.g., submerged aquatic vegetation, shellfish beds, salt marsh wetlands), as well as the water column and prey species.

Consultation with us may also be necessary if a proposed action results in adverse impacts to other NOAA-trust resources. Part 6 of the worksheet is designed to help assess the effects of the action on other NOAA-trust resources. This helps maintain efficiency in our interagency coordination process. In addition, further consultation may be required if a proposed action impacts marine mammals or threatened and endangered species for which we are responsible. Staff from our Greater Atlantic Regional Fisheries Office, Protected Resources Division should be contacted regarding potential impacts to marine mammals or threatened and endangered species.

Instructions for Use:

Federal agencies must submit an EFH assessment to NOAA Fisheries as part of the EFH consultation. Your EFH assessment must include:

1) A description of the proposed action.
2) An analysis of the potential adverse effects of the action on EFH, and the managed species.
3) The federal agency's conclusions regarding the effects of the action on EFH.
4) Proposed mitigation if applicable.

In order for this worksheet to be considered as your EFH assessment, you must answer the questions in this worksheet fully and with as much detail as available. Give brief explanations for each answer.

Federal action agencies or the non-federal designated lead agency should submit the completed worksheet to NOAA Fisheries Greater Atlantic Regional Fisheries Office, Habitat Conservation Division (HCD) with the public notice or project application. Include project plans showing existing and proposed conditions, all waters of the U.S. on the project site, with mean low water (MLW), mean high water (MHW), high tide line (HTL), and water depths clearly marked and sensitive habitats mapped, including special aquatic sites (submerged aquatic vegetation, saltmarsh, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges), hard bottom habitat areas and shellfish beds, as well as any available site photographs.

For most consultations, NOAA Fisheries has 30 days to provide EFH conservation recommendations once we receive a complete EFH assessment. Submitting all necessary information at once minimizes delays in review and keeps review timelines consistent. Delays in providing a complete EFH assessment can result in our consultation review period extending beyond the public comment period for a particular project.

The information contained on the HCD Consultation website and NOAA's EFH Mapper will assist you in completing this worksheet. Please note that the Mapper is currently being up-dated with new designations and EFH maps and text descriptions for many species are temporarily missing. When you open the Mapper, read the WARNING that pops up when you click on the Greater Atlantic Region. It will direct you to a document with maps and text descriptions for each of the missing New England Species and to the Mapper's Data Inventory where a data layer for all the missing species is available for downloading into GIS software. Once the Mapper is up-dated, you can do a Location Query for your project location, but until then, the only way to easily generate a list of the missing species and life stages is to use your own GIS software. Before you fill out the worksheet, we recommend that you check with the appropriate HCD staff member to ensure that your list is complete and accurate. They will be able to answer any questions that you have.

Also note that a number of new Habitat Areas of Particular Concern (HAPCs) have been designated in the Greater Atlantic Region. HAPC maps will also be added to the Mapper the next time it is up-dated. Currently, they can be viewed by following the instructions on the warning page for the region. We expect the Mapper to be fully up-dated and functional later this spring.

EFH ASSESSMENT WORKSHEET FOR FEDERAL AGENCIES (modified 3/2016)

PROJECT NAME: Rebuild by Design - Meadowlands Flood Protection Project

DATE: 08/20/2018

PROJECT NO.: Build Alternative 3 = Hybrid Alternative

LOCATION (Water body, county, physical address):

Hackensack River; Boroughs of Little Ferry, Moonachie, Carlstadt, and Teterboro, and the Township of South Hackensack; Bergen County, New Jersey

PREPARER: AECOM

Step 1: Use NOAA's EFH Mapper to generate the list of designated EFH for federally-managed species and life stages for the geographic area of interest. Use this list as part of the initial screening process to determine if EFH for those species occurs in the vicinity of the proposed action. The list can be included as an attachment to the worksheet. Make a preliminary determination on the need to conduct an EFH consultation.

1. INITIAL CONSIDERATIONS

EFH Designations	Yes	No
Is the action located in or adjacent to EFH designated for eggs? **List the species:** Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS).	✓	
Is the action located in or adjacent to EFH designated for larvae? **List the species:** Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS).	✓	
Is the action located in or adjacent to EFH designated for juveniles? **List the species:** Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS).	✓	

Is the action located in or adjacent to EFH designated for adults or spawning adults? List the species: Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS).	✓	

If you answered 'no' to all questions above, then an EFH consultation is not required - go to Section 5.

If you answered 'yes' to any of the above questions, proceed to Section 2 and complete the remainder of the worksheet.

Step 2: In order to assess impacts, it is critical to know the habitat characteristics of the site before the activity is undertaken. Use existing information, to the extent possible, in answering these questions. Identify the sources of the information provided and provide as much description as available. These should not be yes or no answers. Please note that there may be circumstances in which new information must be collected to appropriately characterize the site and assess impacts. Project plans that show the location and extent of sensitive habitats, as well as water depths, the HTL, MHW and MLW should be provided.

2. SITE CHARACTERISTICS

Site Characteristics	Description
Is the site intertidal, sub-tidal, or water column?	The Project Area is intertidal and subtidal.
What are the sediment characteristics?	The sediment is predominantly fine grained materials and sand. Contaminants are present, attributable to urban runoff and the Superfund sites in Project Area. Additional details are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Is there submerged aquatic vegetation (SAV) at or adjacent to project site? If so describe the SAV species and spatial extent.	No.
Are there wetlands present on or adjacent to the site? If so, describe the spatial extent and vegetation types.	Yes, intertidal wetlands primarily dominated by common reed (Phragmites sp.) are present in the Project Area. Additionally, some of the wetland mitigation bank areas in the Project Area have been restored with native salt marsh vegetation. Additional details are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS), and spatial extent is provided in the RBDM EIS.

Is there shellfish present at or adjacent to the project site? If so, please describe the spatial extent and species present.	Yes, blue mussel (Mytilus edulis), soft-shell clam (Mya arenaria), and eastern oyster (Crassostrea virginica) are present in the Project Area; however, the spatial extent is not known. Additional details are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS) and the Biological Resources Survey Report (Appendix J in the RBDM EIS).
Are there mudflats present at or adjacent to the project site? If so please describe the spatial extent.	Mudflats are present at the Kane Mitigation Bank (an existing restoration/preservation/mitigation site within the Township of South Hackensack and Borough of Carlstadt) during low tide, but are not characteristically found throughout the Project Area.
Is there rocky or cobble bottom habitat present at or adjacent to the project site? If so, please describe the spatial extent.	Rocky or cobble bottom habitat is not expected in the Project Area.
Is Habitat Area of Particular Concern (HAPC) designated at or near the site? If so for which species, what type habitat type, size, characteristics?	No.
What is the typical salinity, depth and water temperature regime/range?	Salinity in the Project Area is consistent with a mixing water/brackish salinity zone (0.5 ppt - 25.0 ppt). Based on navigation charts, water depths in the Project Area range from zero along edge of rivers and creeks to a maximum of 25 feet in-channel, with typical depths ranging from 10 to 15 feet. Water temperatures in the Project Area vary seasonally from approximately 32 to 70 degrees Fahrenheit.
What is the normal frequency of site disturbance, both natural and man-made?	The Project Area is characteristic of an urban estuary that experiences frequent human use and disturbance. Natural disturbance, mainly attributable to flooding, occurs periodically and infrequently.
What is the area of proposed impact (work footprint & far afield)?	Figures depicting disturbance areas and locations are provided in the RBDM EIS and the EFH Assessment Report (Appendix Q in the RBDM EIS).

Step 3: This section is used to describe the anticipated impacts from the proposed action on the physical/chemical/biological environment at the project site and areas adjacent to the site that may be affected.

3. DESCRIPTION OF IMPACTS

Impacts	Y	N	Description
Nature and duration of activity(s). Clearly describe the activities proposed and the duration of any disturbances.			Detailed descriptions of in-water activities are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Will the benthic community be disturbed? If no, why not? If yes, describe in detail how the benthos will be impacted.	✓		There would be a minimal footprint of impact to the benthic community; temporary and permanent actions would impact approximately 0.3 acre of tidal water total (no tidal wetlands would be impacted). Additional details are provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Will SAV be impacted? If no, why not? If yes, describe in detail how the SAV will be impacted. Consider both direct and indirect impacts. Provide details of any SAV survey conducted at the site.		✓	No.
Will salt marsh habitat be impacted? If no, why not? If yes, describe in detail how wetlands will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?		✓	No. No salt marsh vegetation would be impacted.

Will mudflat habitat be impacted? If no, why not? If yes, describe in detail how mudflats will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?	✓		A limited area of mudflat habitat along the shoreline of creeks and rivers would be impacted.
Will shellfish habitat be impacted? If so, provide in detail how the shellfish habitat will be impacted. What is the aerial extent of the impact? Provide details of any shellfish survey conducted at the site.	✓		A limited area of shellfish habitat would be impacted.
Will hard bottom (rocky, cobble, gravel) habitat be impacted at the site? If so, provide in detail how the hard bottom will be impacted. What is the aerial extent of the impact?		✓	No.
Will sediments be altered and/or sedimentation rates change? If no, why not? If yes, describe how.	✓		Sedimentation rates would be reduced, particularly in Berry's Creek where shear stresses would be reduced. Additional details are provided in the Sediment Scour and Deposition Analysis (Appendix I of the RBDM EIS).
Will turbidity increase? If no, why not? If yes, describe the causes, the extent of the effects, and the duration.	✓		Temporary increases in turbidity would be expected during construction and would be minimized thorough use of best management practices (BMPs). There would be no long-term increases in turbidity.

Will water depth change? What are the current and proposed depths?	☐	☑	No.
Will contaminants be released into sediments or water column? If yes, describe the nature of the contaminants and the extent of the effects.	☐	☑	No, based on the Sediment Scour and Deposition Analysis (Appendix I of the RBDM EIS).
Will tidal flow, currents, or wave patterns be altered? If no, why not? If yes, describe in detail how.	☐	☑	No.
Will water quality be altered? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration of the impact.	☑	☐	There would be short-term, minor impacts to water quality during construction. However, there would be long-term improvements to water quality due to habitat improvements and reductions in the floodwater transport of debris and contaminants.
Will ambient noise levels change? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration and degree of impact.	☑	☐	There would be short-term, temporary increases to noise levels during construction; however, there would be no permanent changes to noise levels near aquatic habitats.
Does the action have the potential to impact prey species of federally managed fish with EFH designations?	☑	☐	There would be a potential to impact the applicable prey species temporarily during construction and permanently through habitat loss; however, the permanent impact to aquatic habitat, including wetlands, would be small (0.2 acre).

Step 4: This section is used to evaluate the consequences of the proposed action on the functions and values of EFH as well as the vulnerability of the EFH species and their life stages. Identify which species (from the list generated in Step 1) will be adversely impacted from the action. Assessment of EFH impacts should be based upon the site characteristics identified in Step 2 and the nature of the impacts described within Step 3. NOAA's EFH Mapper should be used during this assessment to determine the ecological parameters/ preferences associated with each species listed and the potential impact to those parameters.

4. EFH ASSESSMENT

Functions and Values	Y	N	Describe habitat type, species and life stages to be adversely impacted
Will functions and values of EFH be impacted for:			
Spawning **If yes, describe in detail how, and for which species. Describe how adverse effects will be avoided and minimized.**	✓		With the implementation of BMPs and the seasonal restrictions to avoid and minimize impacts, there would be little to no adverse impact to managed fish species during spawning. Therefore, Alternative 3 may affect, but is unlikely to adversely affect, managed species during spawning. A species list is provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Nursery **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**	✓		Most of the tidal marsh that would be disturbed or lost during construction is dominated by common reed and provides very limited function as nursery habitat for juvenile fishes. Adverse impacts would be avoided to the extent practicable during design. Further, impacts would be minimized through use of BMPs to control sedimentation and maintain water quality during construction. Alternative 3 may affect, and is likely to adversely affect, nursery habitat for EFH or applicable prey species. A species list is provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Forage **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**	✓		Adverse impacts would be avoided to the extent practicable during design. Additionally, impacts would be minimized through use of BMPs to control sedimentation and maintain water quality during construction, and through the appropriate seasonal restrictions on in-water activities and activities that may affect water quality. Alternative 3 may affect, but is unlikely to adversely affect, managed species during foraging. A species list and a description of in-water activities is provided in the EFH Assessment Report (Appendix Q in the RBDM EIS).
Shelter **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**		✓	No.

Will impacts be temporary or permanent? Please indicate in description box and describe the duration of the impacts.			Impacts would be both temporary and permanent. Further details are provided in Table 3.2 of the EFH Assessment Report (Appendix Q in the RBDM EIS).
Will compensatory mitigation be used? If no, why not? Describe plans for mitigation and how this will offset impacts to EFH. Include a conceptual compensatory mitigation plan, if applicable.	✓		Alternative 3 includes habitat restoration and the enhancement of wetlands. Additional compensatory mitigation, if required, would be developed during the design phase.

<u>Step 5</u>: This section provides the federal agency's determination on the degree of impact to EFH from the proposed action. The EFH determination also dictates the type of EFH consultation that will be required with NOAA Fisheries.

Please note: if information provided in the worksheet is insufficient to allow NOAA Fisheries to complete the EFH consultation additional information will be requested.

5. DETERMINATION OF IMPACT

Federal Agency's EFH Determination		
Overall degree of adverse effects on EFH (not including compensatory mitigation) will be: **(check the appropriate statement)**		**There is no adverse effect on EFH or no EFH is designated at the project site.** **EFH Consultation is not required.**
	✓	**The adverse effect on EFH is not substantial. This means that the adverse effects are either no more than minimal, temporary, or that they can be alleviated with minor project modifications or conservation recommendations.** **This is a request for an abbreviated EFH consultation.**
		The adverse effect on EFH is substantial. **This is a request for an expanded EFH consultation.**

Step 6: Consultation with NOAA Fisheries may also be required if the proposed action results in adverse impacts to other NOAA-trust resources, such as anadromous fish, shellfish, crustaceans, or their habitats as part of the Fish and Wildlife Coordination Act Some examples of other NOAA-trust resources are listed below. Inquiries regarding potential impacts to marine mammals or threatened/endangered species should be directed to NOAA Fisheries' Protected Resources Division.

6. OTHER NOAA-TRUST RESOURCES IMPACT ASSESSMENT

Species known to occur at site (list others that may apply)	Describe habitat impact type (i.e., physical, chemical, or biological disruption of spawning and/or egg development habitat, juvenile nursery and/or adult feeding or migration habitat). Please note, impacts to federally listed species of fish, sea turtles, and marine mammals must be coordinated with the GARFO Protected Resources Division.
alewife	Refer to the EFH Assessment Report (Appendix Q in the RBDM EIS) for the assessment of impacts to NOAA Trust Resources species.
American eel	
American shad	
Atlantic menhaden	
blue crab	
blue mussel	
blueback herring	

Eastern oyster	
horseshoe crab	
quahog	
soft-shell clams	
striped bass	
other species:	

Useful Links

National Wetland Inventory Maps

EPA’s National Estuaries Program

Northeast Regional Ocean Council (NROC) Data

Mid-Atlantic Regional Council on the Ocean (MARCO) Data

Resources by State:

Maine
Eelgrass maps

Maine Office of GIS Data Catalog

Casco Bay Estuary Partnership

Maine GIS Stream Habitat Viewer

New Hampshire
New Hampshire's Statewide GIS Clearinghouse, NH GRANIT

New Hampshire Coastal Viewer

Massachusetts
Eelgrass maps

MADMF Recommended Time of Year Restrictions Document

Massachusetts Bays National Estuary Program

Buzzards Bay National Estuary Program

Massachusetts Division of Marine Fisheries

Massachusetts Office of Coastal Zone Management

Rhode Island
Eelgrass maps

Narraganset Bay Estuary Program

Rhode Island Division of Marine Fisheries

Rhode Island Coastal Resources Management Council

Connecticut

Eelgrass Maps

Long Island Sound Study

CT GIS Resources

CT DEEP Office of Long Island Sound Programs and Fisheries

CT Bureau of Aquaculture Shellfish

Maps CT River Watershed Council

New York

Eelgrass report

Peconic Estuary Program

NY/NJ Harbor Estuary

New Jersey

Submerged Aquatic Vegetation mapping

Barnegat Bay Partnership

Delaware

Partnership for the Delaware Estuary

Center for Delaware Inland Bays

Maryland

Submerged Aquatic Vegetation mapping

MERLIN

Maryland Coastal Bays Program

Virginia

Submerged Aquatic Vegetation mapping