Appendix B

Supplemental Information and Additional Figures and Tables

Appendix B: Supplemental Information and Additional Figures and Tables

B.1 Climate and Meteorology

The National Climatic Data Center defines distinct climatological divisions to represent geographic areas that are nearly climatically homogeneous. Locations within the same climatic division are considered to share the same overall climatic features and influences. New Jersey's north-south orientation, with the highest elevations in the northern portion and lower coastal plains in the south and along the bays and the ocean, contributes to climatic differences between the northern and southern portions of the state. Temperature differences are greatest in the winter and least in summer (New Jersey State Climatologist 2020). New Jersey has four well-defined physiographic belts that parallel the Atlantic Coast—the Coastal Plain, Piedmont, Highlands, and the Valley and Ridge Province (New Jersey Geological Society 2003). The Proposed Action is within the New Jersey Coastal Plain climatic division (NOAA 2021).

B.1.1 Ambient Temperature

The Onshore Project area is characterized by mild seasons and storms that bring precipitation (rain and snow) to the region; the mild seasons are influenced by sea winds that reduce both the temperature range and mean temperature while providing humidity (NJDEP 2010). Air temperatures in the Project area are generally moderate. Air temperature data collected from the Office of the New Jersey State Climatologist, Rutgers University, which averaged the annual, seasonal, and monthly means in southern and coastal areas of New Jersey for 1985–2009, indicate that the annual mean air temperature was 53.2°F (11.8°C) (NJDEP 2010). The mean seasonal air temperature between 1985 and 2010 during the winter ranged from approximately 32–43°F (0–6°C) and in the spring from 54–64°F (12–18°C). The mean seasonal air temperature during the summer ranges from approximately 68–75°F (20–24°C) and during the fall from 53–65°F (12–18°C). The lowest average air temperatures occur in January and the highest in July (NJDEP 2010; NCDC 2021a). Recent offshore air temperature data were downloaded from NOAA buoys near the Offshore Project area. Data for the years 2014–2018 were downloaded from Atlantic City, New Jersey (Buoy No. ACYN4). Table B.1-1 summarizes average temperatures at the Atlantic City buoy.

Table B.1-1. Representative temperature data for the Project area

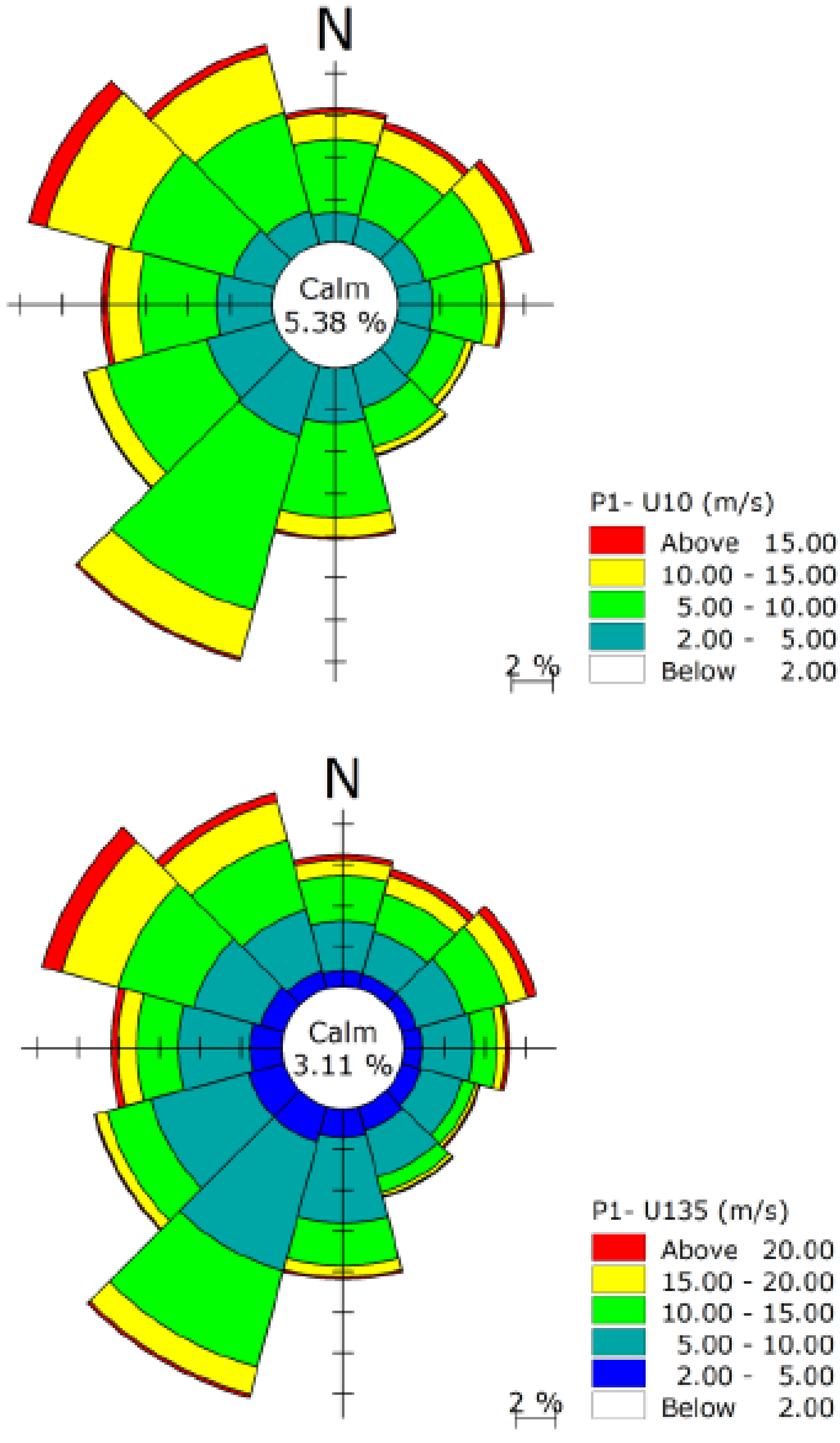
NOAA Station	Year	Annual Average °F/°C	Number of Observations
Atlantic City Buoy (No. ACYN4)	2014	53.8/12.1	86,432
	2015	55.4/13.0	86,357
	2016	55.6/13.1	81,252
	2017	55.9/13.3	85,57
	2018	52.9/11.6	63,856

Source: NDBC 2022

B.1.2 Wind Conditions

Prevailing winds in the middle latitudes over North America flow mostly west to east ("westerlies"). Westerlies within the Lease Area vary in strength, pattern, and directionality. Winds during the summer are typically from the southwest and flow parallel to the shore, and winds in the winter months are typically from the northwest and flow perpendicular to the shore. Spring and fall are more variable, with winds from either the southwest or northeast (Schofield et al. 2008). Data for the Project were generated through numerical models using a location within the Lease Area and are shown on Figure B.1-1. The highest-frequency wind directions generally were from south-southwest to north-northwest.

Extreme wind conditions on the U.S. East Coast are influenced by both winter storms and tropical systems. Several northeasters occur each winter season, while hurricanes are rarer but potentially more extreme. The tropical systems therefore define the wind farm design, based on extreme wind speeds (those with recurrence periods of 50 years and beyond).



Source: COP, Appendix II-B1, Figure 2-1; Atlantic Shores 2024.
Elevations are 10 meters AMSL (U10) and 135 meters AMSL (U135).

Figure B.1-1. Wind rose graphs of mean wind speeds for the Lease Area

Table B.1-2 summarizes wind conditions in the region, including the monthly average wind speeds, monthly average peak wind gusts, and hourly peak wind gusts for each individual month. Data from 1984 through 2008 show that monthly mean wind speeds range from a low of 10.9 miles per hour (17.6 kilometers per hour) in July to a high of 17.4 miles per hour (28.0 kilometers per hour) in January. The monthly wind mean peak gusts reach a maximum during January at 24.1 miles per hour (38.7 kilometers per hour). The 1-hour average wind gusts reach a maximum during September at 63.3 miles per hour (101.9 kilometers per hour) (NDBC 2018).

Table B.1-2. Representative wind speed data

	Monthly Average Wind Speed		Monthly Average of Hourly Peak Gust		Monthly Maximum Hourly Peak Gust	
Month	**mph**	**km/hr**	**mph**	**km/hr**	**mph**	**km/hr**
January	17.4	28.0	24.1	38.7	61.6	99.1
February	16.2	26.1	21.9	35.2	56.8	91.5
March	15.5	25.0	20.5	33.0	57.5	92.6
April	14.0	22.6	19.0	30.6	56.8	91.5
May	12.7	20.4	16.2	26.1	60.2	96.9
June	11.5	18.5	15.3	24.6	47.6	76.7
July	10.9	17.6	14.7	23.7	50.1	80.6
August	11.2	18.0	15.2	24.4	48.6	78.2
September	13.0	20.9	18.0	28.9	63.3	101.9
October	14.8	23.9	20.5	33.0	60.6	97.6
November	16.3	26.3	21.8	35.0	57.3	92.2
December	17.1	27.6	23.8	38.3	56.2	90.4
Annual	14.0	22.6	19.1	30.7	63.3	101.9

Source: NDBC 2018.
Note: Data presented are for National Data Buoy Center buoy station #44009 (southeast of Cape May, New Jersey).
km/hr = kilometers per hour; mph = miles per hour.

B.1.3 Precipitation and Fog

Data from a study conducted by NJDEP indicate the Lease Area is characterized by mild seasons and storms throughout the year, with precipitation in the form of rain and snow being most common (NJDEP 2010). Average monthly precipitation data from the National Climatic Data Center are presented in Table B.1-3.

Table B.1-3. Monthly precipitation data[1]

Month	Precipitation (inches/centimeters)	
	Atlantic City Marina, New Jersey	Brant Beach, Beach Haven, New Jersey
January	3.08/7.82	3.25/8.26
February	2.87/7.29	2.86/7.26
March	4.02/10.21	3.97/10.08
April	3.39/8.61	3.26/8.28
May	3.22/8.18	2.78/7.06
June	2.68/6.81	3.05/7.75
July	3.31/8.41	3.92/9.96
August	3.92/9.96	3.71/9.42
September	3.08/7.82	2.78/7.06
October	3.47/8.81	3.65/9.27
November	3.35/8.51	2.91/7.39
December	3.62/9.19	3.36/8.53
Annual Average	3.33/8.47	3.29/8.36

Sources: NCDC 2021a, 2021b.
[1] Precipitation is recorded in melted inches (snow and ice are melted to determine monthly equivalent).

Snowfall amounts can vary quite drastically within small distances. Data from Lewes, Delaware, show that the annual snowfall average is approximately 12 inches (30.5 centimeters), and the month with the highest snowfall is January, averaging around 4 inches (10.2 centimeters) (WRCC 2020).

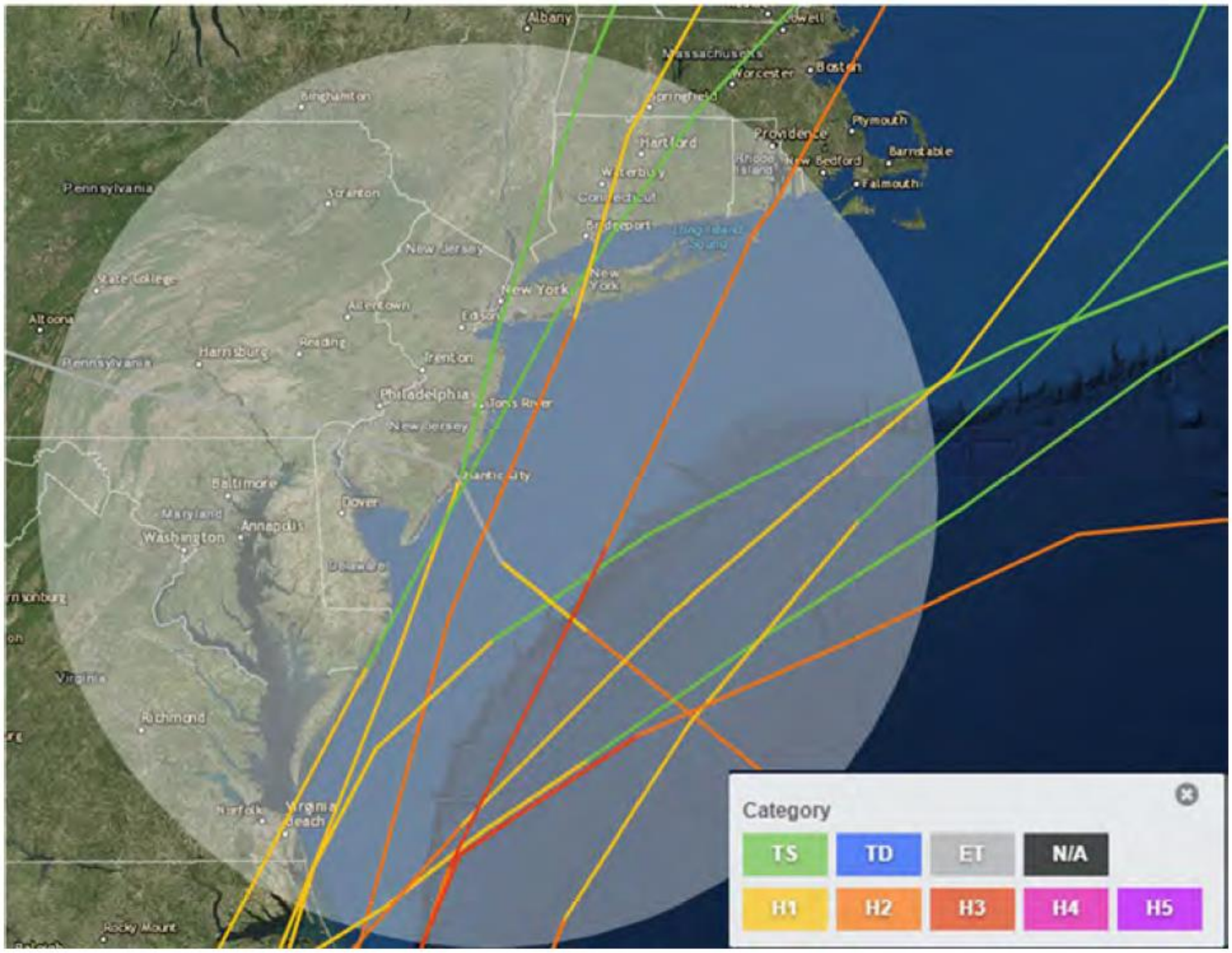
Given the cold air temperatures experienced during many mid-Atlantic winters, there is potential for icing of equipment and vessels above the water line in the Lease Area. Cook and Chatterton (2008) analyzed icing events in Delaware Bay for winters from 1997 to 2007 and found that icing events are a common occurrence during the months of January, February, and March. The worst winter, as far as icing is concerned, experienced by the Delaware Bay region from 1997 through 2007 was in 2002 to 2003, during which 21 icing events occurred. Delaware Bay experiences approximately eight events annually where the variables favoring icing are consistent for 3 or more hours.

The occurrence of fog in the mid-Atlantic states is driven by regional-scale weather patterns and local topographic and surface conditions. The interaction between various weather systems and the physical state of the local conditions is complex. Ward and Croft (2008) found that high-pressure systems result in heavy fog over the Delaware Bay and nearby Atlantic coastal areas. During the 2006–2007 winter season (December–February), Sussex County Airport, Delaware, reported 45 fog events, 4 of which were described as dense fog (Ward and Croft 2008).

B.1.4 Hurricanes and Tropical Storms

Coastal New Jersey is subject to extratropical and tropical storm systems. Records of cyclone track locations, central pressures, and wind speeds are documented by several government agencies. Extratropical storms, including northeasters, are common in the Lease Area from October to April. These storms bring high winds and heavy precipitation, which can lead to severe flooding and storm surges. Most hurricane events within the Atlantic generally occur from mid-August to late October, with the majority of all events occurring in September (Donnelly et al. 2004). On average, hurricanes occur every 3 to 4 years within 90 to 170 miles (145 to 274 kilometers) of the New Jersey coast (NJDEP 2010).

Figure B.1-2 identifies the hurricane tracks within the Lease Area and surrounding areas since 1979 (NOAA 2018). The category for each storm is designated by a color for each track. Extratropical storms are captured by gray line segments, tropical depressions are captured in blue, tropical storms are depicted in green, Category 1 storms are yellow line segments, Category 2 storms are in light orange, and Category 3 storms are dark orange.



Source: NOAA 2018.

Figure B.1-2. Overview of storm tracks since 1979 in the vicinity of the Lease Area

Although data on tropical systems go back to 1851, the quality and consistency of the data are lacking the further back one looks. The storm period was selected based on the availability of consistent wind data for tropical and extratropical systems. The majority of historical cyclones affecting the Project area are tropical storms, and storms as powerful as Category 3 hurricanes have affected the area.

Regional storm events are recorded in NOAA's National Centers for Environmental Information Storm Events Database (NOAA 2018). Notable events are recorded when there is sufficient intensity to cause loss of life, injuries, significant property damage, or disruption to commerce. Table B.1-4 indicates storms that have occurred within 200 nautical miles (370 kilometers) of the Lease Area in 1979–2018.

Table B.1-4. Named storms that have occurred within 200 nautical miles of the Lease Area in 1979–2018

Storm Name	Date	Storm Category (within 200 nautical miles of Lease Area)
Gloria	1985	Category 1 and Category 2 Hurricane
Bob	1991	Category 2 and Category 2 Hurricane
Emily	1993	Category 2 and Category 2 Hurricane
Charley	1998	Tropical Storm and Category 1 Hurricane
Floyd	1999	Tropical Storm and Category 1 Hurricane
Earl	2010	Tropical Storm and Category 1 Hurricane
Irene	2011	Tropical Storm and Category 1 Hurricane
Sandy	2012	Extratropical Cyclone, Category 1 and Category 2 Hurricane
Arthur	2014	Category 1 Hurricane

Source: NOAA 2018.

Hurricane Sandy occurred in 2012 and caused the highest storm surges and greatest inundation on land in New Jersey. The storm surge and large waves from the Atlantic Ocean meeting up with rising waters from back bays such as Barnegat Bay and Little Egg Harbor caused barrier islands to be completely inundated (Blake et al. 2013). In Atlantic City and Cape May, tide gauges measured storm surges of 5.8 and 5.2 feet (1.8 and 1.6 meters), respectively (Blake et al. 2013). Atlantic City International Airport recorded maximum sustained wind speeds of 44.3 knots (82 kilometers per hour) and a peak wind speed of 55.6 knots (103 kilometers per hour) on the coast (NOAA 2012). Marine observations at the Cape May National Ocean Service (CMAN4) recorded sustained wind speeds at 52 knots (96 kilometers per hour) and an estimated inundation of 3.5 feet (1.1 meter) (Blake et al. 2013).

B.1.5 Mixing Height

The mixing height is the altitude above ground level to which air pollutants vertically disperse. The mixing height affects air quality because it acts as a lid on the height pollutants can reach. Lower mixing heights allow less air volume for pollutant dispersion and can lead to higher ground-level pollutant concentrations than do higher mixing heights. Table B.1-5 presents atmospheric mixing height data from the nearest measurement location to the Project area (Atlantic City, New Jersey). As shown in the table, the minimum average mixing height is 390 meters (1,279 feet), while the maximum average mixing height is 1,218 meters (3,996 feet). The minimum average mixing height is much higher than the height of the top of the proposed WTG rotors (262 meters [860 feet]).

Table B.1-5. Representative seasonal mixing height data

Season	Data Hours Included[1]	Atlantic City, New Jersey Average Mixing Height (meters)
Winter (December, January, February)	Morning: no-precipitation hours	624
	Morning: all hours	617
	Afternoon: no-precipitation hours	774
	Afternoon: all hours	390
Spring (March, April, May)	Morning: no-precipitation hours	545
	Morning: all hours	640
	Afternoon: no-precipitation hours	1,196
	Afternoon: all hours	499
Summer (June, July, August)	Morning: no-precipitation hours	511
	Morning: all hours	566
	Afternoon: no-precipitation hours	1,218
	Afternoon: all hours	695
Fall (September, October, November)	Morning: no-precipitation hours	484
	Morning: all hours	649
	Afternoon: no-precipitation hours	988
	Afternoon: all hours	476
Annual Average	Morning: no-precipitation hours	539
	Morning: all hours	620
	Afternoon: no-precipitation hours	1,052
	Afternoon: all hours	508

Source: USEPA 2021.
[1] Missing values are not included.

B.1.6 References Cited

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B.2 Wetlands

Table B.2-1 summarizes NWI wetland communities in the geographic analysis area. This table is equivalent to Table 3.5.8.1-1 in Section 3.5.8, *Wetlands*, but shows NWI data instead of NJDEP wetland data.

Table B.2-1. NWI wetland communities in the geographic analysis area

Wetland Community	Acres	Percent of Total
Estuarine and Marine Wetland	20,695	48.8
Freshwater Emergent Wetland	884	2.1
Freshwater Forested/Shrub Wetland	20,830	49.1
Total	**42,408**	**100.0**

Source: USFWS 2021.

Figures B.2-1 through B.2-8 show NJDEP and NWI mapped wetlands in the Cardiff and O&M facility study areas. Figures B.2-9 through B.2-17 show NJDEP and NWI mapped wetlands within the Larrabee study area.

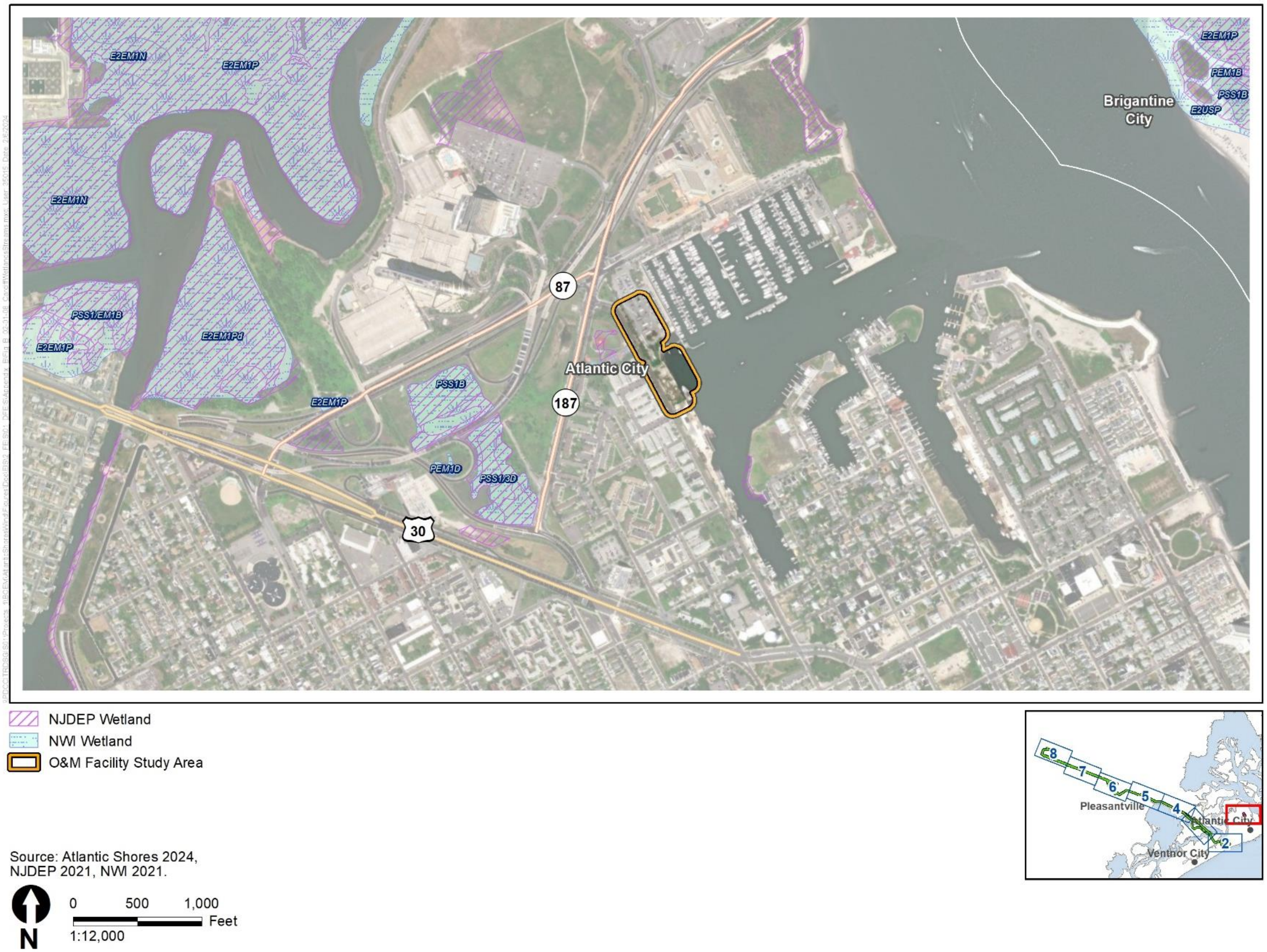


Figure B.2-1. NJDEP/NWI mapped wetlands in the Cardiff and O&M facility study areas

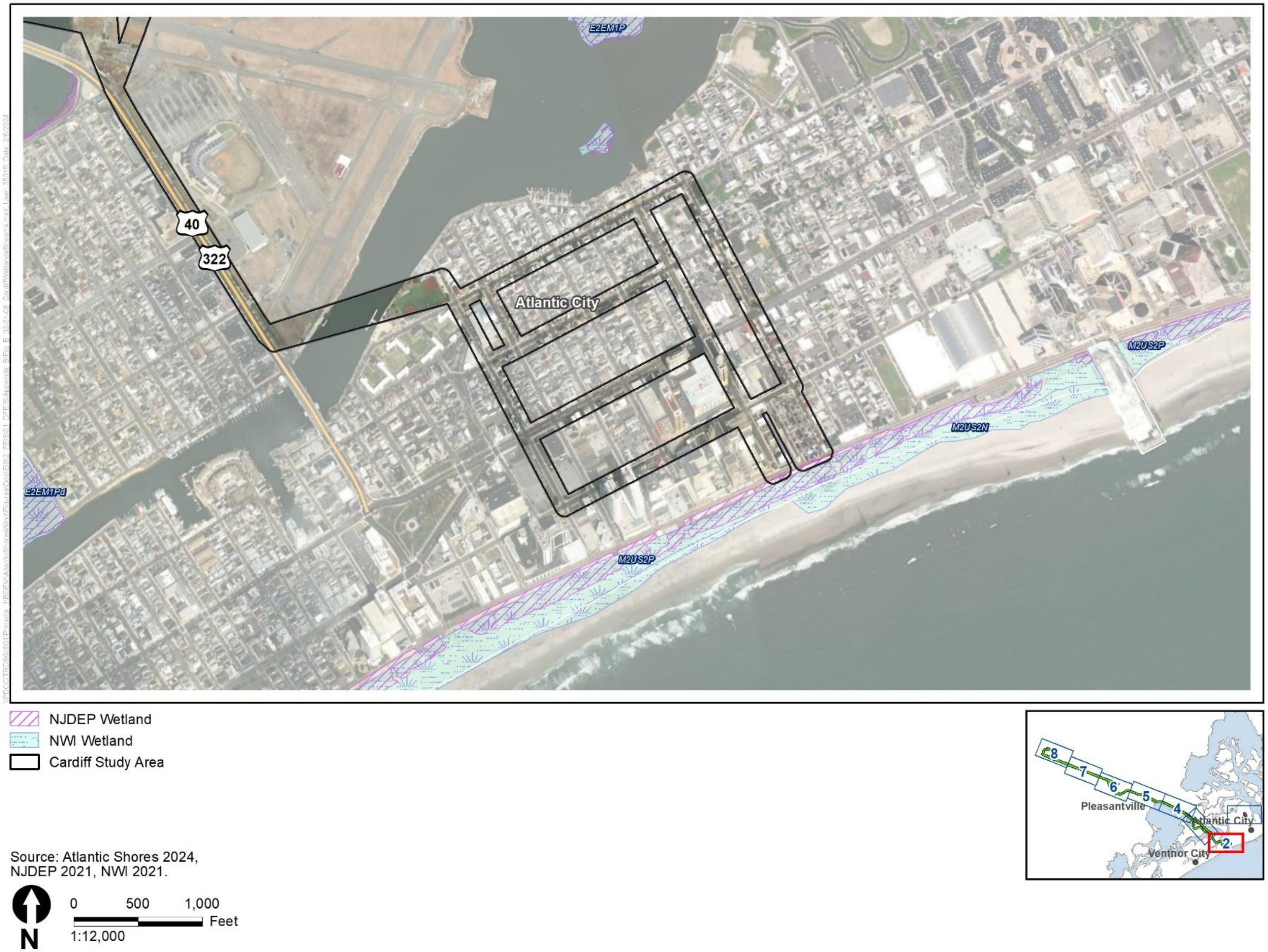


Figure B.2-2. NJDEP/NWI mapped wetlands in the Cardiff and O&M facility study areas

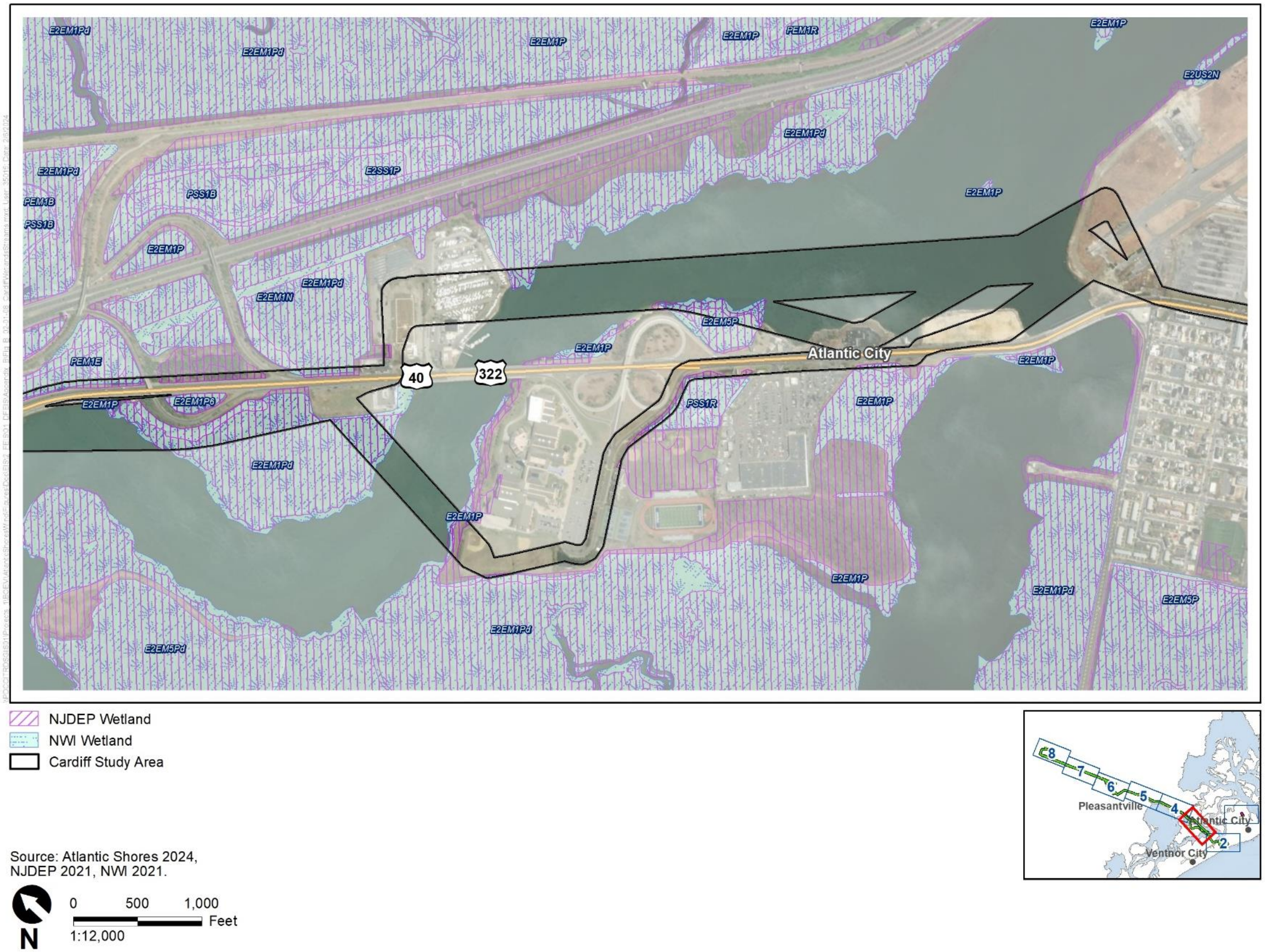
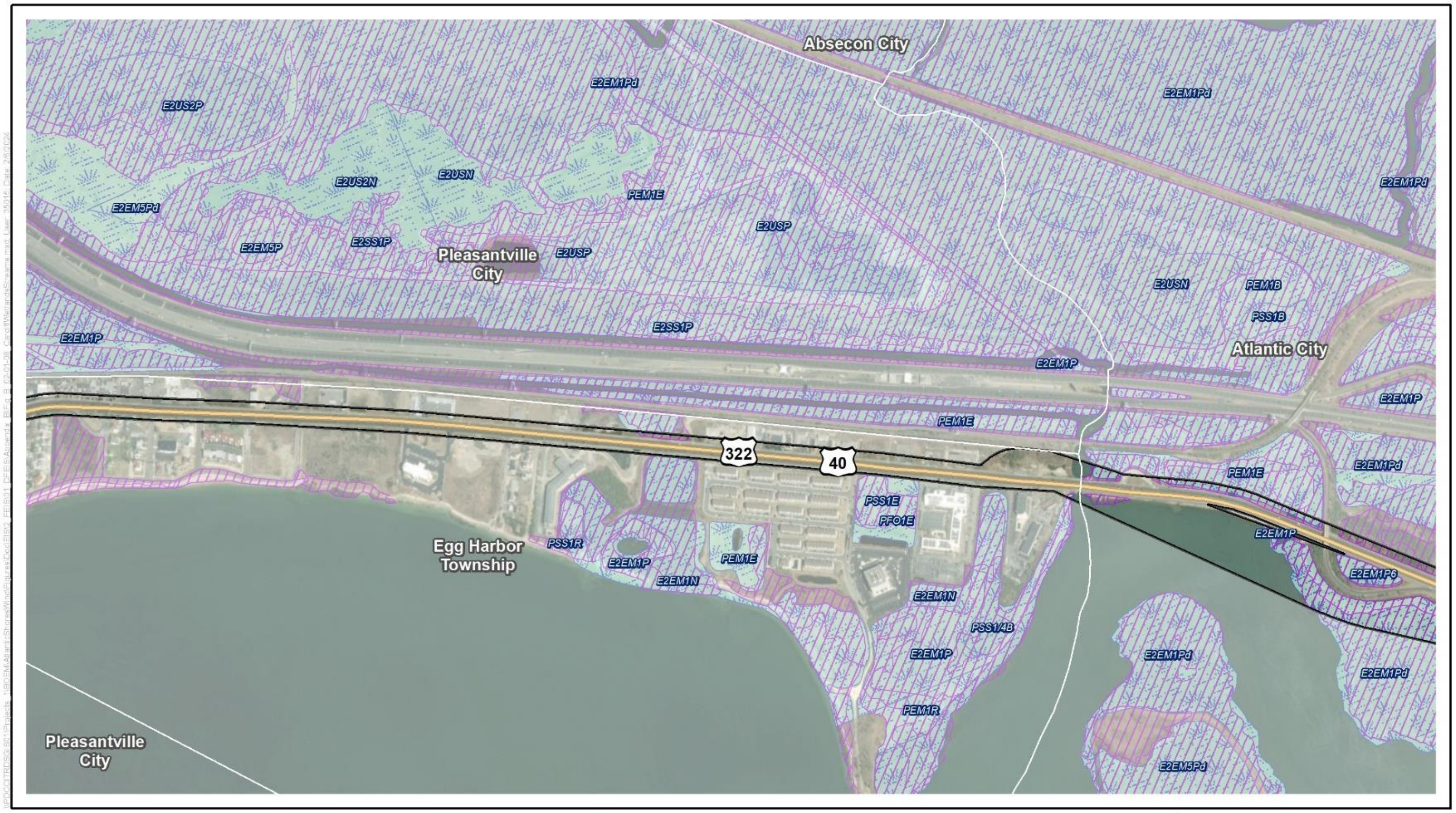
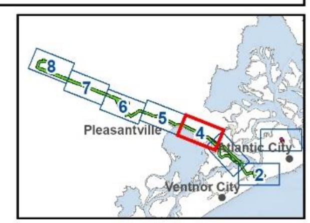


Figure B.2-3. NJDEP/NWI mapped wetlands in the Cardiff and O&M facility study areas



NJDEP Wetland
NWI Wetland
Cardiff Study Area



Source: Atlantic Shores 2024, NJDEP 2021, NWI 2021.

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Figure B.2-4. NJDEP/NWI mapped wetlands in the Cardiff and O&M facility study areas

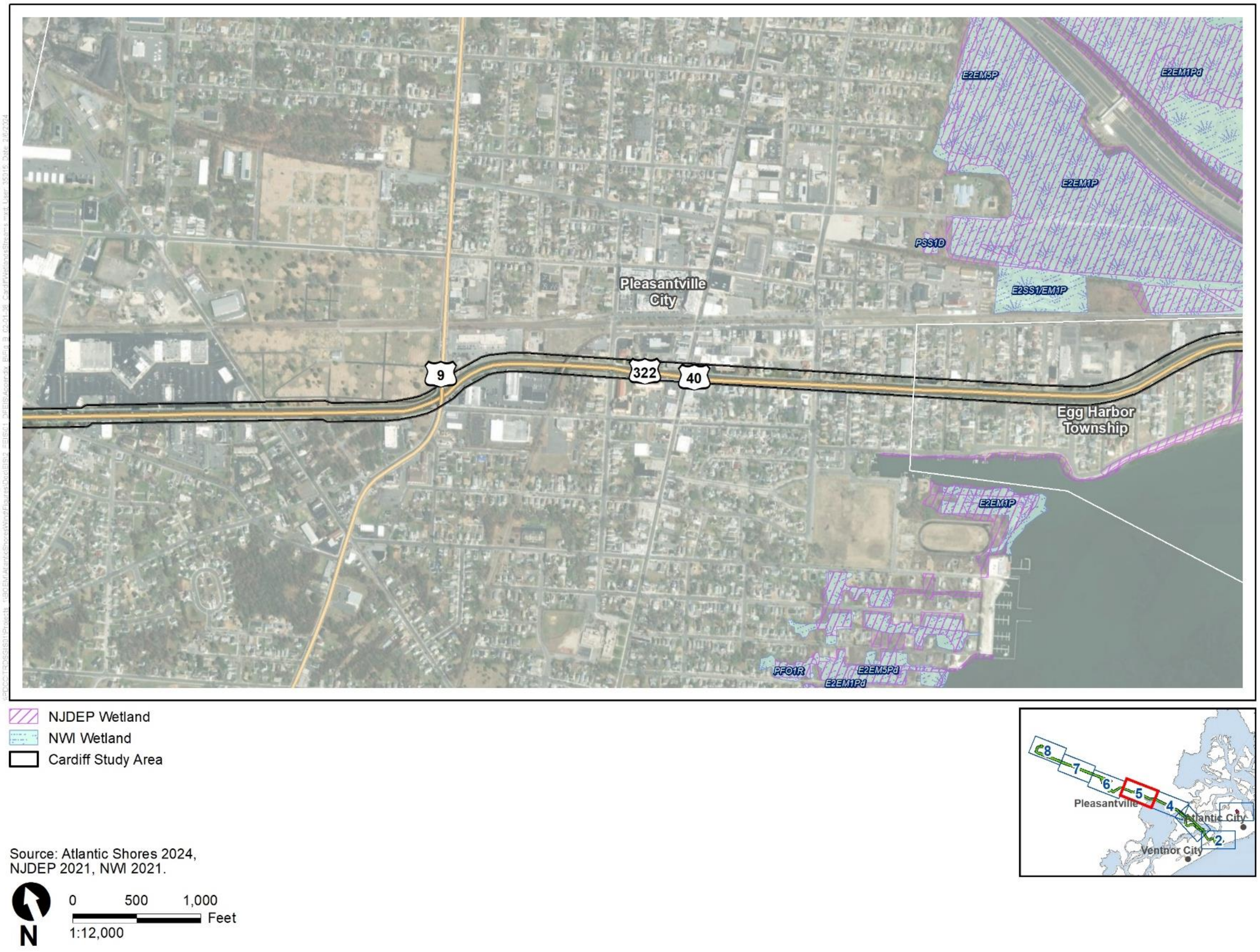


Figure B.2-5. NJDEP/NWI mapped wetlands in the Cardiff and O&M facility study areas

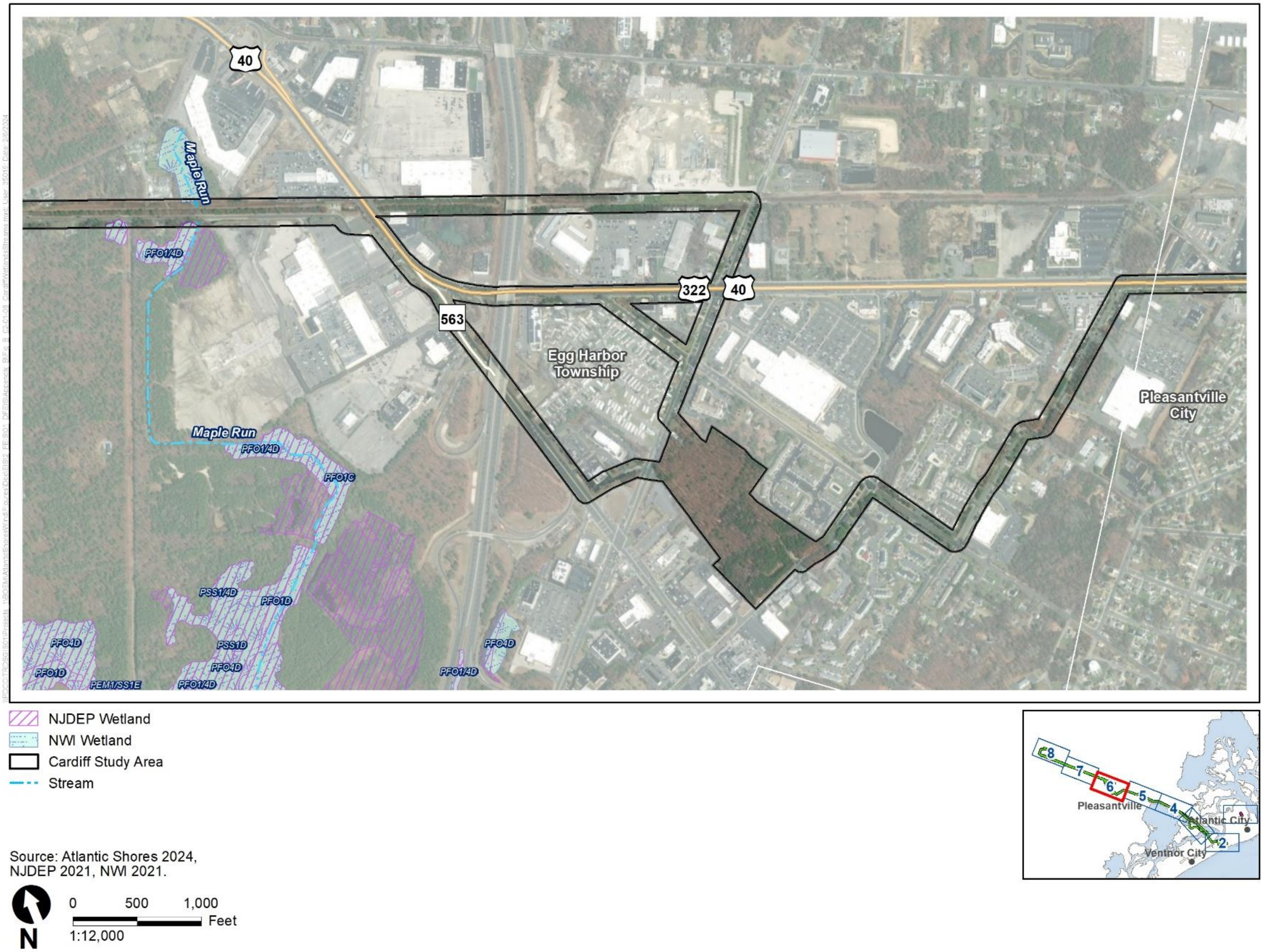


Figure B.2-6. NJDEP/NWI mapped wetlands in the Cardiff and O&M facility study areas

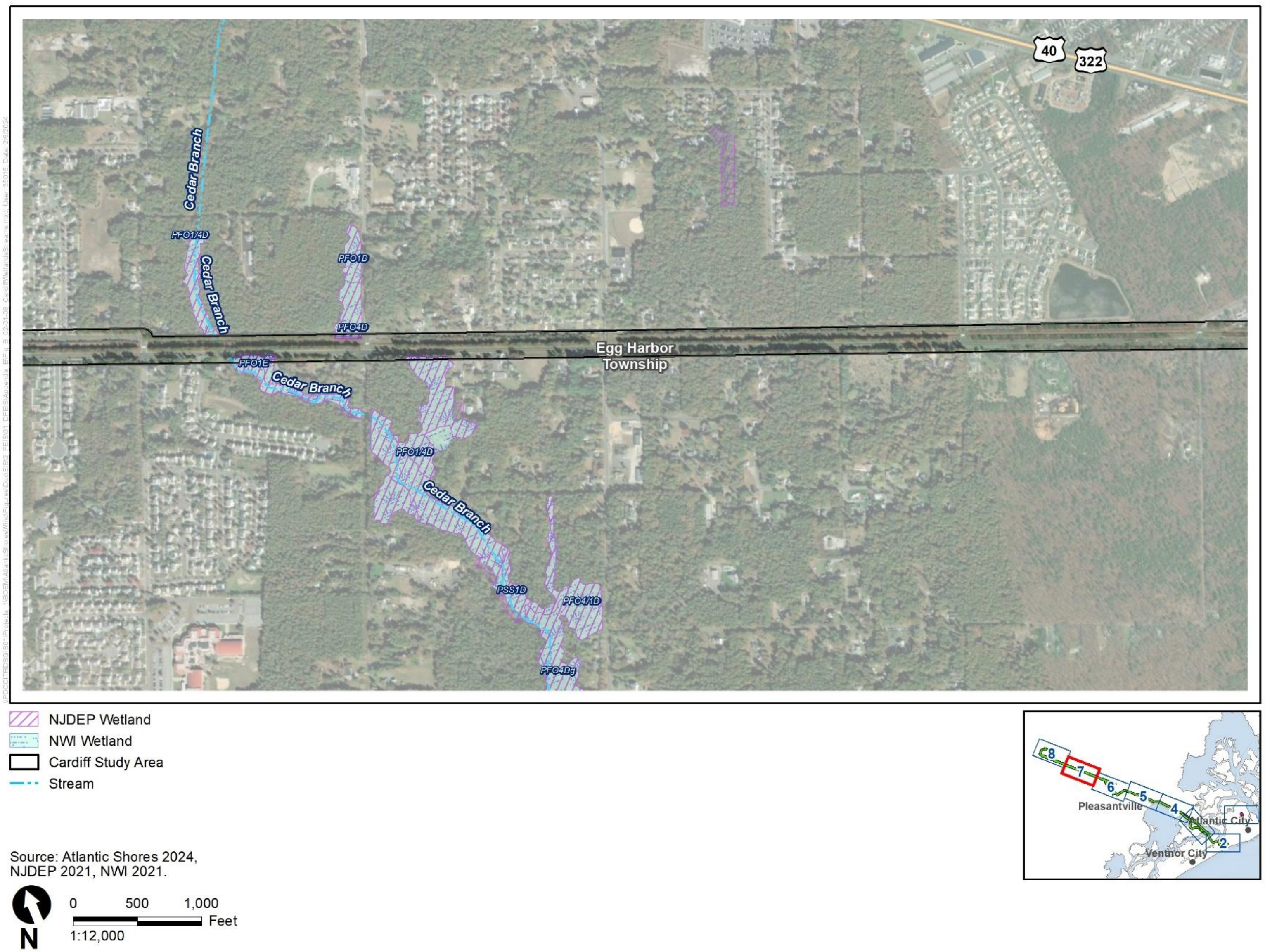


Figure B.2-7. NJDEP/NWI mapped wetlands in the Cardiff and O&M facility study areas

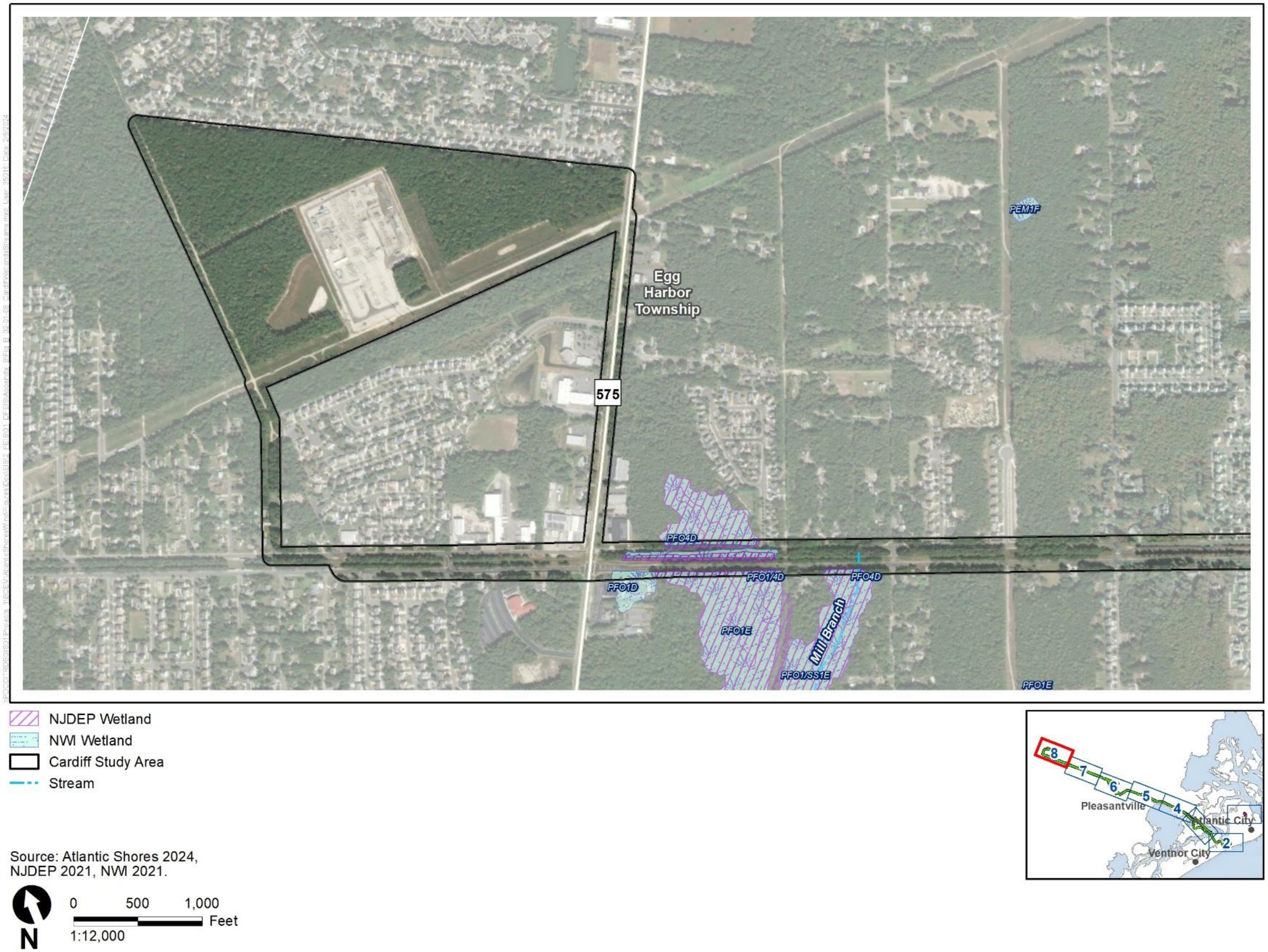


Figure B.2-8. NJDEP/NWI mapped wetlands in the Cardiff and O&M facility study areas

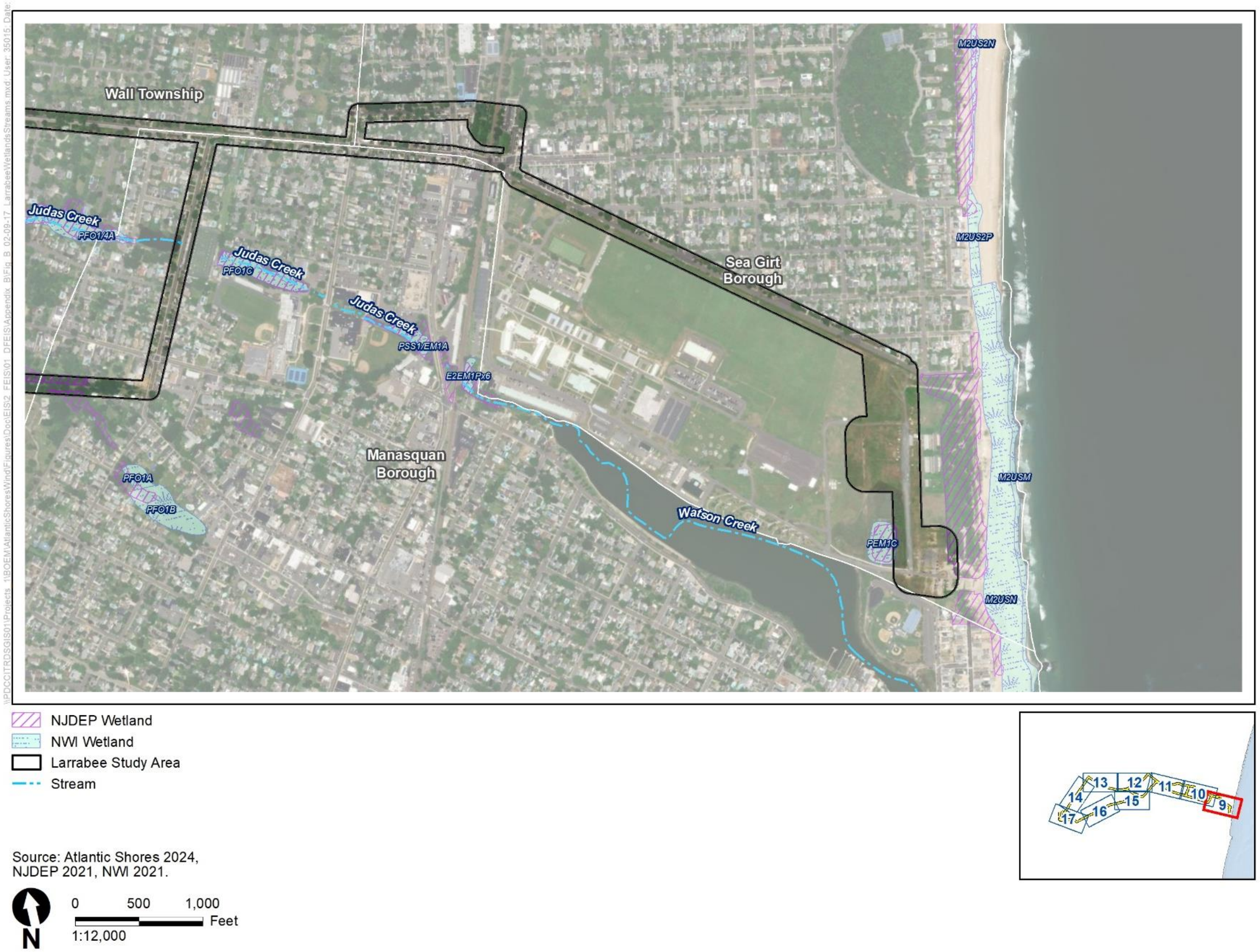


Figure B.2-9. NJDEP/NWI mapped wetlands in the Larrabee study area

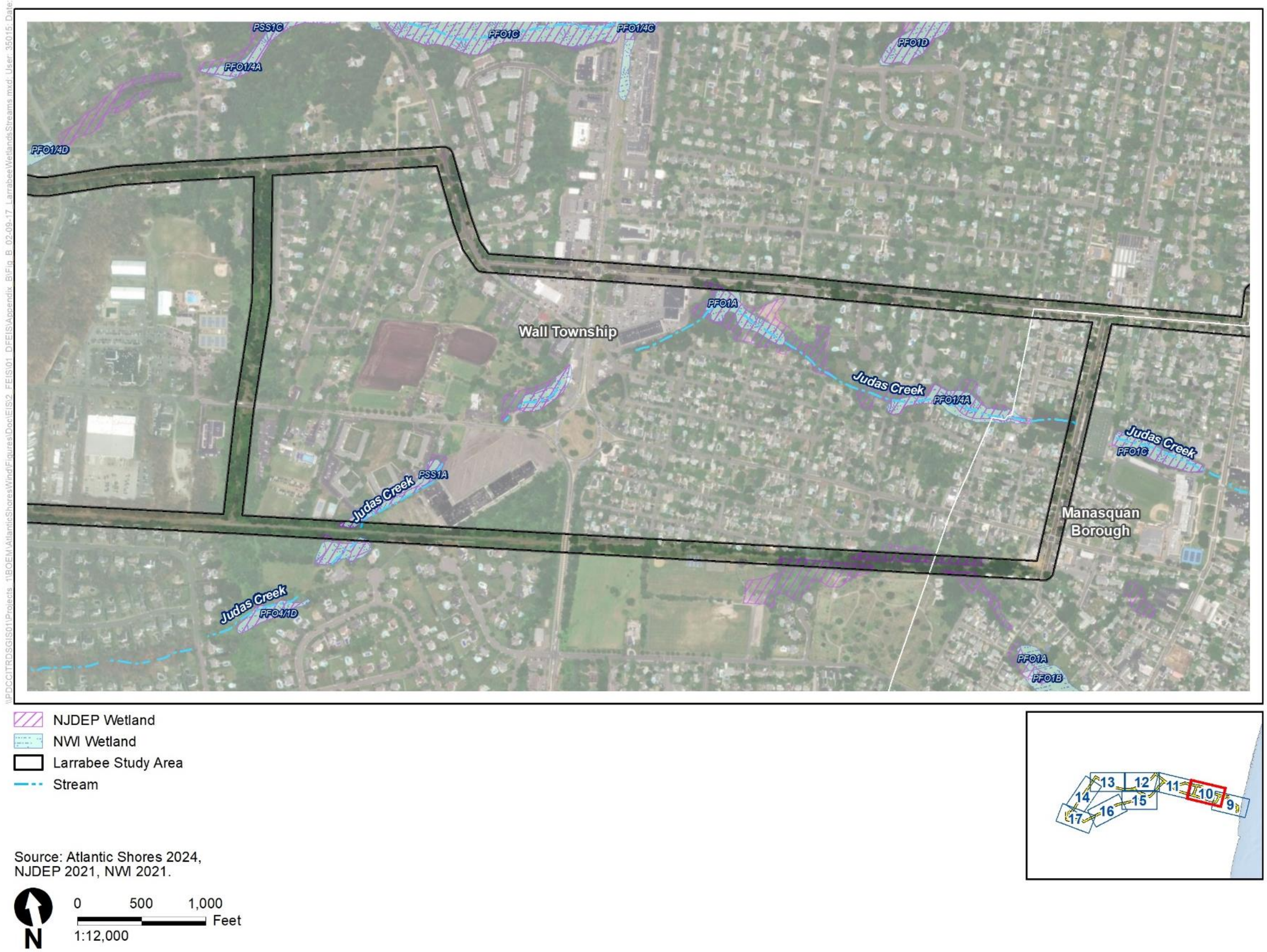


Figure B.2-10. NJDEP/NWI mapped wetlands in the Larrabee study area

Source: Atlantic Shores 2024, NJDEP 2021, NWI 2021.

0 500 1,000 Feet
1:12,000

Figure B.2-11. NJDEP/NWI mapped wetlands in the Larrabee study area

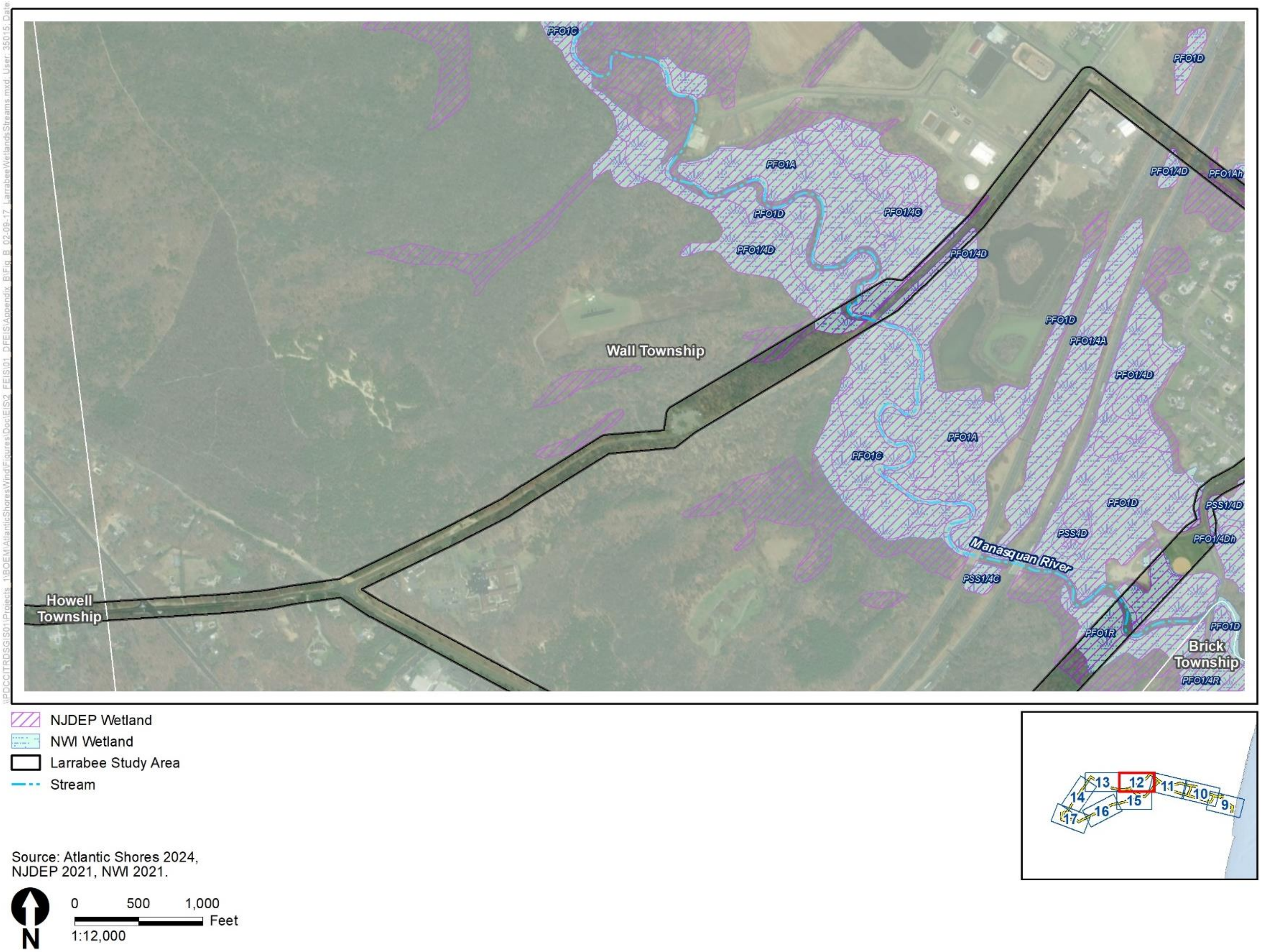


Figure B.2-12. NJDEP/NWI mapped wetlands in the Larrabee study area

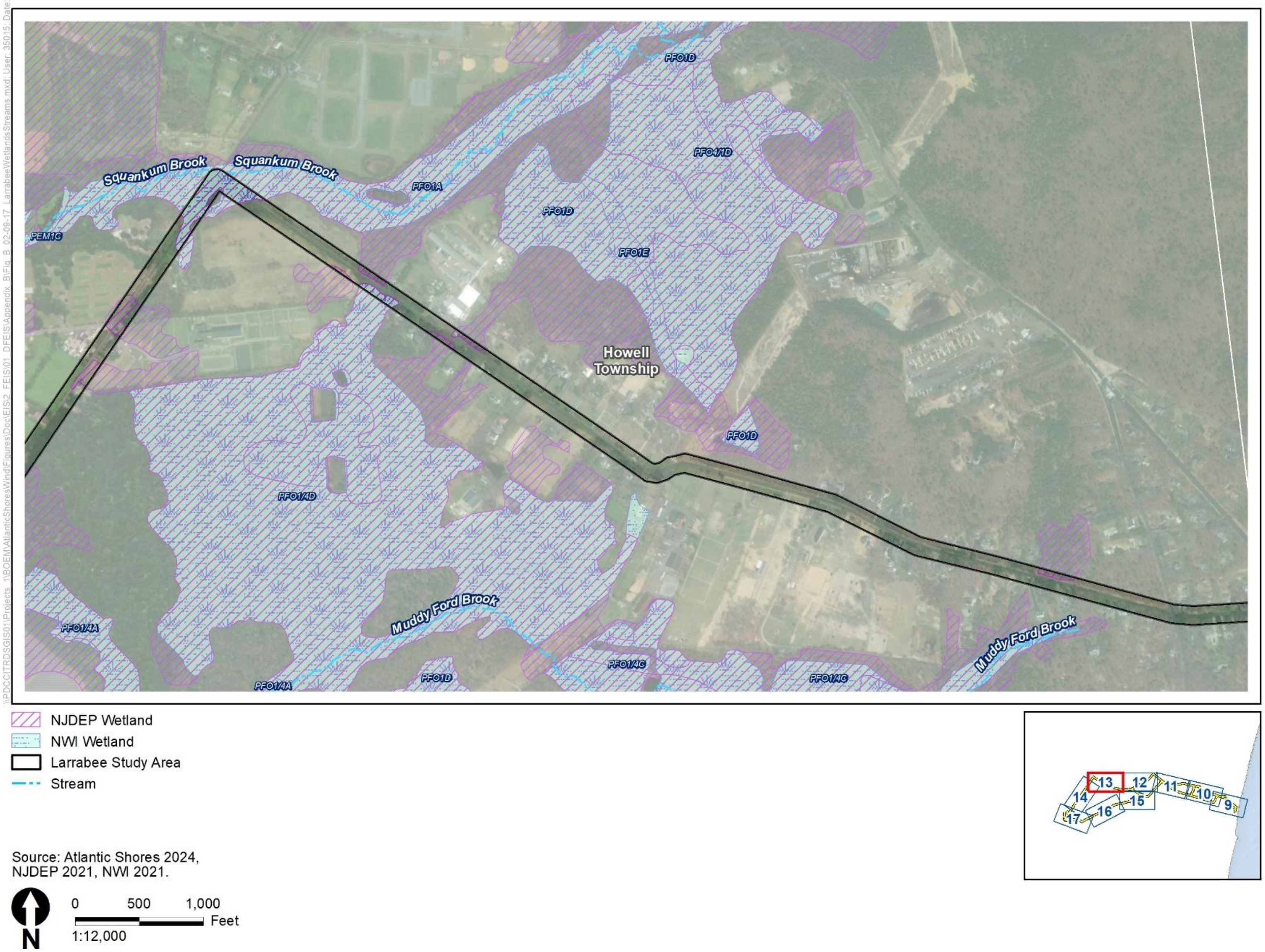


Figure B.2-13. NJDEP/NWI mapped wetlands in the Larrabee study area

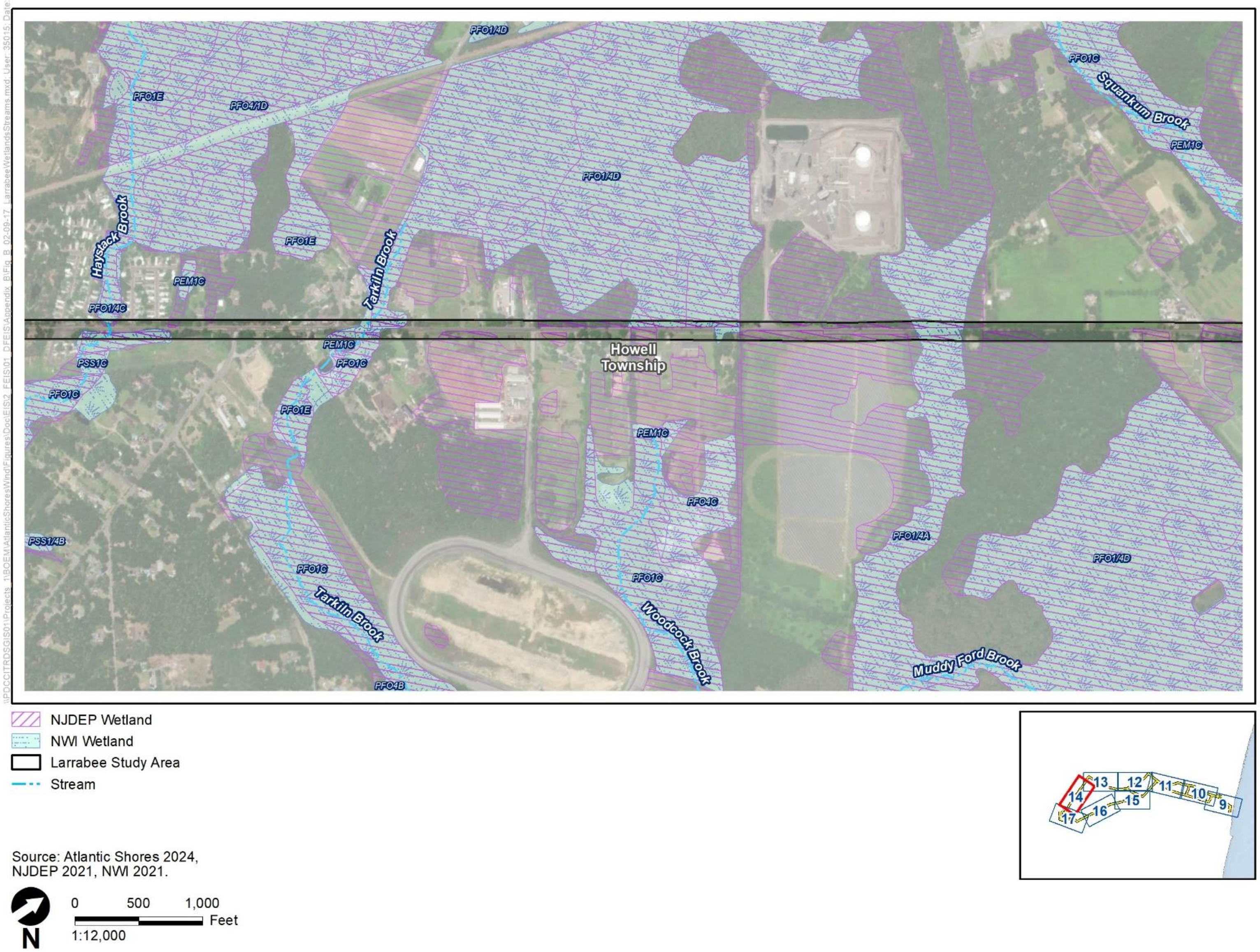


Figure B.2-14. NJDEP/NWI mapped wetlands in the Larrabee study area

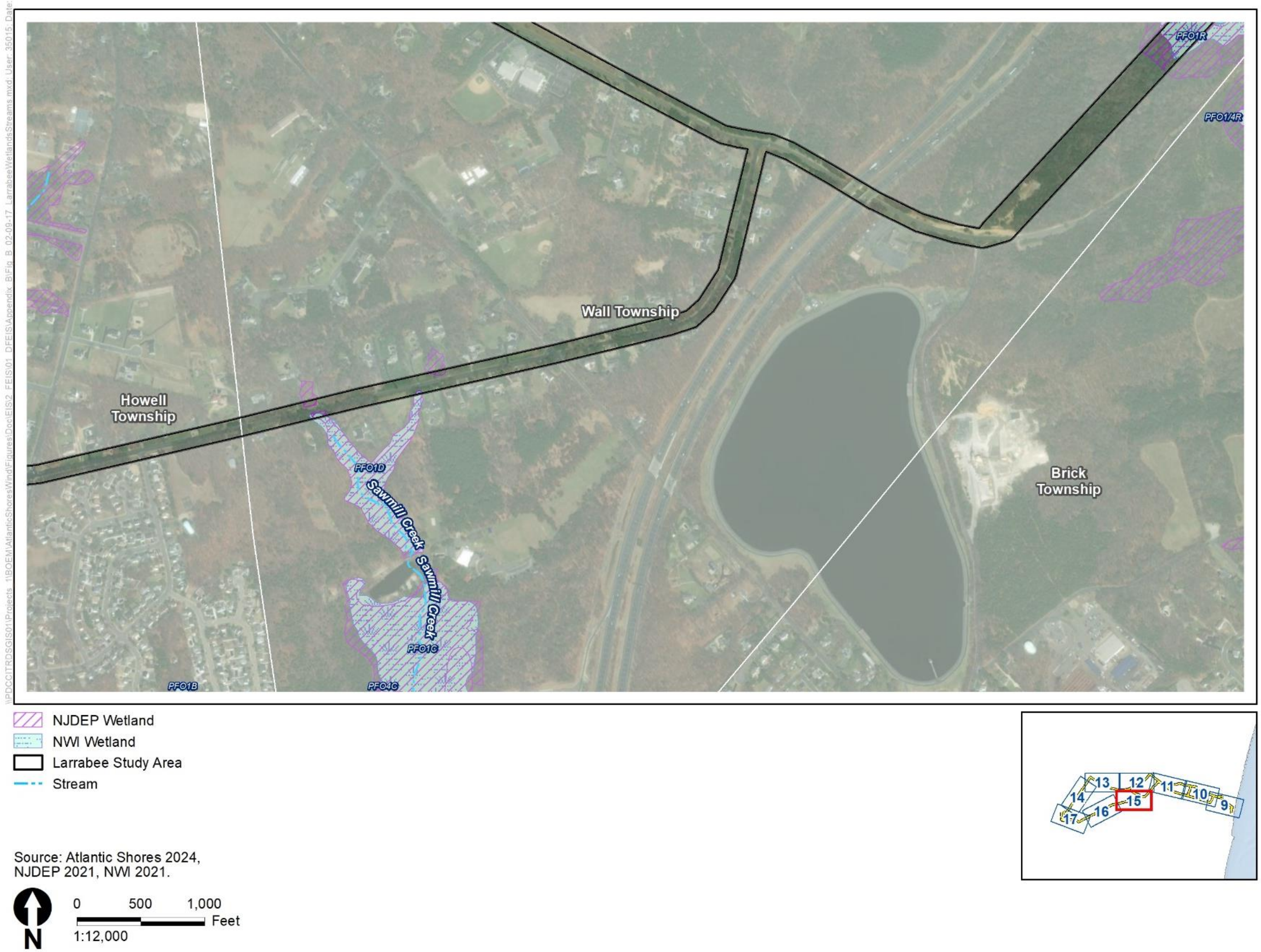


Figure B.2-15. NJDEP/NWI mapped wetlands in the Larrabee study area

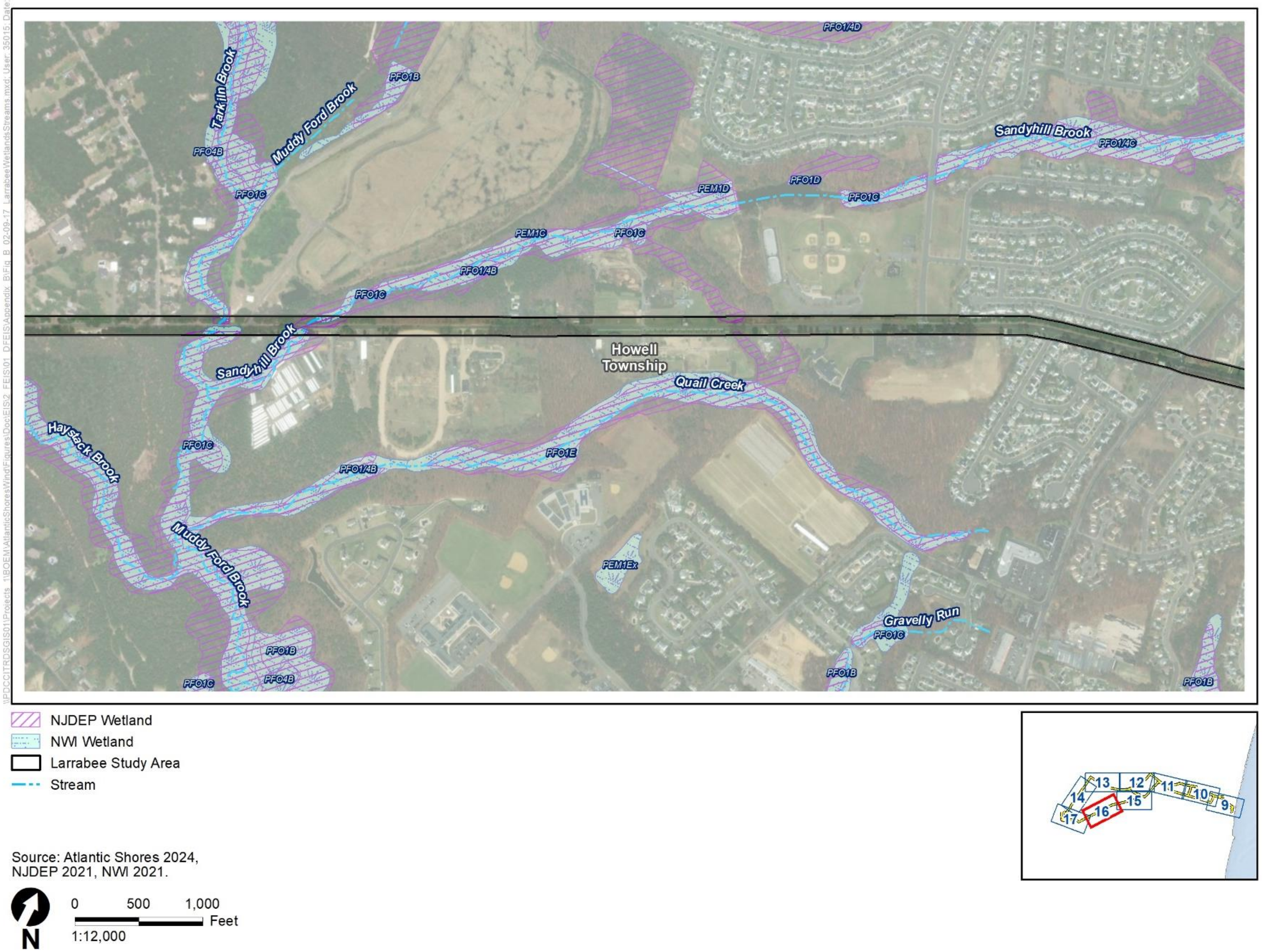
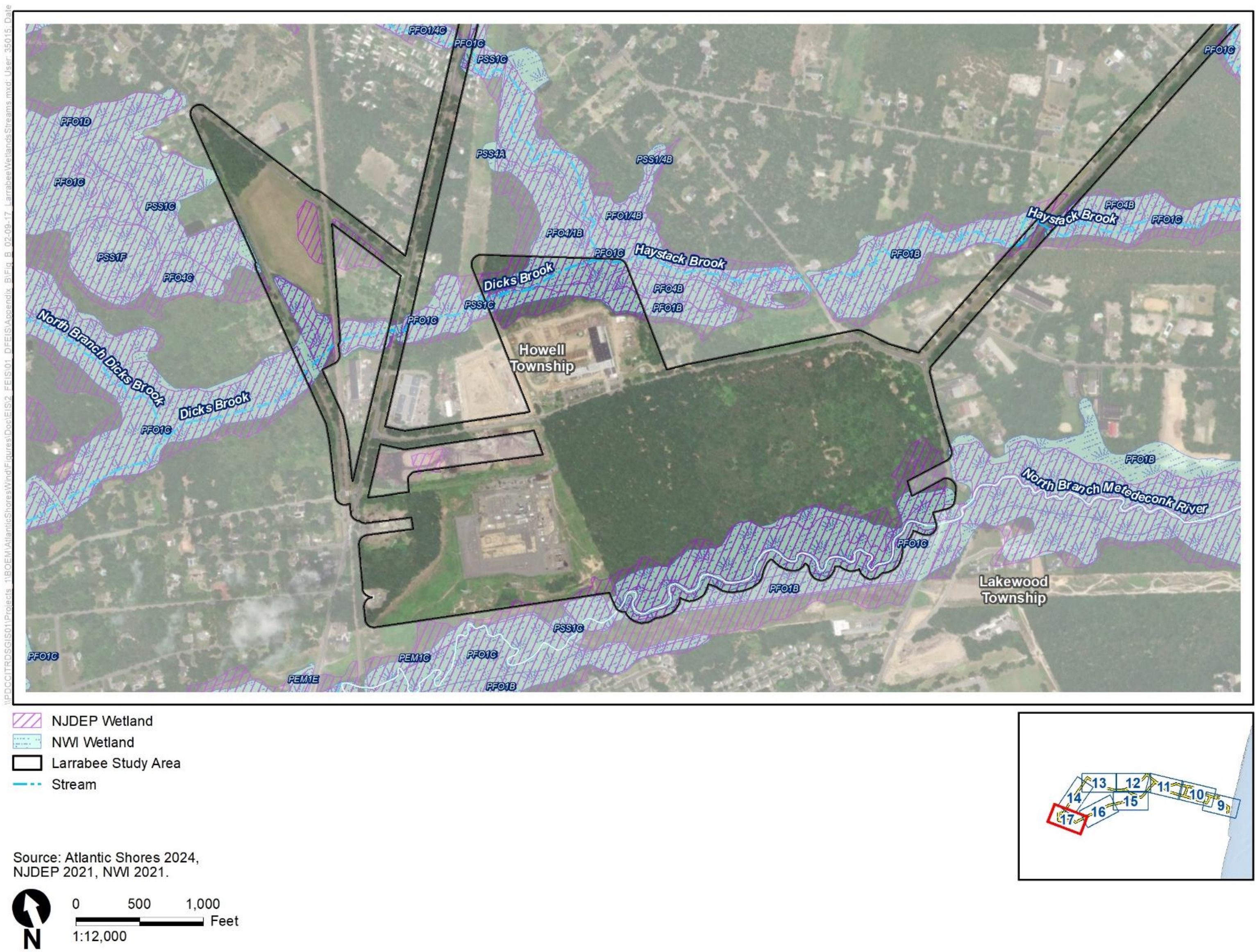


Figure B.2-16. NJDEP/NWI mapped wetlands in the Larrabee study area



Source: Atlantic Shores 2024, NJDEP 2021, NWI 2021.

Figure B.2-17. NJDEP/NWI mapped wetlands in the Larrabee study area

B.2.1 References Cited

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B.3 Commercial Fisheries and For-Hire Recreational Fishing

Table B.3-1. Number of commercial fishing vessel trips to the Project 1 WTA by species and year, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	322	260	355	205	133	145	76	148	253	309	193	139	159	133	98	195
Atlantic sea scallop	300	253	326	146	123	114	82	88	100	71	40	23	52	82	24	122
Monkfish	218	206	248	137	137	118	117	90	77	47	61	58	39	52	36	109
Black sea bass	146	95	104	116	118	138	135	93	89	75	96	81	77	111	70	103
Summer flounder	104	163	120	136	114	101	124	124	65	56	61	68	55	107	88	99
Longfin squid	77	97	56	141	114	83	120	77	90	55	66	79	51	75	61	83
American lobster	81	48	57	51	65	56	56	64	63	61	60	42	58	80	46	59
Bluefish	44	66	35	73	86	73	67	37	35	28	9	19	18	14	30	42
Scup	50	44	36	51	41	59	53	17	23	17	24	31	25	46	25	36
Butterfish	41	41	26	52	42	41	49	20	30	26	41	43	20	22	22	34
Shortfin squid	25	16	28	67	32	24	33	16	29	17	24	28	20	25	0	26
Jonah crab	0	21	21	21	33	30	25	37	24	22	8	0	19	41	21	22
Silver hake	13	28	10	22	17	21	35	10	12	20	24	29	21	27	8	20
John dory	11	11	18	32	34	29	19	25	32	25	16	13	0	10	16	19
Red hake	27	36	19	25	12	10	9	5	7	10	11	13	10	22	7	15
Channeled whelk	23	13	13	0	4	0	5	18	20	11	0	18	39	0	46	14
Weakfish	33	19	15	15	18	21	13	7	10	8	6	9	9	17	9	14
Atlantic mackerel	10	19	21	20	7	6	15	5	6	9	27	26	10	17	4	13
Smooth dogfish	0	30	11	18	19	13	13	13	8	16	15	8	13	7	7	13
Atlantic croaker	29	35	9	22	19	19	25	16	11	0	0	0	0	0	0	12
All species[1]	**1,688**	**1,613**	**1,630**	**1,466**	**1,306**	**1,251**	**1,178**	**1,007**	**1,045**	**946**	**857**	**794**	**705**	**979**	**722**	**1,146**

Source: NMFS 2023.
[1]Includes 54 species that were caught by commercial fishing vessels in the Project 1 WTA.

Table B.3-2. Number of commercial fishing vessels that visited the Project 1 WTA by species and year, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic sea scallop	152	137	159	73	55	61	53	42	70	57	35	21	34	52	15	68
Monkfish	117	121	130	81	67	54	62	51	45	28	37	35	31	38	24	61
Summer flounder	65	95	81	76	61	55	69	53	41	31	37	41	33	50	37	55
Longfin squid	38	59	26	49	47	36	58	45	38	27	33	40	34	41	25	40
Black sea bass	52	44	38	41	43	50	56	41	39	23	32	35	26	42	28	39
Bluefish	33	46	25	43	47	38	43	30	26	19	9	14	13	12	16	28
Scup	31	33	24	34	28	35	39	16	19	12	16	23	21	30	17	25
Butterfish	26	33	16	24	20	18	25	14	17	15	22	28	17	16	12	20
Atlantic surfclam	17	20	16	20	16	14	12	12	15	16	16	13	11	12	8	15
Silver hake	9	24	7	14	7	14	24	6	9	13	18	21	15	20	4	14
Weakfish	21	15	10	12	10	17	10	6	9	7	6	8	8	12	7	11
American lobster	14	20	12	9	11	10	8	7	12	9	9	10	6	12	8	10
John dory	7	8	10	16	16	15	10	8	13	14	13	12	0	6	9	10
Atlantic mackerel	7	16	15	14	5	5	9	4	6	8	13	16	7	13	3	9
Red hake	10	24	13	9	5	8	9	4	7	7	8	10	6	9	5	9
Golden tilefish	4	7	7	9	10	15	5	4	9	10	12	9	0	6	6	8
Atlantic croaker	17	22	8	13	10	8	12	10	9	0	0	0	0	0	0	7
Shortfin squid	8	6	10	11	9	7	8	5	7	8	7	8	6	7	0	7
Smooth dogfish	0	14	8	5	9	7	10	9	5	6	10	3	7	4	5	7
King whiting	8	8	0	7	10	4	8	5	8	4	7	7	4	8	5	6
All species[1]	**706**	**841**	**671**	**610**	**546**	**542**	**582**	**417**	**441**	**346**	**375**	**390**	**290**	**447**	**268**	**498**

Source: NMFS 2023.

[1]Includes 54 species that were caught by commercial fishing vessels in the Project 1 WTA.

Table B.3-3. Number of commercial fishing vessel trips to the Project 2 WTA by species and year, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	382	290	410	299	131	160	85	0	283	367	208	149	155	139	134	213
Atlantic sea scallop	312	247	338	189	157	140	104	91	121	85	42	20	55	85	22	134
Monkfish	236	197	251	146	160	140	130	95	90	53	62	60	47	60	48	118
Summer flounder	112	154	116	135	121	113	128	84	71	52	64	69	62	120	103	100
Black sea bass	124	87	98	117	119	136	139	88	88	74	82	77	73	119	80	100
Longfin squid	82	94	52	139	120	90	130	82	94	58	66	79	51	80	70	86
American lobster	55	40	51	45	58	41	53	56	58	56	49	39	47	79	49	52
Bluefish	43	63	31	70	84	83	73	32	39	27	9	16	21	18	24	42
Scup	54	44	36	56	52	74	59	20	30	22	24	32	33	57	32	42
Butterfish	42	36	21	50	36	41	47	19	31	26	41	44	20	26	25	34
Shortfin squid	24	15	25	64	31	24	32	16	30	19	24	26	21	25	0	25
Silver hake	16	27	10	25	18	22	39	11	12	23	22	32	24	33	13	22
John dory	13	10	17	31	34	27	20	25	30	24	17	13	0	11	19	19
Jonah crab	0	17	20	18	23	22	23	27	15	18	0	14	17	39	21	18
Atlantic mackerel	13	20	21	20	8	8	14	5	5	10	24	27	11	20	5	14
Weakfish	34	19	9	13	12	21	13	5	11	8	5	9	11	21	9	13
Red hake	16	32	16	22	11	9	9	5	6	9	8	10	10	21	11	13
Atlantic croaker	24	32	9	19	12	18	22	12	10	0	0	0	0	0	0	11
Golden tilefish	6	7	10	14	21	20	8	7	8	10	11	9	0	7	12	10
Channeled whelk	6	9	8	0	0	0	5	11	12	11	0	0	38	0	45	10
All species[1]	**1,717**	**1,557**	**1,607**	**1,550**	**1,311**	**1,303**	**1,208**	**740**	**1,091**	**997**	**804**	**777**	**733**	**1,052**	**774**	**1,148**

Source: NMFS 2023.

[1]Includes 50 species that were caught by commercial fishing vessels in the Project 2 WTA.

Table B.3-4. Number of commercial fishing vessels that visited the Project 2 WTA by species and year, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic sea scallop	150	132	153	78	66	66	57	44	76	54	37	18	35	54	16	69
Monkfish	127	121	124	82	75	62	70	53	50	31	37	33	37	41	31	65
Summer flounder	75	93	77	77	63	57	71	54	46	33	40	42	37	55	45	58
Longfin squid	40	61	25	52	48	38	63	49	43	29	34	41	35	42	30	42
Black sea bass	53	46	36	46	46	51	61	41	41	27	32	31	29	45	33	41
Scup	34	34	23	37	34	40	43	17	21	16	17	24	26	34	22	28
Bluefish	32	46	22	44	47	39	46	28	26	21	8	12	14	15	18	28
Butterfish	28	30	16	24	20	19	25	12	16	16	22	28	17	17	15	20
Silver hake	12	24	7	17	8	15	25	6	9	16	17	23	18	21	8	15
Atlantic surfclam	17	20	16	20	16	14	11	0	15	16	15	13	11	12	9	14
John dory	9	8	10	15	18	15	10	8	13	12	14	11	0	7	11	11
Weakfish	22	15	9	13	9	15	10	4	9	7	5	7	10	13	7	10
American lobster	11	19	11	9	16	10	7	6	11	10	7	6	6	12	9	10
Atlantic mackerel	10	16	15	14	6	5	9	3	5	9	12	19	8	14	4	10
Red hake	10	23	11	9	7	7	9	4	6	8	6	8	7	9	8	9
Shortfin squid	8	6	10	11	9	8	9	5	7	7	8	9	6	7	0	7
Golden tilefish	5	7	6	9	12	14	6	4	7	10	10	7	0	6	6	7
Smooth dogfish	5	11	5	3	9	7	8	9	3	5	8	3	8	5	7	6
Atlantic croaker	13	20	8	13	7	8	10	8	8	0	0	0	0	0	0	6
King whiting	8	7	0	7	9	5	8	6	8	4	6	6	6	8	7	6
All species[1]	**743**	**814**	**623**	**621**	**579**	**554**	**597**	**389**	**449**	**360**	**357**	**366**	**326**	**477**	**317**	**505**

Source: NMFS 2023.

[1]Includes 50 species that were caught by commercial fishing vessels in the Project 2 WTA.

Table B.3-5. Number of commercial fishing vessel trips to the combined Project 1 and Project 2 WTAs by species and year, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	405	300	423	305	143	169	90	174	295	379	217	162	169	149	140	235
Atlantic sea scallop	344	285	368	201	161	143	106	93	123	95	45	23	58	91	27	144
Monkfish	259	226	285	158	169	145	138	96	95	54	67	65	48	61	50	128
Black sea bass	155	100	108	125	135	154	145	96	100	81	101	83	86	121	81	111
Summer flounder	119	170	132	148	133	120	134	132	78	61	66	75	65	121	103	110
Longfin squid	85	101	58	149	128	96	133	84	100	60	70	85	55	81	71	90
American lobster	81	49	58	51	71	57	56	64	64	62	60	44	58	81	49	60
Bluefish	48	68	35	77	97	85	77	38	43	31	10	21	21	18	36	47
Scup	55	45	38	57	53	74	60	20	31	22	26	35	33	57	32	43
Butterfish	44	41	27	55	45	43	53	22	33	27	45	47	21	26	27	37
Shortfin squid	25	16	28	69	33	26	35	16	30	20	26	29	21	26	0	27
Jonah crab	0	21	21	21	33	30	25	37	24	22	8	16	19	41	22	23
Silver hake	16	28	11	25	18	24	39	11	14	23	25	35	24	33	14	23
John dory	13	11	19	32	36	31	20	26	34	26	17	14	0	11	20	21
Red hake	30	36	19	25	15	11	9	5	8	11	12	13	11	22	11	16
Weakfish	34	19	15	18	19	24	14	7	12	8	6	10	11	21	10	15
Atlantic mackerel	13	20	21	21	8	8	15	6	6	11	27	29	11	20	5	15
Channeled whelk	23	13	13	0	4	0	5	18	20	11	0	18	39	0	46	14
Smooth dogfish	7	30	11	18	20	13	13	14	8	16	15	9	15	9	10	14
Atlantic croaker	29	35	9	22	19	19	25	16	11	0	0	0	0	0	0	12
All species[1]	**1,944**	**1,731**	**1,803**	**1,704**	**1,498**	**1,439**	**1,306**	**1,078**	**1,198**	**1,090**	**921**	**891**	**789**	**1,090**	**865**	**1,290**

Source: NMFS 2023.

[1]Includes 55 species that were caught by commercial fishing vessels in the combined Project 1 and Project 2 WTAs.

Table B.3-6. Number of commercial fishing vessels that visited the combined Project 1 and Project 2 WTAs by species and year, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic sea scallop	165	149	168	83	67	67	57	45	77	63	40	21	37	57	18	74
Monkfish	132	130	138	89	77	63	70	54	51	32	39	37	38	42	32	68
Summer flounder	76	99	87	81	67	59	73	57	48	35	41	45	38	55	45	60
Black sea bass	58	49	40	47	48	53	63	42	45	27	35	36	31	45	34	44
Longfin squid	42	62	27	53	51	38	63	49	44	31	34	41	37	42	31	43
Bluefish	36	48	25	46	51	40	48	30	29	22	9	15	14	15	20	30
Scup	34	34	25	38	34	40	44	17	22	16	17	26	26	34	22	29
Butterfish	29	33	17	26	22	19	26	15	18	16	23	29	18	17	17	22
Silver hake	12	24	8	17	8	15	25	6	11	16	18	24	18	21	9	15
Atlantic surfclam	18	20	16	20	16	14	12	15	15	16	16	13	11	12	9	15
American lobster	14	21	13	9	16	11	8	7	13	10	9	11	6	12	9	11
John dory	9	8	11	16	18	16	10	8	14	14	14	12	0	7	12	11
Weakfish	22	15	10	15	11	17	11	6	10	7	6	8	10	13	8	11
Atlantic mackerel	10	16	15	15	6	5	9	4	6	10	13	19	8	14	4	10
Red hake	13	24	13	9	7	8	9	4	8	8	8	10	7	9	8	10
Golden tilefish	5	7	7	10	13	15	6	4	9	10	12	9	0	7	7	8
Smooth dogfish	5	14	8	5	10	7	10	10	5	6	10	3	9	5	7	8
Shortfin squid	8	6	10	11	9	8	9	5	7	8	8	9	6	7	0	7
Atlantic croaker	17	22	8	13	10	8	12	10	9	0	0	0	0	0	0	7
King whiting	8	8	0	8	11	5	8	6	8	4	8	7	6	8	7	7
All species[1]	**803**	**880**	**703**	**667**	**619**	**584**	**629**	**443**	**491**	**388**	**396**	**420**	**336**	**484**	**337**	**545**

Source: NMFS 2023.

[1]Includes 55 species that were caught by commercial fishing vessels in the combined Project 1 and Project 2 WTAs.

Table B.3-7. Number of commercial fishing vessel trips to the Project 1 WTA by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	408	312	469	334	232	221	154	245	315	366	237	179	203	216	167	271
Cape May, NJ	189	117	106	73	77	74	90	58	74	55	38	48	54	74	49	78
New Bedford, MA	37	49	82	22	12	14	6	6	24	21	13	21	23	34	21	26
Barnegat, NJ	0	26	42	45	7	64	19	24	8	14	19	0	28	33	25	24
Newport News, VA	49	58	65	40	26	28	12	0	0	7	7	4	0	10	6	21
Point Judith, RI	0	16	10	20	14	15	17	7	23	13	15	23	16	20	10	15
Hampton, VA	22	26	20	17	27	23	0	4	10	5	6	12	7	12	12	14
Point Pleasant, NJ	4	17	10	11	6	4	0	8	6	10	4	20	5	18	15	9
North Kingstown, RI	29	22	27	34	14	0	0	0	0	0	0	0	0	0	0	8
Beaufort, NC	10	0	5	0	0	0	10	10	5	7	11	6	4	9	9	6
Ocean City, MD	4	16	12	12	6	6	10	0	5	0	4	4	0	6	0	6
Sea Isle City, NJ	28	15	0	11	0	0	0	0	10	0	0	6	0	6	0	5
Barnegat Light, NJ	0	0	0	0	0	0	0	0	0	0	0	0	0	21	49	5
Davisville, RI	0	0	0	0	0	17	18	0	8	0	0	0	0	0	19	4
Wanchese, NC	10	10	8	7	0	0	12	6	6	0	0	0	0	0	0	4
Chincoteague, VA	0	8	0	0	9	7	6	0	0	0	0	0	0	0	0	2
Long Beach, NJ	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Oriental, NC	7	0	3	4	0	0	4	7	0	0	0	0	0	0	0	2
Wildwood, NJ	0	0	0	0	0	0	0	0	0	0	3	0	0	15	0	1
Montauk, NY	0	7	0	3	0	0	0	0	0	0	0	0	0	0	0	1
Shinnecock, NY	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All ports	**824**	**704**	**859**	**633**	**430**	**473**	**358**	**375**	**494**	**498**	**357**	**323**	**340**	**474**	**382**	**502**

Source: NMFS 2023.

Table B.3-8. Number of commercial fishing vessels that visited the Project 1 WTA by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Cape May, NJ	88	69	65	30	34	36	42	33	37	28	24	23	25	30	21	39
Atlantic City, NJ	29	30	22	28	24	18	16	16	16	18	20	14	11	13	12	19
New Bedford, MA	23	32	55	14	8	13	4	5	19	21	8	9	15	28	12	18
Newport News, VA	26	33	30	25	18	18	12	0	0	6	7	4	0	9	6	13
Hampton, VA	13	18	15	10	14	11	0	4	8	5	6	6	7	10	9	9
Point Judith, RI	0	11	5	6	3	7	12	3	12	9	10	17	13	10	6	8
Barnegat, NJ	0	12	14	11	6	11	8	8	6	8	10	0	7	7	5	8
Point Pleasant, NJ	4	11	8	8	6	4	0	5	4	10	4	3	5	7	8	6
Beaufort, NC	7	0	4	0	0	0	9	10	5	6	9	6	4	9	6	5
Ocean City, MD	4	8	9	6	5	5	3	0	4	0	3	3	0	5	0	4
Wanchese, NC	5	7	7	6	0	0	9	3	5	0	0	0	0	0	0	3
Oriental, NC	5	0	3	3	0	0	4	7	0	0	0	0	0	0	0	1
North Kingstown, RI	5	4	5	3	3	0	0	0	0	0	0	0	0	0	0	1
Chincoteague, VA	0	5	0	0	5	5	4	0	0	0	0	0	0	0	0	1
Sea Isle City, NJ	3	3	0	4	0	0	0	0	3	0	0	3	0	3	0	1
Davisville, RI	0	0	0	0	0	3	4	0	3	0	0	0	0	0	3	1
Long Beach, NJ	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Montauk, NY	0	5	0	3	0	0	0	0	0	0	0	0	0	0	0	1
Wildwood, NJ	0	0	0	0	0	0	0	0	0	0	3	0	0	4	0	0
Barnegat Light, NJ	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0
Shinnecock, NY	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
All ports	**224**	**252**	**242**	**157**	**126**	**131**	**127**	**94**	**122**	**111**	**104**	**88**	**87**	**138**	**91**	**140**

Source: NMFS 2023.

Table B.3-9. Number of commercial fishing vessel trips to the Project 2 WTA by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	467	344	550	459	246	252	182	263	360	438	253	191	203	227	202	309
Cape May, NJ	179	111	100	70	79	74	87	48	79	47	36	37	45	62	39	73
New Bedford, MA	33	38	70	22	13	17	5	6	26	20	14	20	23	36	18	24
Barnegat, NJ	0	24	42	35	14	64	13	23	8	13	17	0	30	35	27	23
Newport News, VA	51	61	63	41	30	31	14	0	0	6	7	3	0	11	7	22
Hampton, VA	24	26	19	20	32	25	10	5	11	8	5	12	10	16	15	16
Point Judith, RI	0	15	10	21	14	17	17	0	22	14	16	27	15	22	11	15
Point Pleasant, NJ	5	18	9	13	6	7	8	8	7	10	4	22	7	19	18	11
North Kingstown, RI	28	21	24	36	0	0	0	0	0	0	0	0	0	0	0	7
Beaufort, NC	9	0	6	0	0	0	10	10	8	11	11	7	3	11	11	6
Ocean City, MD	0	9	8	11	6	8	11	0	3	0	0	4	4	6	0	5
Wanchese, NC	11	10	8	7	0	3	15	8	6	0	0	0	0	0	0	5
Davisville, RI	0	0	0	0	0	17	18	0	8	0	0	0	0	0	19	4
Chincoteague, VA	0	7	0	0	10	8	6	0	0	0	0	0	0	0	0	2
Oriental, NC	8	0	3	4	0	0	4	8	0	0	0	0	0	0	0	2
Sea Isle City, NJ	5	9	0	4	0	0	0	0	0	0	0	0	0	6	0	2
Long Beach, NJ	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Montauk, NY	6	7	0	3	0	0	0	0	0	0	0	0	0	0	0	1
Hobucken, NC	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
Shinnecock, NY	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Belford, NJ	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Wildwood, NJ	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
All ports	**847**	**705**	**912**	**746**	**450**	**526**	**400**	**379**	**543**	**567**	**366**	**323**	**340**	**451**	**367**	**528**

Source: NMFS 2023.

Table B.3-10. Number of commercial fishing vessels that visited the Project 2 WTA by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Cape May, NJ	82	66	62	30	34	38	43	29	39	25	23	21	25	30	21	38
Atlantic City, NJ	29	29	23	28	25	17	17	18	15	18	19	15	11	14	12	19
New Bedford, MA	24	26	47	16	9	16	4	5	19	19	9	8	16	28	10	17
Newport News, VA	28	37	31	25	21	19	12	0	0	5	6	3	0	10	7	14
Hampton, VA	15	19	15	12	16	11	8	5	9	7	5	6	8	12	10	11
Point Judith, RI	0	11	5	7	3	7	12	0	12	9	10	17	12	10	7	8
Barnegat, NJ	0	11	13	8	8	10	7	7	6	7	9	0	7	8	5	7
Point Pleasant, NJ	5	12	7	8	6	7	8	5	4	10	4	4	7	7	10	7
Beaufort, NC	6	0	5	0	0	0	9	10	7	10	9	7	3	10	8	6
Wanchese, NC	6	7	7	6	0	3	12	5	5	0	0	0	0	0	0	3
Ocean City, MD	0	6	6	6	5	5	3	0	3	0	0	3	3	4	0	3
Oriental, NC	6	0	3	3	0	0	4	7	0	0	0	0	0	0	0	2
Chincoteague, VA	0	5	0	0	5	5	4	0	0	0	0	0	0	0	0	1
North Kingstown, RI	5	4	5	3	0	0	0	0	0	0	0	0	0	0	0	1
Davisville, RI	0	0	0	0	0	3	4	0	3	0	0	0	0	0	3	1
Long Beach, NJ	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Montauk, NY	4	5	0	3	0	0	0	0	0	0	0	0	0	0	0	1
Sea Isle City, NJ	3	3	0	3	0	0	0	0	0	0	0	0	0	3	0	1
Hobucken, NC	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Shinnecock, NY	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Belford, NJ	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Wildwood, NJ	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
All ports	**226**	**245**	**229**	**158**	**132**	**144**	**147**	**91**	**126**	**110**	**97**	**84**	**92**	**136**	**93**	**141**

Source: NMFS 2023.

Table B.3-11. Number of commercial fishing vessel trips to the combined Project 1 and Project 2 WTAs by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	499	358	567	473	262	264	188	275	371	453	262	204	214	237	209	322
Cape May, NJ	208	127	111	79	88	80	94	61	86	57	41	49	54	81	51	84
New Bedford, MA	44	52	86	26	13	17	6	7	27	25	14	21	25	38	21	28
Barnegat, NJ	0	33	53	48	14	65	20	25	8	14	19	0	31	35	27	26
Newport News, VA	53	63	66	43	31	31	14	0	0	7	8	4	0	11	7	23
Hampton, VA	26	28	20	20	33	25	10	5	11	8	6	12	10	16	15	16
Point Judith, RI	0	16	11	21	14	17	17	8	24	15	17	28	16	22	12	16
Point Pleasant, NJ	5	19	10	13	6	7	8	8	7	11	4	22	7	19	18	11
North Kingstown, RI	29	22	27	36	15	0	0	0	0	0	0	0	0	0	0	9
Beaufort, NC	10	0	6	0	0	0	10	10	8	11	11	8	4	11	11	7
Ocean City, MD	4	16	12	12	6	8	11	0	5	0	4	4	4	7	0	6
Sea Isle City, NJ	28	15	8	11	0	0	0	0	10	0	0	6	0	6	0	6
Barnegat Light, NJ	0	0	0	0	0	0	0	0	0	0	0	0	0	22	49	5
Wanchese, NC	11	10	8	7	0	3	15	8	6	0	0	0	0	0	0	5
Davisville, RI	0	0	0	0	0	19	18	0	8	0	0	0	0	0	19	4
Chincoteague, VA	0	8	0	0	10	8	6	0	0	0	0	0	0	0	0	2
Long Beach, NJ	32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Oriental, NC	8	0	3	5	0	0	4	8	0	0	0	0	0	0	0	2
Wildwood, NJ	0	0	0	0	0	0	0	0	0	0	3	0	0	15	0	1
Montauk, NY	6	7	0	3	0	0	0	0	0	0	0	0	0	0	0	1
Hobucken, NC	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
Shinnecock, NY	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Belford, NJ	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
All ports	**963**	**779**	**988**	**797**	**492**	**547**	**421**	**415**	**576**	**601**	**389**	**358**	**365**	**520**	**439**	**577**

Source: NMFS 2023.

Table B.3-12. Number of commercial fishing vessels that visited the combined Project 1 and Project 2 WTAs by port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Cape May, NJ	89	72	69	31	37	39	44	34	41	28	27	24	25	32	22	41
Atlantic City, NJ	31	31	24	28	25	18	18	18	16	18	20	15	11	14	12	20
New Bedford, MA	30	33	58	18	9	16	4	6	20	24	9	9	17	30	12	20
Newport News, VA	29	37	31	27	22	19	12	0	0	6	7	4	0	10	7	14
Hampton, VA	17	19	15	12	16	11	8	5	9	7	6	6	8	12	10	11
Point Judith, RI	0	11	6	7	3	7	12	3	13	9	10	18	13	10	8	9
Barnegat, NJ	0	14	15	11	8	11	8	9	6	8	10	0	8	8	5	8
Point Pleasant, NJ	5	13	8	8	6	7	8	5	4	11	4	4	7	7	10	7
Beaufort, NC	7	0	5	0	0	0	9	10	7	10	9	8	4	10	8	6
Ocean City, MD	4	8	9	6	5	5	3	0	4	0	3	3	3	5	0	4
Wanchese, NC	6	7	7	6	0	3	12	5	5	0	0	0	0	0	0	3
Oriental, NC	6	0	3	4	0	0	4	7	0	0	0	0	0	0	0	2
Sea Isle City, NJ	3	3	3	4	0	0	0	0	3	0	0	3	0	3	0	1
North Kingstown, RI	5	4	5	3	3	0	0	0	0	0	0	0	0	0	0	1
Chincoteague, VA	0	5	0	0	5	5	4	0	0	0	0	0	0	0	0	1
Davisville, RI	0	0	0	0	0	3	4	0	3	0	0	0	0	0	3	1
Long Beach, NJ	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Montauk, NY	4	5	0	3	0	0	0	0	0	0	0	0	0	0	0	1
Wildwood, NJ	0	0	0	0	0	0	0	0	0	0	3	0	0	4	0	0
Barnegat Light, NJ	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0
Hobucken, NC	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Shinnecock, NY	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Belford, NJ	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
All ports	**249**	**266**	**258**	**168**	**139**	**147**	**150**	**102**	**135**	**121**	**108**	**94**	**96**	**148**	**100**	**152**

Source: NMFS 2023.

Table B.3-13. Number of commercial fishing vessel trips to the Project 1 WTA by fishing gear type and year, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	337	277	385	263	174	180	96	189	271	321	198	146	170	161	102	218
Trawl-bottom	176	207	116	226	161	171	198	165	121	92	103	127	98	150	129	149
Dredge-scallop	244	216	310	80	72	75	54	39	86	56	35	22	41	54	15	93
Pot-other	94	41	81	93	54	96	54	69	73	52	75	61	77	107	80	74
Gillnet-sink	20	14	29	24	24	0	26	26	8	0	10	0	0	5	3	13
Pot-lobster	6	10	3	4	6	3	0	0	0	15	8	0	0	6	0	4
Trawl-midwater	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	1
All gear	**877**	**765**	**935**	**690**	**491**	**525**	**428**	**488**	**559**	**536**	**429**	**356**	**386**	**483**	**329**	**552**

Source: NMFS 2023.

Table B.3-14. Number of commercial fishing vessels that visited the Project 1 WTA by fishing gear type and year, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Trawl-bottom	72	89	55	79	62	64	79	60	52	46	49	55	52	59	44	61
Dredge-scallop	125	119	155	58	42	52	39	32	59	48	30	20	29	49	11	58
Dredge-clam	17	22	18	22	20	14	13	13	15	16	17	13	11	14	10	16
Pot-other	10	12	11	9	7	11	7	8	8	4	6	9	6	10	9	8
Gillnet-sink	8	7	9	6	5	0	6	4	3	0	6	0	0	3	3	4
Pot-lobster	4	6	3	3	4	3	0	0	0	4	4	0	0	4	0	2
Trawl-midwater	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	1
All gear	**236**	**255**	**260**	**177**	**140**	**144**	**144**	**117**	**137**	**118**	**112**	**97**	**98**	**139**	**77**	**150**

Source: NMFS 2023.

Table B.3-15. Number of commercial fishing vessel trips to the Project 2 WTA by fishing gear type and year, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	400	308	456	387	179	205	117	206	313	395	214	158	167	169	137	254
Trawl-bottom	183	198	109	224	170	184	204	125	132	98	105	127	102	167	142	151
Dredge-scallop	255	212	305	91	98	90	65	40	96	54	38	19	43	57	13	98
Pot-other	55	31	72	83	44	79	50	56	60	45	58	52	67	106	79	62
Gillnet-sink	13	4	23	0	6	0	9	8	0	0	5	0	0	5	0	5
Pot-lobster	6	9	3	4	4	0	0	0	0	13	7	0	0	5	0	3
Trawl-midwater	0	5	12	0	0	0	0	0	0	0	0	0	0	0	0	1
All gear	**912**	**767**	**980**	**789**	**501**	**558**	**445**	**435**	**601**	**605**	**427**	**356**	**379**	**509**	**371**	**576**

Source: NMFS 2023.

Table B.3-16. Number of commercial fishing vessels that visited the Project 2 WTA by fishing gear type and year, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Trawl-bottom	79	91	53	81	66	69	84	61	59	48	50	57	52	62	50	64
Dredge-scallop	125	116	150	60	53	55	42	33	61	43	33	17	30	49	10	58
Dredge-clam	18	22	17	22	20	14	12	14	15	16	16	14	11	15	11	16
Pot-other	7	9	9	9	6	9	6	6	6	3	5	7	7	10	8	7
Gillnet-sink	8	4	8	0	5	0	5	3	0	0	3	0	0	3	0	3
Pot-lobster	4	6	3	3	3	0	0	0	0	4	3	0	0	4	0	2
Trawl-midwater	0	3	10	0	0	0	0	0	0	0	0	0	0	0	0	1
All gear	**241**	**251**	**250**	**175**	**153**	**147**	**149**	**117**	**141**	**114**	**110**	**95**	**100**	**143**	**79**	**151**

Source: NMFS 2023.

Table B.3-17. Number of commercial fishing vessel trips to the combined Project 1 and Project 2 WTAs by gear type and year, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	424	320	471	395	192	214	123	218	326	408	223	171	181	182	144	266
Trawl-bottom	190	211	121	239	180	192	213	175	139	103	111	136	108	168	144	162
Dredge-scallop	283	245	335	102	102	94	66	42	98	63	40	22	46	60	17	108
Pot-other	94	41	81	93	56	96	54	69	73	52	75	61	78	108	80	74
Gillnet-sink	25	14	38	24	24	0	26	26	8	0	10	0	0	5	3	14
Pot-lobster	6	11	3	4	6	3	0	0	0	15	8	0	0	6	0	4
Trawl-midwater	0	5	12	0	0	0	0	0	0	0	0	0	0	0	0	1
All gear	**1,022**	**847**	**1,061**	**857**	**560**	**599**	**482**	**530**	**644**	**641**	**467**	**390**	**413**	**529**	**388**	**629**

Source: NMFS 2023.

Table B.3-18. Number of commercial fishing vessels that visited the combined Project 1 and Project 2 WTAs by gear type and year, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Trawl-bottom	80	92	58	83	68	69	86	63	60	50	52	59	55	62	51	66
Dredge-scallop	138	130	165	65	53	57	42	34	62	52	35	20	32	52	13	63
Dredge-clam	18	22	18	22	20	14	13	15	15	16	17	14	11	15	11	16
Pot-other	10	12	11	9	7	11	7	8	8	4	6	9	7	10	9	9
Gillnet-sink	9	7	9	6	5	0	6	4	3	0	6	0	0	3	3	4
Pot-lobster	4	7	3	3	4	3	0	0	0	4	4	0	0	4	0	2
Trawl-midwater	0	3	10	0	0	0	0	0	0	0	0	0	0	0	0	1
All gear	**259**	**273**	**274**	**188**	**157**	**154**	**154**	**124**	**148**	**126**	**120**	**102**	**105**	**146**	**87**	**161**

Source: NMFS 2023.

Table B.3-19. Commercial fishing landings (pounds) in the Project 1 WTA by species and year, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	906,237	970,409	1,173,386	331,913	277,578	214,498	73,577	97,530	317,554	309,548	298,893	136,283	152,388	170,951	45,508	365,083
Atlantic menhaden	305,951	55,932	0	0	7,437	0	22,990	0	0	712,532	6,983	0	0	0	141,207	83,535
All others	3,295	2,240	183,694	1,399	2,210	2,654	1,105	28,254	1,614	1,901	4,517	191,555	20,932	305,420	42,669	52,897
Atlantic sea scallop	32,818	31,778	37,790	8,177	7,429	7,946	5,538	7,119	8,826	4,550	4,127	2,061	14,647	6,890	401	12,007
Shortfin squid	8,977	2,479	6,165	28,561	4,532	639	1,693	1,648	4,104	2,461	2,817	10,369	13,865	12,852	0	6,744
Longfin squid	2,372	2,267	1,151	4,953	3,064	4,464	2,210	2,491	5,447	1,897	5,123	3,993	3,740	4,404	5,480	3,537
Black sea bass	5,156	3,023	4,715	3,029	2,847	2,788	2,761	1,851	1,631	1,132	2,265	3,353	1,264	4,185	1,134	2,742
Atlantic mackerel	5,743	3,182	22,445	32	100	34	216	839	5	287	4,509	1,004	576	11	0	2,599
Atlantic herring	0	3,784	21,650	651	0	1,879	9,257	577	0	0	0	0	0	0	0	2,520
Summer flounder	1,600	2,097	1,523	3,099	1,691	1,793	1,647	2,014	366	460	233	483	622	1,840	4,593	1,604
Smooth dogfish	0	7,773	61	171	1,843	194	102	170	141	6,234	4,825	389	1,209	241	88	1,563
Atlantic croaker	6,387	5,284	2,546	527	650	1,724	927	2,193	9	0	0	0	0	0	0	1,350
Ocean quahog	0	7,608	0	4,871	0	0	0	0	0	0	0	0	0	0	0	832
American lobster	1,063	302	608	599	608	853	1,330	1,636	1,041	1,399	904	685	501	654	286	831
Scup	1,097	643	535	575	58	1,277	260	1,964	159	45	25	455	888	848	426	617
Jonah crab	0	426	444	448	341	350	653	295	56	65	29	0	61	642	440	283
Winter skate	0	0	0	499	20	160	1,768	232	0	6	1,110	0	20	58	1	258
Spiny dogfish	0	167	128	168	796	460	0	782	180	0	0	0	0	744	0	228
Monkfish	789	458	641	133	116	207	210	252	98	26	24	48	7	23	12	203
Silver hake	46	684	97	77	1,607	9	17	1	2	9	23	28	37	144	6	186
All species[1]	**1,282,801**	**1,101,960**	**1,458,556**	**390,361**	**313,460**	**242,955**	**127,119**	**150,454**	**342,291**	**1,042,995**	**336,678**	**351,163**	**211,390**	**511,064**	**242,719**	**540,398**

Source: NMFS 2023.

[1]Includes 54 species that were caught by commercial fishing vessels in the Project 1 WTA.

Table B.3-20. Commercial fishing revenue (2022 dollars) in the Project 1 WTA by species and year, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	$787,919	$734,335	$985,955	$278,614	$213,582	$171,490	$43,040	$61,195	$176,988	$201,357	$205,555	$78,260	$95,334	$136,593	$35,403	$280,375
Atlantic sea scallop	$293,505	$271,632	$363,606	$97,199	$91,287	$111,127	$78,647	$104,870	$129,467	$49,374	$44,341	$20,909	$201,483	$102,506	$8,775	$131,249
All others	$708	$675	$27,620	$1,838	$2,295	$1,760	$1,195	$4,315	$712	$935	$2,722	$63,157	$2,656	$45,671	$39,311	$13,038
Atlantic menhaden	$45,812	$6,806	$0	$0	$933	$0	$4,353	$0	$0	$88,660	$1,047	$0	$0	$0	$36,648	$12,284
Black sea bass	$14,757	$7,886	$14,698	$9,304	$7,543	$8,158	$8,710	$5,214	$4,941	$3,146	$6,340	$8,900	$3,006	$10,818	$2,238	$7,711
Summer flounder	$3,919	$4,208	$3,314	$5,410	$4,366	$5,548	$5,244	$7,843	$1,237	$2,343	$998	$1,914	$1,971	$7,872	$16,329	$4,835
Longfin squid	$3,222	$2,739	$1,363	$6,316	$4,508	$6,118	$2,665	$3,066	$8,897	$2,879	$6,731	$5,848	$5,197	$5,095	$6,876	$4,768
Shortfin squid	$2,622	$1,046	$3,456	$19,705	$2,726	$278	$708	$634	$2,933	$1,441	$2,103	$7,652	$9,586	$9,259	$0	$4,277
American lobster	$3,212	$1,170	$1,571	$1,902	$2,252	$4,541	$7,040	$7,190	$5,789	$7,573	$5,401	$4,149	$2,806	$3,433	$1,214	$3,950
Smooth dogfish	$0	$2,443	$52	$109	$2,054	$129	$85	$101	$126	$8,345	$3,472	$426	$1,218	$256	$7	$1,255
Ocean quahog	$0	$7,327	$0	$4,608	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$796
Atlantic mackerel	$1,524	$1,199	$4,659	$25	$65	$19	$91	$105	$2	$80	$1,845	$454	$344	$5	$0	$695
Atlantic croaker	$2,934	$2,662	$551	$393	$261	$861	$188	$1,506	$9	$0	$0	$0	$0	$0	$0	$624
Monkfish	$2,111	$1,049	$1,682	$341	$347	$527	$497	$548	$221	$82	$39	$105	$8	$33	$24	$508
Scup	$838	$465	$253	$366	$56	$813	$134	$962	$128	$36	$14	$419	$699	$617	$275	$405
Channeled whelk	$23	$1	$9	$0	$5	$0	$0	$73	$28	$65	$0	$109	$2,068	$0	$2,349	$315
Atlantic herring	$0	$345	$2,209	$105	$0	$611	$1,266	$120	$0	$0	$0	$0	$0	$0	$0	$310
Tautog	$1,403	$72	$794	$288	$0	$148	$0	$607	$0	$0	$242	$0	$0	$57	$0	$241
Winter skate	$0	$0	$0	$232	$14	$101	$1,462	$140	$0	$2	$188	$0	$5	$19	$1	$144
Silver hake	$2	$470	$67	$101	$1,098	$5	$8	$1	$2	$13	$15	$30	$38	$103	$2	$130
All species[1]	**$1,165,093**	**$1,047,087**	**$1,412,140**	**$427,406**	**$333,888**	**$313,309**	**$156,229**	**$199,473**	**$331,845**	**$366,663**	**$281,214**	**$192,736**	**$326,795**	**$322,830**	**$149,602**	**$468,421**

Source: NMFS 2023.

[1]Includes 54 species that were caught by commercial fishing vessels in the Project 1 WTA.

Table B.3-21. Commercial fishing landings (pounds) in the Project 2 WTA by species and year, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	1,028,887	1,230,107	1,046,104	370,757	142,977	406,535	117,624	0	526,981	423,057	241,191	143,420	180,922	137,286	58,690	403,636
All others	557	1,223	40,430	1,048	693	3,646	6,716	138,667	638	439,216	4,030	48,041	12,203	73,238	20,494	52,723
Atlantic menhaden	161,984	15,152	0	0	0	0	11,067	0	0	0	3,382	0	0	0	39,515	15,407
Atlantic sea scallop	26,344	27,167	38,761	6,525	10,755	8,480	6,057	2,777	6,545	2,391	3,477	1,288	6,035	2,809	308	9,981
Shortfin squid	6,001	2,248	7,100	19,244	3,147	443	1,295	1,133	2,725	1,237	2,992	7,143	9,796	9,668	0	4,945
Ocean quahog	0	33,453	0	7,576	0	0	0	0	0	0	0	0	0	0	0	2,735
Longfin squid	1,860	1,961	957	3,883	2,074	3,161	1,626	1,886	3,880	1,413	4,184	3,136	2,705	3,329	3,776	2,655
Atlantic mackerel	4,118	3,053	15,435	26	941	25	146	337	1	226	5,462	689	395	9	0	2,058
Summer flounder	1,389	1,402	914	2,510	1,322	962	1,928	1,143	446	278	234	371	451	2,531	4,218	1,340
Atlantic herring	368	2,745	13,510	0	0	0	0	0	0	0	0	0	0	0	0	1,108
Atlantic croaker	2,937	1,679	1,126	234	419	2,496	518	1,955	12	0	0	0	0	0	0	758
Black sea bass	1,034	489	886	724	678	855	862	435	531	312	637	1,074	436	1,325	510	719
Scup	971	581	431	497	61	1,384	308	1,422	148	60	23	323	763	742	311	535
Smooth dogfish	11	2,041	29	63	1,224	65	20	45	16	1,478	746	274	1,233	155	232	509
Monkfish	628	421	923	205	146	218	94	67	184	45	43	90	7	27	11	207
Spiny dogfish	0	675	0	19	388	11	0	0	0	0	0	0	1,373	507	0	198
American lobster	160	74	107	115	102	176	350	299	282	264	187	161	78	137	73	171
Silver hake	44	737	68	108	880	6	12	1	2	10	18	23	30	100	4	136
Clearnose skate	0	0	0	0	0	0	0	0	1,769	0	0	0	0	0	0	118
Winter skate	0	0	0	66	8	30	780	0	0	9	172	0	13	74	1	77
All species[1]	**1,237,685**	**1,325,947**	**1,167,176**	**413,951**	**166,163**	**429,159**	**149,762**	**150,383**	**544,318**	**870,283**	**266,881**	**206,348**	**216,741**	**232,787**	**128,413**	**500,400**

Source: NMFS 2023.

[1]Includes 50 species that were caught by commercial fishing vessels in the Project 2 WTA.

Table B.3-22. Commercial fishing revenue (2022 dollars) in the Project 2 WTA by species and year, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	$886,673	$992,534	$824,253	$274,916	$107,274	$320,806	$64,788	$0	$306,605	$288,767	$171,073	$86,079	$103,446	$106,032	$42,917	$305,078
Atlantic sea scallop	$236,564	$230,029	$362,883	$79,986	$129,040	$118,804	$85,402	$42,074	$96,601	$25,452	$36,443	$13,155	$76,341	$47,364	$6,727	$105,791
All others	$157	$335	$6,630	$836	$694	$2,085	$1,276	$66,595	$290	$54,526	$2,444	$17,165	$1,519	$12,774	$15,456	$12,185
Summer flounder	$3,407	$2,718	$1,998	$4,457	$3,495	$2,483	$6,605	$4,072	$1,716	$1,371	$960	$1,489	$1,416	$11,511	$15,266	$4,198
Longfin squid	$2,505	$2,270	$1,138	$4,935	$3,073	$4,334	$1,937	$2,353	$6,325	$2,137	$5,522	$4,670	$3,763	$3,887	$4,750	$3,573
Shortfin squid	$1,840	$938	$4,060	$13,285	$1,892	$194	$545	$436	$1,959	$829	$2,248	$5,238	$6,782	$6,895	$0	$3,143
Atlantic menhaden	$23,320	$1,826	$0	$0	$0	$0	$2,148	$0	$0	$0	$511	$0	$0	$0	$11,214	$2,601
Ocean quahog	$0	$31,116	$0	$7,677	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,586
Black sea bass	$3,042	$1,341	$2,969	$2,392	$2,101	$2,798	$2,925	$1,260	$1,688	$843	$1,787	$3,045	$822	$3,194	$1,119	$2,088
American lobster	$429	$311	$228	$484	$385	$915	$1,840	$1,351	$1,592	$1,188	$1,151	$946	$437	$717	$322	$820
Atlantic mackerel	$1,078	$1,056	$3,202	$20	$613	$14	$62	$44	$0	$77	$2,254	$312	$235	$4	$0	$598
Monkfish	$1,735	$927	$2,171	$499	$419	$609	$215	$179	$426	$142	$83	$201	$7	$40	$21	$512
Smooth dogfish	$12	$657	$29	$42	$1,443	$38	$17	$29	$19	$2,003	$532	$300	$1,250	$161	$10	$436
Atlantic croaker	$1,379	$706	$257	$189	$162	$1,280	$112	$1,372	$8	$0	$0	$0	$0	$0	$0	$364
Scup	$751	$354	$205	$279	$54	$818	$152	$656	$117	$48	$12	$264	$608	$548	$203	$338
Atlantic herring	$123	$248	$1,349	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$115
Silver hake	$6	$532	$45	$151	$602	$4	$6	$2	$1	$15	$13	$23	$30	$72	$1	$100
Channeled whelk	$1	$0	$2	$0	$0	$0	$0	$10	$14	$9	$0	$0	$406	$0	$541	$65
Winter skate	$0	$0	$0	$34	$5	$19	$623	$0	$0	$3	$29	$0	$3	$26	$1	$50
Tautog	$291	$11	$263	$0	$0	$73	$0	$70	$0	$0	$0	$0	$0	$14	$0	$48
All species[1]	**$1,163,559**	**$1,268,321**	**$1,211,782**	**$390,478**	**$251,492**	**$455,690**	**$168,938**	**$120,681**	**$417,694**	**$377,586**	**$225,143**	**$133,183**	**$197,558**	**$193,543**	**$98,663**	**$444,954**

Source: NMFS 2023.

[1]Includes 50 species that were caught by commercial fishing vessels in the Project 2 WTA.

Table B.3-23. Commercial fishing landings (pounds) in the combined Project 1 and Project 2 WTAs by species and year, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	1,625,893	1,895,999	1,880,090	611,046	346,777	546,454	161,835	189,533	701,340	624,054	465,727	240,418	279,337	248,659	90,142	660,487
Atlantic menhaden	414,650	65,631	0	0	7,437	0	29,886	0	0	788,465	9,008	0	0	0	170,546	99,041
All others	3,025	3,018	209,268	1,722	2,382	4,372	1,589	39,101	1,952	2,336	7,444	224,182	27,596	351,367	55,300	62,310
Atlantic sea scallop	50,904	49,932	64,265	12,616	15,686	12,988	9,501	8,935	13,065	5,935	6,457	2,815	18,524	8,596	627	18,723
Shortfin squid	12,901	3,850	10,891	41,394	6,422	937	2,453	2,405	5,859	3,220	4,629	15,102	20,036	18,668	0	9,918
Longfin squid	3,617	3,648	1,826	7,641	4,399	6,508	3,280	3,758	7,987	2,827	7,815	5,929	5,542	6,553	7,848	5,279
Atlantic mackerel	8,491	5,449	32,331	50	959	51	314	1,002	5	395	8,498	1,464	840	16	1	3,991
Atlantic herring	786	5,567	30,258	980	0	2,759	12,802	832	0	0	0	0	0	0	0	3,599
Ocean quahog	0	37,928	0	11,410	0	0	0	0	0	0	0	0	0	0	0	3,289
Black sea bass	5,756	3,297	5,197	3,464	3,245	3,287	3,216	2,087	1,924	1,314	2,592	3,884	1,549	4,959	1,478	3,150
Summer flounder	2,539	2,982	2,102	4,832	2,627	2,430	3,066	2,790	703	655	396	713	933	3,845	7,405	2,535
Atlantic croaker	8,263	6,325	3,294	685	927	3,566	1,260	3,317	19	0	0	0	0	0	0	1,844
Smooth dogfish	28	8,920	83	221	2,435	238	117	202	152	6,975	5,100	592	1,624	367	291	1,823
Scup	1,750	1,028	818	920	103	2,220	470	2,979	261	87	40	655	1,394	1,345	634	980
American lobster	1,151	343	663	669	669	948	1,486	1,784	1,202	1,550	988	762	540	727	330	921
Spiny dogfish	0	774	131	182	998	467	0	868	214	45	0	0	2,010	1,024	0	447
Monkfish	1,242	762	1,398	301	227	348	270	299	245	60	59	118	12	44	19	360
Jonah crab	0	466	502	486	367	384	712	316	69	73	29	142	69	747	517	325
Winter skate	0	0	0	544	25	174	1,891	232	0	13	1,173	0	29	118	2	280
Silver hake	76	1,207	143	165	2,045	13	25	2	3	16	34	41	56	210	8	270
All species[1]	**2,142,621**	**2,099,018**	**2,244,447**	**700,029**	**398,454**	**589,599**	**235,257**	**261,155**	**737,596**	**1,438,630**	**520,331**	**497,463**	**360,904**	**648,772**	**335,712**	**880,666**

Source: NMFS 2023.

[1]Includes 55 species that were caught by commercial fishing vessels in the combined Project 1 and Project 2 WTAs.

Table B.3-24. Commercial fishing revenue (2022 dollars) in the combined Project 1 and Project 2 WTAs by species and year, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	$1,403,021	$1,504,512	$1,539,207	$478,269	$263,607	$432,892	$91,427	$109,417	$401,133	$419,511	$326,849	$140,567	$162,383	$194,738	$67,268	$502,320
Atlantic sea scallop	$455,647	$424,949	$610,463	$151,986	$189,998	$182,247	$134,473	$132,378	$192,055	$63,943	$69,022	$28,603	$250,683	$131,394	$13,806	$202,110
All others	$536	$884	$31,832	$2,267	$2,461	$2,995	$1,502	$6,072	$887	$1,105	$4,513	$74,700	$3,443	$54,397	$48,619	$15,747
Atlantic menhaden	$61,342	$7,984	$0	$0	$933	$0	$5,693	$0	$0	$98,115	$1,354	$0	$0	$0	$45,028	$14,697
Black sea bass	$16,527	$8,652	$16,325	$10,762	$8,817	$9,862	$10,331	$5,912	$5,897	$3,619	$7,244	$10,458	$3,490	$12,657	$2,990	$8,903
Summer flounder	$6,221	$5,933	$4,578	$8,480	$6,879	$7,161	$10,198	$10,581	$2,565	$3,311	$1,663	$2,839	$2,994	$17,148	$26,488	$7,803
Longfin squid	$4,897	$4,312	$2,162	$9,739	$6,500	$8,920	$3,936	$4,653	$13,042	$4,288	$10,281	$8,706	$7,703	$7,612	$9,821	$7,105
Shortfin squid	$3,813	$1,621	$6,157	$28,564	$3,886	$409	$1,032	$926	$4,208	$1,969	$3,466	$11,128	$13,865	$13,407	$0	$6,297
American lobster	$3,460	$1,342	$1,701	$2,203	$2,483	$5,030	$7,863	$7,874	$6,698	$8,231	$5,914	$4,603	$3,024	$3,813	$1,424	$4,377
Ocean quahog	$0	$35,340	$0	$11,262	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,107
Smooth dogfish	$31	$2,808	$74	$143	$2,747	$153	$98	$122	$139	$9,347	$3,668	$648	$1,640	$386	$15	$1,468
Atlantic mackerel	$2,245	$1,960	$6,706	$39	$625	$28	$133	$127	$2	$135	$3,494	$662	$501	$7	$0	$1,111
Monkfish	$3,340	$1,707	$3,439	$748	$659	$934	$634	$676	$564	$190	$108	$261	$13	$65	$37	$892
Atlantic croaker	$3,808	$3,107	$722	$524	$367	$1,816	$262	$2,299	$15	$0	$0	$0	$0	$0	$0	$861
Scup	$1,343	$698	$389	$557	$94	$1,370	$239	$1,425	$208	$71	$22	$580	$1,114	$988	$410	$634
Atlantic herring	$262	$508	$3,039	$164	$0	$897	$1,705	$174	$0	$0	$0	$0	$0	$0	$0	$450
Channeled whelk	$23	$2	$10	$0	$5	$0	$0	$79	$39	$71	$0	$118	$2,289	$0	$2,706	$356
Tautog	$1,536	$78	$954	$306	$0	$214	$0	$643	$0	$0	$262	$0	$0	$66	$0	$271
Silver hake	$7	$850	$96	$226	$1,399	$7	$11	$3	$3	$23	$24	$43	$57	$149	$3	$193
Jonah crab	$0	$12	$25	$130	$139	$423	$376	$509	$83	$60	$31	$178	$100	$187	$123	$158
All species[1]	**$1,968,843**	**$2,008,132**	**$2,228,224**	**$707,254**	**$492,130**	**$656,392**	**$272,193**	**$284,609**	**$628,074**	**$614,380**	**$438,291**	**$284,677**	**$454,122**	**$437,542**	**$218,856**	**$779,581**

Source: NMFS 2023.

[1]Includes 55 species that were caught by commercial fishing vessels in the combined Project 1 and Project 2 WTAs.

Table B.3-25. Commercial fishing landings in the Project 1 WTA as a percentage of commercial fishing landings in the geographic analysis area by species, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	1.838	2.203	2.956	0.803	0.701	0.527	0.184	0.233	0.791	0.836	0.837	0.414	0.575	0.611	0.175	0.912
American eel	0.000	1.028	1.841	0.000	0.154	1.304	0.000	0.000	0.000	0.000	0.010	0.050	0.000	0.006	0.012	0.294
Atlantic menhaden	0.531	0.173	0.000	0.000	0.014	0.000	0.089	0.000	0.000	2.052	0.011	0.000	0.000	0.000	0.143	0.201
Black sea bass	0.325	0.355	0.402	0.239	0.220	0.160	0.152	0.109	0.083	0.037	0.087	0.126	0.041	0.123	0.032	0.166
Tautog	0.559	0.055	0.273	0.160	0.000	0.077	0.000	0.235	0.000	0.000	0.199	0.000	0.000	0.037	0.000	0.106
Smooth dogfish	0.000	0.338	0.002	0.006	0.084	0.009	0.005	0.010	0.011	0.394	0.301	0.027	0.110	0.016	0.008	0.088
Conger eel	0.015	0.017	0.005	0.000	0.000	0.000	0.118	0.567	0.042	0.088	0.066	0.112	0.000	0.044	0.013	0.073
Triggerfish	0.000	0.282	0.142	0.000	0.002	0.001	0.000	0.000	0.000	0.041	0.000	0.000	0.000	0.000	0.000	0.031
Channeled whelk	0.029	0.011	0.032	0.000	0.000	0.000	0.051	0.005	0.003	0.006	0.000	0.007	0.140	0.000	0.179	0.031
Clearnose skate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.423	0.000	0.000	0.000	0.000	0.000	0.000	0.028
Atlantic croaker	0.057	0.082	0.040	0.013	0.021	0.053	0.025	0.093	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.026
Sea scallop	0.063	0.058	0.069	0.014	0.013	0.020	0.017	0.020	0.022	0.009	0.007	0.003	0.031	0.016	0.001	0.024
Northern kingfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.287	0.000	0.019
Shortfin squid	0.026	0.006	0.018	0.068	0.018	0.008	0.009	0.031	0.028	0.005	0.005	0.017	0.022	0.019	0.000	0.019
Summer flounder	0.017	0.023	0.013	0.021	0.015	0.016	0.017	0.022	0.005	0.009	0.004	0.006	0.008	0.020	0.041	0.016
Longfin squid	0.009	0.011	0.007	0.023	0.011	0.018	0.009	0.010	0.014	0.011	0.021	0.015	0.019	0.019	0.014	0.014
Rock crab	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.195	0.000	0.013
Atlantic mackerel	0.012	0.007	0.103	0.003	0.001	0.000	0.002	0.007	0.000	0.002	0.023	0.009	0.003	0.000	0.000	0.011
Ocean pout	0.000	0.132	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
Scup	0.030	0.011	0.007	0.005	0.001	0.009	0.002	0.014	0.001	0.000	0.000	0.004	0.008	0.008	0.005	0.007

Source: NMFS 2023.

Table B.3-26. Commercial fishing revenue in the Project 1 WTA as a percentage of commercial fishing revenue in the geographic analysis area by species, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	1.885	1.890	2.782	0.780	0.592	0.476	0.124	0.160	0.482	0.582	0.631	0.258	0.388	0.557	0.164	0.783
American eel	0.000	1.472	1.336	0.000	0.106	0.873	0.000	0.000	0.000	0.000	0.008	0.065	0.000	0.008	0.007	0.258
Atlantic menhaden	0.750	0.197	0.000	0.000	0.017	0.000	0.108	0.000	0.000	1.582	0.012	0.000	0.000	0.000	0.153	0.188
Black sea bass	0.249	0.242	0.300	0.172	0.136	0.114	0.120	0.073	0.057	0.029	0.061	0.087	0.037	0.115	0.023	0.121
Smooth dogfish	0.000	0.128	0.002	0.005	0.107	0.007	0.005	0.008	0.011	0.618	0.248	0.033	0.118	0.019	0.001	0.087
Tautog	0.371	0.026	0.276	0.084	0.000	0.043	0.000	0.212	0.000	0.000	0.108	0.000	0.000	0.026	0.000	0.076
Conger eel	0.015	0.018	0.007	0.000	0.000	0.000	0.107	0.625	0.030	0.074	0.040	0.108	0.000	0.009	0.000	0.069
Triggerfish	0.000	0.312	0.066	0.000	0.002	0.000	0.000	0.000	0.000	0.027	0.000	0.000	0.000	0.000	0.000	0.027
Atlantic sea scallop	0.062	0.057	0.064	0.013	0.013	0.019	0.016	0.020	0.023	0.008	0.007	0.003	0.038	0.014	0.002	0.024
Northern kingfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.352	0.000	0.023
Shortfin squid	0.024	0.008	0.023	0.081	0.020	0.009	0.010	0.033	0.034	0.006	0.008	0.024	0.035	0.029	0.000	0.023
Clearnose skate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.304	0.000	0.000	0.000	0.000	0.000	0.000	0.020
Atlantic croaker	0.054	0.083	0.018	0.015	0.011	0.033	0.007	0.076	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020
Summer flounder	0.014	0.019	0.011	0.017	0.014	0.018	0.017	0.024	0.004	0.010	0.004	0.007	0.009	0.028	0.061	0.017
Channeled whelk	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.001	0.004	0.000	0.004	0.089	0.000	0.095	0.013
Atlantic mackerel	0.019	0.010	0.095	0.005	0.001	0.001	0.003	0.002	0.000	0.002	0.038	0.015	0.006	0.000	0.000	0.013
Longfin squid	0.011	0.012	0.007	0.020	0.012	0.019	0.009	0.008	0.015	0.010	0.016	0.012	0.019	0.015	0.012	0.013
Swordfish	0.000	0.000	0.000	0.026	0.002	0.001	0.059	0.000	0.000	0.000	0.000	0.022	0.000	0.003	0.000	0.007
Thresher shark	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.094	0.006
Scup	0.019	0.009	0.004	0.005	0.001	0.008	0.001	0.009	0.001	0.000	0.000	0.005	0.009	0.008	0.004	0.006

Source: NMFS 2023.

Table B.3-27. Commercial fishing landings in the Project 2 WTA as a percentage of commercial fishing landings in the geographic analysis area by species, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	2.087	2.793	2.635	0.897	0.361	1.000	0.295	0.000	1.312	1.143	0.676	0.436	0.683	0.490	0.226	1.002
Clearnose skate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.897	0.000	0.000	0.000	0.000	0.000	0.000	0.060
Black sea bass	0.065	0.057	0.076	0.057	0.052	0.049	0.047	0.025	0.027	0.010	0.024	0.040	0.014	0.039	0.014	0.040
Northern kingfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.536	0.000	0.036
Smooth dogfish	0.001	0.089	0.001	0.002	0.056	0.003	0.001	0.003	0.001	0.094	0.046	0.019	0.112	0.010	0.020	0.030
Atlantic menhaden	0.281	0.047	0.000	0.000	0.000	0.000	0.043	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.040	0.028
American eel	0.000	0.139	0.000	0.000	0.024	0.159	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.003	0.022
Atlantic sea scallop	0.051	0.049	0.070	0.011	0.019	0.021	0.018	0.008	0.016	0.005	0.006	0.002	0.013	0.007	0.001	0.020
Atlantic croaker	0.026	0.026	0.018	0.006	0.014	0.077	0.014	0.083	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.018
Tautog	0.109	0.012	0.063	0.000	0.000	0.021	0.000	0.027	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.016
Shortfin squid	0.017	0.006	0.020	0.046	0.012	0.005	0.007	0.021	0.019	0.002	0.006	0.012	0.016	0.014	0.000	0.014
Summer flounder	0.015	0.015	0.008	0.017	0.012	0.009	0.020	0.012	0.006	0.005	0.004	0.005	0.006	0.027	0.037	0.013
Longfin squid	0.007	0.010	0.006	0.018	0.008	0.013	0.006	0.007	0.010	0.008	0.017	0.012	0.014	0.015	0.010	0.011
Conger eel	0.002	0.003	0.002	0.000	0.000	0.000	0.019	0.062	0.005	0.024	0.008	0.021	0.000	0.011	0.003	0.011
Triggerfish	0.000	0.053	0.030	0.000	0.001	0.001	0.050	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.009
Atlantic mackerel	0.009	0.006	0.071	0.002	0.008	0.000	0.001	0.003	0.000	0.001	0.028	0.006	0.002	0.000	0.000	0.009
Ocean quahog	0.000	0.096	0.000	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
Channeled whelk	0.003	0.003	0.010	0.000	0.000	0.000	0.011	0.001	0.001	0.001	0.000	0.000	0.027	0.000	0.042	0.007
Scup	0.026	0.010	0.006	0.004	0.001	0.010	0.002	0.010	0.001	0.000	0.000	0.003	0.007	0.007	0.003	0.006
John dory	0.009	0.005	0.007	0.003	0.002	0.004	0.005	0.006	0.007	0.007	0.003	0.001	0.000	0.002	0.008	0.005

Source: NMFS 2023.

Table B.3-28. Commercial fishing revenue in the Project 2 WTA as a percentage of commercial fishing revenue in the geographic analysis area by species, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	2.122	2.555	2.325	0.769	0.298	0.890	0.187	0.000	0.835	0.835	0.525	0.284	0.421	0.433	0.199	0.845
Northern kingfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.683	0.000	0.046
Atlantic menhaden	0.382	0.053	0.000	0.000	0.000	0.000	0.053	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.047	0.036
Clearnose skate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.539	0.000	0.000	0.000	0.000	0.000	0.000	0.036
Smooth dogfish	0.001	0.034	0.001	0.002	0.075	0.002	0.001	0.002	0.002	0.148	0.038	0.023	0.121	0.012	0.001	0.031
Black sea bass	0.051	0.041	0.061	0.044	0.038	0.039	0.040	0.018	0.020	0.008	0.017	0.030	0.010	0.034	0.012	0.031
American eel	0.000	0.179	0.000	0.000	0.016	0.109	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.002	0.021
Atlantic sea scallop	0.050	0.049	0.064	0.011	0.018	0.021	0.017	0.008	0.017	0.004	0.006	0.002	0.014	0.007	0.001	0.019
Shortfin squid	0.017	0.007	0.027	0.055	0.014	0.007	0.008	0.023	0.023	0.003	0.008	0.016	0.025	0.022	0.000	0.017
Tautog	0.077	0.004	0.091	0.000	0.000	0.021	0.000	0.024	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.015
Summer flounder	0.012	0.012	0.007	0.014	0.011	0.008	0.021	0.012	0.006	0.006	0.004	0.005	0.006	0.041	0.057	0.015
Atlantic croaker	0.026	0.022	0.009	0.007	0.007	0.049	0.004	0.069	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013
Atlantic mackerel	0.014	0.009	0.065	0.004	0.013	0.001	0.002	0.001	0.000	0.002	0.046	0.010	0.004	0.000	0.000	0.011
Longfin squid	0.009	0.010	0.006	0.016	0.008	0.013	0.006	0.006	0.011	0.007	0.013	0.010	0.014	0.011	0.008	0.010
Conger eel	0.002	0.003	0.002	0.000	0.000	0.000	0.017	0.068	0.003	0.018	0.005	0.021	0.000	0.002	0.000	0.010
Ocean quahog	0.000	0.107	0.000	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
Triggerfish	0.000	0.068	0.018	0.000	0.001	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.001	0.000	0.006
Swordfish	0.000	0.000	0.000	0.017	0.001	0.000	0.035	0.000	0.000	0.000	0.000	0.015	0.000	0.002	0.000	0.005
Scup	0.017	0.007	0.003	0.004	0.001	0.008	0.002	0.006	0.001	0.000	0.000	0.003	0.007	0.007	0.003	0.005
John dory	0.006	0.003	0.012	0.003	0.002	0.003	0.003	0.003	0.004	0.004	0.003	0.001	0.000	0.003	0.003	0.003

Source: NMFS 2023.

Table B.3-29. Commercial fishing landings in the combined Project 1 and Project 2 WTAs as a percentage of commercial fishing landings in the geographic analysis area by species, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surf clam	3.298	4.305	4.736	1.479	0.876	1.344	0.405	0.452	1.746	1.686	1.305	0.731	1.054	0.888	0.346	1.643
American eel	0.000	1.104	1.976	0.000	0.168	1.381	0.000	0.000	0.000	0.000	0.010	0.050	0.000	0.007	0.014	0.314
Atlantic menhaden	0.720	0.203	0.000	0.000	0.014	0.000	0.116	0.000	0.000	2.271	0.014	0.000	0.000	0.000	0.173	0.234
Black sea bass	0.363	0.387	0.443	0.274	0.251	0.188	0.177	0.122	0.097	0.043	0.100	0.146	0.050	0.145	0.042	0.189
Tautog	0.613	0.060	0.308	0.169	0.000	0.090	0.000	0.249	0.000	0.000	0.215	0.000	0.000	0.043	0.000	0.117
Smooth dogfish	0.002	0.388	0.002	0.007	0.111	0.011	0.006	0.012	0.012	0.441	0.318	0.041	0.148	0.024	0.025	0.103
Conger eel	0.015	0.018	0.006	0.000	0.000	0.000	0.127	0.600	0.045	0.102	0.070	0.122	0.000	0.051	0.015	0.078
Clearnose skate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.158	0.000	0.000	0.000	0.000	0.000	0.000	0.077
Northern kingfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.740	0.000	0.049
Triggerfish	0.000	0.312	0.158	0.000	0.002	0.001	0.147	0.000	0.000	0.044	0.000	0.000	0.000	0.001	0.000	0.044
Atlantic sea scallop	0.098	0.090	0.117	0.022	0.028	0.032	0.029	0.025	0.033	0.012	0.011	0.005	0.039	0.020	0.002	0.038
Atlantic croaker	0.073	0.098	0.052	0.017	0.031	0.110	0.035	0.140	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.037
Channeled whelk	0.031	0.013	0.038	0.000	0.000	0.000	0.057	0.006	0.003	0.006	0.000	0.008	0.155	0.000	0.207	0.035
Shortfin squid	0.037	0.009	0.031	0.099	0.025	0.011	0.013	0.045	0.040	0.006	0.009	0.025	0.032	0.028	0.000	0.027
Summer flounder	0.027	0.033	0.019	0.033	0.023	0.022	0.031	0.030	0.010	0.013	0.007	0.009	0.012	0.041	0.066	0.025
Longfin squid	0.014	0.018	0.012	0.036	0.016	0.027	0.013	0.015	0.021	0.016	0.031	0.022	0.028	0.029	0.020	0.021
Atlantic mackerel	0.018	0.011	0.149	0.004	0.008	0.001	0.002	0.008	0.000	0.003	0.044	0.013	0.005	0.000	0.000	0.018
Rock crab	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.222	0.000	0.015
Scup	0.047	0.017	0.011	0.008	0.001	0.015	0.004	0.022	0.002	0.001	0.000	0.006	0.013	0.013	0.007	0.011
Ocean pout	0.000	0.148	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010

Source: NMFS 2023.

Table B.3-30. Commercial fishing revenue in the combined Project 1 and Project 2 WTAs as a percentage of commercial fishing revenue in the geographic analysis area by species, 2008–2022

Species	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic surfclam	3.357	3.873	4.343	1.338	0.731	1.201	0.263	0.286	1.092	1.213	1.003	0.463	0.661	0.794	0.311	1.395
American eel	0.000	1.575	1.441	0.000	0.115	0.926	0.000	0.000	0.000	0.000	0.008	0.065	0.000	0.009	0.009	0.276
Atlantic menhaden	1.005	0.231	0.000	0.000	0.017	0.000	0.141	0.000	0.000	1.750	0.015	0.000	0.000	0.000	0.188	0.223
Black sea bass	0.278	0.266	0.334	0.199	0.158	0.138	0.142	0.083	0.068	0.034	0.070	0.102	0.043	0.134	0.031	0.139
Smooth dogfish	0.002	0.147	0.003	0.007	0.144	0.008	0.006	0.009	0.012	0.692	0.262	0.050	0.159	0.028	0.002	0.102
Tautog	0.406	0.029	0.331	0.089	0.000	0.061	0.000	0.224	0.000	0.000	0.117	0.000	0.000	0.030	0.000	0.086
Conger eel	0.015	0.019	0.008	0.000	0.000	0.000	0.115	0.662	0.032	0.083	0.043	0.118	0.000	0.011	0.000	0.074
Northern kingfish	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.932	0.000	0.062
Clearnose skate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.743	0.000	0.000	0.000	0.000	0.000	0.000	0.050
Atlantic sea scallop	0.096	0.090	0.107	0.021	0.027	0.032	0.027	0.025	0.034	0.011	0.011	0.004	0.047	0.019	0.003	0.037
Shortfin squid	0.035	0.012	0.041	0.118	0.029	0.014	0.014	0.048	0.048	0.008	0.013	0.035	0.051	0.042	0.000	0.034
Triggerfish	0.000	0.351	0.076	0.000	0.002	0.000	0.001	0.000	0.001	0.029	0.000	0.000	0.000	0.001	0.000	0.031
Atlantic croaker	0.071	0.097	0.024	0.020	0.015	0.069	0.009	0.116	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.028
Summer flounder	0.022	0.027	0.016	0.026	0.021	0.023	0.032	0.032	0.009	0.013	0.007	0.010	0.013	0.061	0.099	0.028
Atlantic mackerel	0.028	0.017	0.136	0.008	0.013	0.001	0.004	0.003	0.000	0.003	0.072	0.022	0.009	0.000	0.000	0.021
Longfin squid	0.017	0.018	0.011	0.031	0.017	0.028	0.013	0.013	0.022	0.015	0.024	0.018	0.028	0.022	0.017	0.020
Channeled whelk	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.001	0.004	0.000	0.005	0.099	0.000	0.109	0.015
Ocean quahog	0.000	0.121	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
Swordfish	0.000	0.000	0.000	0.037	0.002	0.001	0.083	0.000	0.000	0.000	0.000	0.032	0.000	0.005	0.000	0.011
Scup	0.031	0.013	0.006	0.007	0.001	0.014	0.003	0.013	0.002	0.001	0.000	0.007	0.014	0.013	0.006	0.009

Source: NMFS 2023.

Table B.3-31. Commercial fishing landings (pounds) in the Project 1 WTA by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	915,422	977,896	1,172,482	341,326	282,380	218,504	78,612	98,188	315,508	312,640	302,501	140,415	153,268	170,501	47,599	368,483
Cape May, NJ	57,272	44,605	45,330	27,525	14,525	5,669	33,142	37,831	9,209	715,554	10,527	23,653	22,383	306,149	133,455	99,122
All_others	274,975	43,027	190,163	4,390	4,526	3,471	5,000	8,381	7,699	4,090	13,836	183,164	16,186	14,164	713	51,586
New Bedford, MA	4,914	5,045	9,589	840	954	3,515	641	337	1,570	3,326	1,252	2,090	15,398	4,018	27,582	5,405
Newport News, VA	14,756	10,818	14,328	3,305	3,148	1,305	1,638	0	0	301	194	156	0	414	193	3,370
Barnegat, NJ	0	569	942	520	1,674	4,430	3,193	3,054	2,349	6,415	7,397	0	2,633	1,687	8,183	2,870
North Kingstown, RI	8,475	5,546	13,089	8,548	3,254	0	0	0	0	0	0	0	0	0	0	2,594
Davisville, RI	0	0	0	0	0	3,550	2,903	0	2,190	0	0	0	0	0	21,666	2,021
Hampton, VA	3,620	3,089	2,632	1,155	697	893	0	1,874	284	76	150	507	136	1,530	445	1,139
Point Pleasant, NJ	264	3,074	7,576	673	59	13	0	90	1,842	61	116	231	512	341	345	1,013
Point Judith, RI	0	477	1,085	844	416	1,161	770	242	497	415	462	674	837	1,189	976	670
Ocean City, MD	59	2,464	331	812	1,552	343	430	0	692	0	95	113	0	281	0	478
Beaufort, NC	753	0	95	0	0	0	174	177	75	127	97	111	36	4,635	543	455
Wildwood, NJ	0	0	0	0	0	0	0	0	0	0	48	0	0	5,350	0	360
Chincoteague, VA	0	2,951	0	0	275	99	267	0	0	0	0	0	0	0	0	240
Wanchese, NC	638	497	799	196	0	0	250	83	62	0	0	0	0	0	0	168
Sea Isle City, NJ	229	590	0	68	0	0	0	0	315	0	0	50	0	305	0	104
Barnegat Light, NJ	0	0	0	0	0	0	0	0	0	0	0	0	0	500	1,020	101
Long Beach, NJ	1,035	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69
Oriental, NC	389	0	114	47	0	0	97	197	0	0	0	0	0	0	0	56
Montauk, NY	0	718	0	111	0	0	0	0	0	0	0	0	0	0	0	55
Shinnecock, NY	0	592	0	0	0	0	0	0	0	0	0	0	0	0	0	39
All ports	**1,282,800**	**1,101,959**	**1,458,556**	**390,361**	**313,461**	**242,954**	**127,119**	**150,454**	**342,292**	**1,043,007**	**336,677**	**351,164**	**211,390**	**511,066**	**242,719**	**540,399**

Source: NMFS 2023.

Table B.3-32. Commercial fishing revenue (2022 dollars) in the Project 1 WTA by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	$807,890	$745,610	$1,000,516	$299,239	$233,477	$185,071	$59,187	$71,907	$183,571	$211,775	$217,028	$90,576	$100,879	$147,256	$40,585	$292,971
Cape May, NJ	$84,925	$84,412	$116,786	$44,174	$34,584	$26,048	$32,403	$99,349	$54,669	$94,238	$18,603	$16,752	$18,318	$52,420	$36,855	$54,302
All_others	$86,819	$51,327	$69,062	$39,694	$14,862	$30,729	$28,312	$13,288	$31,400	$7,619	$20,848	$72,780	$20,745	$20,288	$908	$33,912
New Bedford, MA	$12,949	$37,783	$49,431	$6,111	$9,141	$44,020	$5,222	$1,703	$19,572	$36,442	$6,115	$7,245	$174,198	$14,043	$35,914	$30,659
Newport News, VA	$126,600	$85,908	$134,366	$21,020	$31,903	$13,227	$20,837	$0	$0	$3,099	$802	$1,315	$0	$3,133	$245	$29,497
Barnegat, NJ	$0	$4,475	$6,061	$757	$2,232	$7,636	$3,689	$4,557	$32,689	$11,609	$15,631	$0	$7,073	$12,152	$17,458	$8,401
Hampton, VA	$31,123	$22,161	$21,454	$4,844	$2,195	$2,044	$0	$5,609	$2,568	$215	$357	$1,290	$144	$2,688	$974	$6,511
Beaufort, NC	$1,490	$0	$234	$0	$0	$0	$486	$608	$193	$632	$259	$456	$80	$60,052	$1,152	$4,376
North Kingstown, RI	$5,469	$2,997	$6,873	$7,211	$2,303	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,657
Point Pleasant, NJ	$2,178	$1,546	$4,452	$1,482	$339	$17	$0	$1,405	$2,300	$304	$152	$665	$4,321	$1,196	$1,013	$1,425
Davisville, RI	$0	$0	$0	$0	$0	$2,025	$1,665	$0	$3,389	$0	$0	$0	$0	$0	$13,013	$1,339
Point Judith, RI	$0	$566	$918	$981	$641	$1,441	$1,029	$320	$710	$731	$670	$1,097	$1,036	$1,336	$1,293	$851
Ocean City, MD	$142	$3,994	$767	$1,226	$1,670	$857	$1,921	$0	$571	$0	$352	$410	$0	$560	$0	$831
Sea Isle City, NJ	$257	$1,774	$0	$192	$0	$0	$0	$0	$109	$0	$0	$150	$0	$3,283	$0	$384
Wildwood, NJ	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$397	$0	$0	$3,889	$0	$286
Wanchese, NC	$1,021	$849	$993	$287	$0	$0	$643	$227	$105	$0	$0	$0	$0	$0	$0	$275
Chincoteague, VA	$0	$2,414	$0	$0	$542	$193	$586	$0	$0	$0	$0	$0	$0	$0	$0	$249
Long Beach, NJ	$3,620	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$241
Oriental, NC	$611	$0	$229	$82	$0	$0	$248	$501	$0	$0	$0	$0	$0	$0	$0	$111
Barnegat Light, NJ	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$536	$193	$49
Montauk, NY	$0	$582	$0	$109	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$46
Shinnecock, NY	$0	$688	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$46
All ports	**$1,165,094**	**$1,047,085**	**$1,412,142**	**$427,406**	**$333,889**	**$313,309**	**$156,229**	**$199,474**	**$331,845**	**$366,664**	**$281,214**	**$192,736**	**$326,794**	**$322,833**	**$149,602**	**$468,421**

Source: NMFS 2023.

Table B.3-33. Commercial fishing landings (pounds) in the Project 2 WTA by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	1,030,505	1,241,970	1,018,436	379,799	144,837	407,695	119,050	120,561	514,804	423,557	242,583	144,814	181,207	137,845	59,148	411,121
Cape May, NJ	47,815	20,978	29,831	18,581	5,245	4,317	19,344	21,285	6,978	440,129	5,647	2,260	13,786	73,312	22,773	48,819
All_others	137,532	14,686	50,175	3,093	6,130	2,383	3,457	4,665	5,465	2,837	14,417	56,019	11,350	12,156	794	21,677
Point Pleasant, NJ	307	21,935	29,369	273	68	22	60	82	7,214	80	276	196	544	369	354	4,077
New Bedford, MA	3,558	4,859	6,691	611	963	3,662	425	409	1,344	1,131	1,205	1,643	5,925	2,663	9,380	2,965
Newport News, VA	6,748	8,145	16,448	2,900	5,986	1,205	1,985	0	0	219	173	63	0	296	251	2,961
Davisville, RI	0	0	0	0	0	2,448	2,063	0	1,486	0	0	0	0	0	26,641	2,176
Barnegat, NJ	0	671	1,242	494	1,353	5,109	1,482	2,366	422	1,809	1,671	0	3,011	2,412	7,606	1,977
North Kingstown, RI	5,974	4,725	10,397	5,940	0	0	0	0	0	0	0	0	0	0	0	1,802
Hampton, VA	2,741	2,835	2,333	878	602	815	56	655	299	107	179	379	100	1,434	350	917
Ocean City, MD	0	2,088	94	430	445	338	604	0	5,675	0	0	115	78	261	0	675
Point Judith, RI	0	481	1,462	628	358	936	577	0	451	334	555	780	708	1,018	636	595
Beaufort, NC	997	0	72	0	0	0	172	153	73	90	105	77	32	859	482	207
Wanchese, NC	449	374	549	177	0	116	214	72	44	0	0	0	0	0	0	133
Montauk, NY	198	818	0	92	0	0	0	0	0	0	0	0	0	0	0	74
Chincoteague, VA	0	596	0	0	176	99	206	0	0	0	0	0	0	0	0	72
Shinnecock, NY	0	636	0	0	0	0	0	0	0	0	0	0	0	0	0	42
Long Beach, NJ	585	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
Oriental, NC	270	0	78	32	0	0	66	134	0	0	0	0	0	0	0	39
Sea Isle City, NJ	6	149	0	21	0	0	0	0	0	0	0	0	0	166	0	23
Wildwood, NJ	0	0	0	0	0	0	0	0	0	0	70	0	0	0	0	5
Hobucken, NC	0	0	0	0	0	0	0	0	63	0	0	0	0	0	0	4
Belford, NJ	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	1
All ports	**1,237,685**	**1,325,946**	**1,167,176**	**413,950**	**166,162**	**429,158**	**149,761**	**150,382**	**544,318**	**870,292**	**266,881**	**206,348**	**216,740**	**232,789**	**128,415**	**500,400**

Source: NMFS 2023.

Table B.3-34. Commercial fishing revenue (2022 dollars) in the Project 2 WTA by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	$892,312	$1,017,547	$809,982	$295,692	$123,329	$327,690	$70,522	$67,127	$299,986	$290,454	$174,389	$89,427	$104,650	$108,958	$44,103	$314,411
Cape May, NJ	$101,881	$71,974	$109,496	$26,618	$28,615	$23,869	$32,264	$32,782	$50,735	$59,883	$9,853	$7,591	$13,624	$19,525	$8,007	$39,781
Newport News, VA	$57,783	$64,850	$152,181	$20,190	$64,329	$13,019	$24,999	$0	$0	$2,166	$449	$451	$0	$1,777	$396	$26,839
All_others	$66,833	$35,895	$54,309	$30,017	$18,491	$28,998	$27,934	$8,493	$26,976	$6,314	$22,370	$26,297	$17,054	$19,533	$1,149	$26,044
New Bedford, MA	$8,685	$33,203	$33,910	$4,675	$9,891	$46,919	$3,434	$3,733	$17,373	$12,413	$7,788	$5,918	$51,100	$12,874	$14,428	$17,756
Barnegat, NJ	$0	$6,187	$3,735	$1,689	$2,998	$9,559	$3,199	$4,342	$5,596	$4,692	$7,590	$0	$5,312	$13,493	$14,394	$5,519
Hampton, VA	$23,781	$20,025	$18,334	$3,612	$2,000	$1,837	$124	$1,963	$2,842	$291	$687	$965	$109	$2,666	$753	$5,332
Point Pleasant, NJ	$1,894	$9,716	$21,632	$1,180	$428	$195	$93	$1,189	$6,123	$327	$312	$513	$4,701	$1,222	$1,030	$3,370
Davisville, RI	$0	$0	$0	$0	$0	$1,392	$1,192	$0	$2,300	$0	$0	$0	$0	$0	$12,447	$1,155
North Kingstown, RI	$3,890	$2,426	$5,758	$4,963	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,136
Beaufort, NC	$1,935	$0	$180	$0	$0	$0	$422	$523	$202	$400	$305	$317	$66	$9,409	$1,104	$991
Ocean City, MD	$0	$2,551	$235	$636	$508	$648	$2,832	$0	$4,701	$0	$0	$429	$103	$508	$0	$877
Point Judith, RI	$0	$551	$1,198	$741	$553	$1,178	$768	$0	$667	$644	$768	$1,272	$840	$1,188	$852	$748
Wanchese, NC	$724	$639	$685	$273	$0	$160	$533	$186	$86	$0	$0	$0	$0	$0	$0	$219
Long Beach, NJ	$3,153	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$210
Sea Isle City, NJ	$22	$670	$0	$41	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,389	$0	$208
Chincoteague, VA	$0	$660	$0	$0	$349	$192	$455	$0	$0	$0	$0	$0	$0	$0	$0	$110
Oriental, NC	$427	$0	$147	$55	$0	$0	$170	$342	$0	$0	$0	$0	$0	$0	$0	$76
Montauk, NY	$241	$642	$0	$96	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$65
Shinnecock, NY	$0	$784	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$52
Wildwood, NJ	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$632	$0	$0	$0	$0	$42
Hobucken, NC	$0	$0	$0	$0	$0	$0	$0	$0	$108	$0	$0	$0	$0	$0	$0	$7
Belford, NJ	$0	$0	$0	$0	$0	$35	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2
All ports	**$1,163,560**	**$1,268,320**	**$1,211,783**	**$390,478**	**$251,491**	**$455,690**	**$168,940**	**$120,681**	**$417,694**	**$377,585**	**$225,143**	**$133,181**	**$197,558**	**$193,543**	**$98,664**	**$444,954**

Source: NMFS 2023.

Table B.3-35. Commercial fishing landings (pounds) in the combined Project 1 and Project 2 WTAs by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	1,635,977	1,913,786	1,853,790	628,176	352,953	551,192	167,580	190,324	687,806	627,430	470,310	245,348	280,401	248,781	92,491	663,090
Cape May, NJ	91,373	57,996	64,458	39,962	17,706	8,469	45,152	50,889	13,968	792,438	14,019	25,038	30,887	351,735	148,361	116,830
All_others	365,812	52,591	222,450	6,544	6,315	4,885	7,229	11,326	11,103	5,973	23,601	221,111	23,463	20,903	1,202	65,634
New Bedford, MA	7,252	8,423	13,974	1,226	1,663	5,196	923	641	2,440	3,905	2,063	3,134	19,314	5,487	33,164	7,254
Newport News, VA	19,099	16,107	25,975	5,230	8,023	2,118	3,000	0	0	411	313	177	0	604	358	5,428
Point Pleasant, NJ	498	23,672	33,998	868	107	31	122	146	8,481	123	318	364	710	602	612	4,710
Barnegat, NJ	0	1,068	1,955	912	2,372	8,287	3,588	4,492	2,539	7,375	8,236	0	4,496	3,658	13,126	4,140
North Kingstown, RI	12,372	8,663	19,505	12,488	5,578	0	0	0	0	0	0	0	0	0	0	3,907
Davisville, RI	0	0	0	0	0	5,193	4,298	0	3,183	0	0	0	0	0	42,358	3,669
Hampton, VA	5,216	5,004	4,206	1,743	1,106	1,459	101	2,255	485	163	268	753	191	2,451	677	1,739
Point Judith, RI	0	802	2,266	1,255	668	1,783	1,155	378	799	636	808	1,138	1,300	1,849	1,343	1,079
Ocean City, MD	62	3,762	378	994	1,569	554	886	0	6,074	0	134	184	82	468	0	1,010
Beaufort, NC	1,455	0	141	0	0	0	288	282	125	193	170	157	58	5,130	890	593
Wildwood, NJ	0	0	0	0	0	0	0	0	0	0	91	0	0	6,179	0	418
Chincoteague, VA	0	3,345	0	0	391	163	390	0	0	0	0	0	0	0	0	286
Wanchese, NC	943	755	1,160	314	0	243	403	135	92	0	0	0	0	0	0	270
Sea Isle City, NJ	230	668	26	81	0	0	0	0	375	0	0	59	0	396	0	122
Montauk, NY	319	1,284	0	171	0	0	0	0	0	0	0	0	0	0	0	118
Barnegat Light, NJ	0	0	0	0	0	0	0	0	0	0	0	0	0	530	1,134	111
Long Beach, NJ	1,448	0	0	0	0	0	0	0	0	0	0	0	0	0	0	97
Oriental, NC	566	0	165	65	0	0	142	287	0	0	0	0	0	0	0	82
Shinnecock, NY	0	1,090	0	0	0	0	0	0	0	0	0	0	0	0	0	73
Hobucken, NC	0	0	0	0	0	0	0	0	127	0	0	0	0	0	0	8
Belford, NJ	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	2
All ports	**2,142,621**	**2,099,016**	**2,244,446**	**700,029**	**398,452**	**589,598**	**235,256**	**261,156**	**737,597**	**1,438,647**	**520,331**	**497,463**	**360,904**	**648,773**	**335,716**	**880,667**

Source: NMFS 2023.

Table B.3-36. Commercial fishing revenue (2022 dollars) in the combined Project 1 and Project 2 WEAs by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	$1,426,549	$1,538,031	$1,538,526	$516,482	$296,608	$451,557	$110,838	$121,953	$400,551	$430,883	$340,220	$154,580	$168,626	$207,348	$73,178	$518,395
Cape May, NJ	$159,491	$132,120	$189,496	$61,000	$52,731	$41,876	$52,157	$120,193	$88,681	$107,289	$25,174	$21,511	$27,324	$64,729	$42,002	$79,052
All_others	$132,449	$75,229	$105,330	$60,331	$25,904	$49,970	$46,965	$18,585	$48,994	$11,749	$35,355	$89,994	$31,966	$32,387	$1,542	$51,117
Newport News, VA	$163,758	$128,001	$242,011	$34,286	$84,511	$21,990	$37,751	$0	$0	$4,151	$1,094	$1,387	$0	$4,196	$513	$48,243
New Bedford, MA	$18,326	$59,509	$71,073	$9,117	$16,574	$65,197	$7,479	$4,663	$30,752	$42,796	$11,723	$10,921	$208,227	$21,904	$45,404	$41,578
Barnegat, NJ	$0	$9,081	$8,166	$2,200	$4,209	$15,257	$5,522	$7,735	$35,096	$14,439	$20,549	$0	$10,209	$22,632	$26,733	$12,122
Hampton, VA	$45,004	$35,800	$33,846	$7,275	$3,546	$3,196	$210	$6,754	$4,409	$451	$878	$1,921	$210	$4,295	$1,456	$9,950
Beaufort, NC	$2,840	$0	$347	$0	$0	$0	$767	$968	$329	$917	$474	$648	$126	$65,181	$1,958	$4,970
Point Pleasant, NJ	$3,456	$10,631	$24,333	$2,149	$633	$203	$180	$2,175	$7,637	$550	$376	$995	$5,735	$2,079	$1,779	$4,194
North Kingstown, RI	$8,007	$4,597	$10,472	$10,492	$3,901	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,498
Davisville, RI	$0	$0	$0	$0	$0	$2,954	$2,473	$0	$4,926	$0	$0	$0	$0	$0	$22,086	$2,163
Ocean City, MD	$158	$5,563	$888	$1,489	$1,711	$1,256	$4,074	$0	$5,016	$0	$509	$683	$106	$922	$0	$1,492
Point Judith, RI	$0	$944	$1,881	$1,465	$1,030	$2,221	$1,541	$493	$1,165	$1,157	$1,155	$1,857	$1,592	$2,115	$1,783	$1,360
Sea Isle City, NJ	$258	$2,169	$93	$216	$0	$0	$0	$0	$126	$0	$0	$179	$0	$4,751	$0	$520
Wanchese, NC	$1,514	$1,289	$1,438	$468	$0	$328	$1,017	$359	$166	$0	$0	$0	$0	$0	$0	$439
Long Beach, NJ	$5,762	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$384
Wildwood, NJ	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$784	$0	$0	$4,417	$0	$347
Chincoteague, VA	$0	$2,836	$0	$0	$771	$316	$857	$0	$0	$0	$0	$0	$0	$0	$0	$319
Oriental, NC	$889	$0	$326	$115	$0	$0	$362	$730	$0	$0	$0	$0	$0	$0	$0	$161
Montauk, NY	$382	$1,016	$0	$170	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$105
Shinnecock, NY	$0	$1,314	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$88
Barnegat Light, NJ	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$585	$421	$67
Hobucken, NC	$0	$0	$0	$0	$0	$0	$0	$0	$228	$0	$0	$0	$0	$0	$0	$15
Belford, NJ	$0	$0	$0	$0	$0	$70	$0	$0	$0	$0	$0	$0	$0	$0	$0	$5
All ports	**$1,968,845**	**$2,008,132**	**$2,228,225**	**$707,255**	**$492,129**	**$656,393**	**$272,193**	**$284,608**	**$628,075**	**$614,381**	**$438,289**	**$284,676**	**$454,122**	**$437,541**	**$218,856**	**$779,581**

Source: NMFS 2023.

Table B.3-37. Commercial fishing landings in the Project 1 WTA as a percentage of commercial fishing landings in the geographic analysis area by fishing port, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	2.582	2.968	4.748	1.145	1.025	0.783	0.263	0.370	1.286	1.261	1.201	0.600	0.871	0.985	0.260	1.356
Cape May, NJ	0.063	0.056	0.071	0.038	0.023	0.015	0.083	0.048	0.019	1.096	0.011	0.032	0.029	0.215	0.141	0.129
Barnegat, NJ	0.000	0.008	0.013	0.007	0.027	0.059	0.058	0.063	0.038	0.089	0.142	0.000	0.055	0.068	0.144	0.051
Newport News, VA	0.152	0.138	0.206	0.043	0.057	0.030	0.060	0.000	0.000	0.015	0.008	0.006	0.000	0.031	0.013	0.051
Beaufort, NC	0.053	0.000	0.016	0.000	0.000	0.000	0.014	0.005	0.005	0.009	0.006	0.006	0.002	0.291	0.040	0.030
Hampton, VA	0.092	0.066	0.069	0.021	0.017	0.018	0.000	0.053	0.007	0.002	0.004	0.011	0.004	0.053	0.030	0.030
Sea Isle City, NJ	0.057	0.200	0.000	0.011	0.000	0.000	0.000	0.000	0.058	0.000	0.000	0.009	0.000	0.055	0.000	0.026
Wildwood, NJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.000	0.371	0.000	0.025
Davisville, RI	0.000	0.000	0.000	0.000	0.000	0.016	0.022	0.000	0.072	0.000	0.000	0.000	0.000	0.000	0.224	0.022
North Kingstown, RI	0.046	0.020	0.053	0.039	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
Chincoteague, VA	0.000	0.120	0.000	0.000	0.008	0.003	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009
Ocean City, MD	0.001	0.028	0.001	0.010	0.027	0.009	0.008	0.000	0.016	0.000	0.002	0.003	0.000	0.010	0.000	0.008
Barnegat Light, NJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.037	0.071	0.007
Oriental, NC	0.020	0.000	0.013	0.008	0.000	0.000	0.024	0.037	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
New Bedford, MA	0.003	0.003	0.007	0.001	0.001	0.003	0.000	0.000	0.002	0.003	0.001	0.002	0.014	0.004	0.034	0.005
Point Pleasant, NJ	0.001	0.017	0.032	0.003	0.000	0.000	0.000	0.001	0.011	0.000	0.001	0.001	0.003	0.002	0.002	0.005
Wanchese, NC	0.005	0.005	0.008	0.002	0.000	0.000	0.005	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Point Judith, RI	0.000	0.001	0.003	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.002
Long Beach, NJ	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Shinnecock, NY	0.000	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Montauk, NY	0.000	0.007	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001

Source: NMFS 2023.

Table B.3-38. Commercial fishing revenue in the Project 1 WTA as a percentage of commercial fishing revenue in the geographic analysis area by fishing port, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	2.294	2.390	4.265	1.034	0.810	0.662	0.215	0.291	0.776	0.951	0.997	0.462	0.696	0.749	0.317	1.127
Beaufort, NC	0.043	0.000	0.020	0.000	0.000	0.000	0.013	0.009	0.005	0.012	0.004	0.008	0.001	1.235	0.035	0.092
Newport News, VA	0.247	0.185	0.239	0.034	0.082	0.055	0.101	0.000	0.000	0.021	0.004	0.007	0.000	0.030	0.006	0.067
Cape May, NJ	0.093	0.092	0.112	0.033	0.037	0.055	0.045	0.118	0.053	0.106	0.023	0.018	0.020	0.079	0.087	0.065
Sea Isle City, NJ	0.024	0.459	0.000	0.014	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.012	0.000	0.247	0.000	0.051
Hampton, VA	0.152	0.115	0.132	0.023	0.013	0.022	0.000	0.038	0.012	0.001	0.003	0.010	0.001	0.027	0.034	0.039
Barnegat, NJ	0.000	0.016	0.018	0.002	0.006	0.024	0.013	0.016	0.110	0.044	0.060	0.000	0.030	0.050	0.097	0.032
Davisville, RI	0.000	0.000	0.000	0.000	0.000	0.015	0.020	0.000	0.066	0.000	0.000	0.000	0.000	0.000	0.151	0.017
North Kingstown, RI	0.048	0.021	0.046	0.042	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012
Ocean City, MD	0.001	0.031	0.007	0.015	0.027	0.019	0.027	0.000	0.009	0.000	0.006	0.006	0.000	0.011	0.000	0.011
Wildwood, NJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.128	0.000	0.009
New Bedford, MA	0.004	0.012	0.013	0.001	0.002	0.009	0.001	0.000	0.005	0.008	0.001	0.001	0.042	0.002	0.008	0.007
Chincoteague, VA	0.000	0.074	0.000	0.000	0.010	0.004	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
Oriental, NC	0.011	0.000	0.011	0.006	0.000	0.000	0.019	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
Point Pleasant, NJ	0.007	0.006	0.014	0.004	0.001	0.000	0.000	0.004	0.006	0.001	0.000	0.002	0.013	0.003	0.003	0.004
Wanchese, NC	0.007	0.013	0.015	0.005	0.000	0.000	0.009	0.005	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.004
Point Judith, RI	0.000	0.002	0.003	0.002	0.001	0.003	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002
Barnegat Light, NJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.006	0.002
Long Beach, NJ	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Shinnecock, NY	0.000	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Montauk, NY	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: NMFS 2023.

Table B.3-39. Commercial fishing landings in the Project 2 WTA as a percentage of commercial fishing landings in the geographic analysis area by fishing port, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	2.906	3.770	4.124	1.274	0.526	1.461	0.398	0.454	2.099	1.708	0.963	0.619	1.030	0.796	0.323	1.497
Cape May, NJ	0.053	0.026	0.047	0.026	0.008	0.012	0.049	0.027	0.014	0.674	0.006	0.003	0.018	0.052	0.024	0.069
Newport News, VA	0.069	0.104	0.236	0.038	0.108	0.028	0.072	0.000	0.000	0.011	0.007	0.002	0.000	0.023	0.017	0.048
Barnegat, NJ	0.000	0.009	0.017	0.006	0.022	0.068	0.027	0.049	0.007	0.025	0.032	0.000	0.063	0.098	0.134	0.037
Hampton, VA	0.070	0.060	0.062	0.016	0.014	0.016	0.002	0.018	0.007	0.002	0.005	0.008	0.003	0.050	0.024	0.024
Davisville, RI	0.000	0.000	0.000	0.000	0.000	0.011	0.015	0.000	0.049	0.000	0.000	0.000	0.000	0.000	0.275	0.023
Point Pleasant, NJ	0.001	0.120	0.124	0.001	0.000	0.000	0.000	0.001	0.043	0.000	0.001	0.001	0.003	0.002	0.002	0.020
Beaufort, NC	0.070	0.000	0.012	0.000	0.000	0.000	0.014	0.005	0.005	0.006	0.006	0.004	0.002	0.054	0.036	0.014
Ocean City, MD	0.000	0.024	0.000	0.005	0.008	0.009	0.011	0.000	0.128	0.000	0.000	0.003	0.004	0.010	0.000	0.013
North Kingstown, RI	0.032	0.017	0.042	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
Sea Isle City, NJ	0.002	0.050	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.030	0.000	0.006
Oriental, NC	0.014	0.000	0.009	0.006	0.000	0.000	0.016	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005
New Bedford, MA	0.002	0.003	0.005	0.001	0.001	0.003	0.000	0.000	0.001	0.001	0.001	0.002	0.005	0.003	0.011	0.003
Chincoteague, VA	0.000	0.024	0.000	0.000	0.005	0.003	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
Wanchese, NC	0.003	0.004	0.005	0.002	0.000	0.005	0.004	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Point Judith, RI	0.000	0.001	0.004	0.002	0.001	0.002	0.001	0.000	0.001	0.001	0.001	0.002	0.002	0.003	0.002	0.001
Shinnecock, NY	0.000	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Long Beach, NJ	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Hobucken, NC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Wildwood, NJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.001
Montauk, NY	0.002	0.008	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Belford, NJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: NMFS 2023.

Table B.3-40. Commercial fishing revenue in the Project 2 WTA as a percentage of commercial fishing revenue in the geographic analysis area by fishing port, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	2.534	3.262	3.452	1.022	0.428	1.172	0.257	0.271	1.267	1.304	0.801	0.457	0.722	0.554	0.345	1.190
Newport News, VA	0.113	0.140	0.271	0.033	0.166	0.054	0.121	0.000	0.000	0.015	0.002	0.002	0.000	0.017	0.010	0.063
Cape May, NJ	0.112	0.079	0.105	0.020	0.030	0.050	0.045	0.039	0.049	0.067	0.012	0.008	0.015	0.030	0.019	0.045
Hampton, VA	0.116	0.103	0.113	0.017	0.012	0.020	0.002	0.013	0.013	0.002	0.006	0.008	0.001	0.027	0.026	0.032
Sea Isle City, NJ	0.002	0.173	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.180	0.000	0.024
Beaufort, NC	0.056	0.000	0.016	0.000	0.000	0.000	0.011	0.008	0.005	0.008	0.005	0.006	0.001	0.193	0.033	0.023
Barnegat, NJ	0.000	0.022	0.011	0.004	0.008	0.030	0.012	0.015	0.019	0.018	0.029	0.000	0.023	0.055	0.080	0.022
Davisville, RI	0.000	0.000	0.000	0.000	0.000	0.011	0.014	0.000	0.045	0.000	0.000	0.000	0.000	0.000	0.145	0.014
Ocean City, MD	0.000	0.020	0.002	0.008	0.008	0.015	0.040	0.000	0.074	0.000	0.000	0.006	0.002	0.010	0.000	0.012
Point Pleasant, NJ	0.006	0.035	0.068	0.003	0.001	0.001	0.000	0.003	0.015	0.001	0.001	0.002	0.014	0.003	0.003	0.011
North Kingstown, RI	0.034	0.017	0.038	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
New Bedford, MA	0.003	0.011	0.009	0.001	0.002	0.010	0.001	0.001	0.004	0.003	0.002	0.001	0.012	0.002	0.003	0.004
Oriental, NC	0.008	0.000	0.007	0.004	0.000	0.000	0.013	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
Wanchese, NC	0.005	0.010	0.010	0.005	0.000	0.005	0.007	0.004	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.003
Chincoteague, VA	0.000	0.020	0.000	0.000	0.006	0.004	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
Point Judith, RI	0.000	0.002	0.003	0.002	0.001	0.002	0.001	0.000	0.001	0.001	0.001	0.002	0.002	0.002	0.001	0.001
Shinnecock, NY	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Long Beach, NJ	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Wildwood, NJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.001
Montauk, NY	0.001	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hobucken, NC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Belford, NJ	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: NMFS 2023.

Table B.3-41. Commercial fishing landings in the combined Project 1 and Project 2 WTAs as a percentage of commercial fishing landings in the geographic analysis area by fishing port, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	4.614	5.809	7.507	2.106	1.281	1.975	0.560	0.716	2.804	2.531	1.867	1.048	1.594	1.437	0.505	2.424
Cape May, NJ	0.101	0.073	0.101	0.055	0.028	0.023	0.113	0.064	0.028	1.213	0.015	0.034	0.040	0.247	0.156	0.153
Newport News, VA	0.196	0.205	0.373	0.069	0.144	0.049	0.109	0.000	0.000	0.021	0.013	0.007	0.000	0.046	0.025	0.084
Barnegat, NJ	0.000	0.014	0.027	0.012	0.039	0.111	0.065	0.092	0.041	0.102	0.158	0.000	0.094	0.148	0.232	0.076
Hampton, VA	0.132	0.106	0.111	0.031	0.026	0.030	0.003	0.063	0.011	0.003	0.007	0.017	0.006	0.085	0.046	0.045
Davisville, RI	0.000	0.000	0.000	0.000	0.000	0.023	0.032	0.000	0.105	0.000	0.000	0.000	0.000	0.000	0.437	0.040
Beaufort, NC	0.102	0.000	0.023	0.000	0.000	0.000	0.024	0.009	0.009	0.013	0.010	0.009	0.004	0.322	0.066	0.039
Sea Isle City, NJ	0.057	0.226	0.003	0.013	0.000	0.000	0.000	0.000	0.069	0.000	0.000	0.011	0.000	0.071	0.000	0.030
Wildwood, NJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.000	0.000	0.429	0.000	0.030
Point Pleasant, NJ	0.002	0.130	0.143	0.004	0.001	0.000	0.001	0.001	0.050	0.001	0.002	0.002	0.004	0.004	0.004	0.023
Ocean City, MD	0.001	0.043	0.002	0.012	0.027	0.014	0.017	0.000	0.137	0.000	0.003	0.005	0.004	0.017	0.000	0.019
North Kingstown, RI	0.067	0.031	0.079	0.057	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018
Chincoteague, VA	0.000	0.136	0.000	0.000	0.012	0.004	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
Oriental, NC	0.030	0.000	0.019	0.011	0.000	0.000	0.035	0.054	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010
Barnegat Light, NJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.079	0.008
New Bedford, MA	0.005	0.005	0.011	0.001	0.001	0.004	0.001	0.001	0.002	0.004	0.002	0.003	0.018	0.006	0.041	0.007
Wanchese, NC	0.007	0.008	0.011	0.004	0.000	0.010	0.008	0.005	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.004
Point Judith, RI	0.000	0.002	0.007	0.004	0.002	0.004	0.002	0.001	0.002	0.002	0.002	0.003	0.003	0.005	0.004	0.003
Shinnecock, NY	0.000	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Long Beach, NJ	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Hobucken, NC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Montauk, NY	0.003	0.013	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Belford, NJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: NMFS 2023.

Table B.3-42. Commercial fishing revenue in the combined Project 1 and Project 2 WTAs as a percentage of commercial fishing revenue in the geographic analysis area by fishing port, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Atlantic City, NJ	4.051	4.931	6.558	1.785	1.029	1.616	0.404	0.493	1.692	1.934	1.563	0.789	1.164	1.055	0.572	1.976
Newport News, VA	0.319	0.276	0.431	0.056	0.218	0.091	0.183	0.000	0.000	0.028	0.006	0.007	0.000	0.040	0.012	0.111
Beaufort, NC	0.082	0.000	0.030	0.000	0.000	0.000	0.021	0.014	0.008	0.018	0.008	0.011	0.002	1.340	0.059	0.106
Cape May, NJ	0.176	0.144	0.181	0.046	0.056	0.088	0.073	0.143	0.087	0.121	0.031	0.023	0.030	0.098	0.099	0.093
Sea Isle City, NJ	0.024	0.561	0.017	0.016	0.000	0.000	0.000	0.000	0.012	0.000	0.000	0.015	0.000	0.358	0.000	0.067
Hampton, VA	0.220	0.185	0.209	0.034	0.022	0.035	0.003	0.046	0.020	0.002	0.008	0.015	0.002	0.043	0.051	0.060
Barnegat, NJ	0.000	0.032	0.024	0.005	0.012	0.048	0.020	0.027	0.118	0.055	0.079	0.000	0.044	0.093	0.148	0.047
Davisville, RI	0.000	0.000	0.000	0.000	0.000	0.022	0.030	0.000	0.096	0.000	0.000	0.000	0.000	0.000	0.256	0.027
Ocean City, MD	0.001	0.043	0.008	0.018	0.027	0.028	0.058	0.000	0.079	0.000	0.009	0.010	0.002	0.019	0.000	0.020
North Kingstown, RI	0.070	0.033	0.070	0.061	0.033	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018
Point Pleasant, NJ	0.011	0.038	0.077	0.005	0.002	0.001	0.001	0.006	0.019	0.001	0.001	0.003	0.018	0.006	0.006	0.013
Wildwood, NJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.000	0.000	0.146	0.000	0.011
New Bedford, MA	0.006	0.019	0.018	0.002	0.003	0.014	0.002	0.001	0.008	0.009	0.002	0.002	0.050	0.004	0.010	0.010
Chincoteague, VA	0.000	0.087	0.000	0.000	0.014	0.006	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008
Oriental, NC	0.016	0.000	0.016	0.008	0.000	0.000	0.027	0.044	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007
Wanchese, NC	0.011	0.020	0.022	0.009	0.000	0.010	0.014	0.009	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.007
Point Judith, RI	0.000	0.003	0.005	0.003	0.002	0.005	0.003	0.001	0.002	0.002	0.002	0.003	0.004	0.003	0.003	0.003
Barnegat Light, NJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.019	0.013	0.002
Shinnecock, NY	0.000	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Long Beach, NJ	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Hobucken, NC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Montauk, NY	0.002	0.006	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Belford, NJ	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: NMFS 2023.

Table B.3-43. Commercial fishing landings (pounds) in the Project 1 WTA by state and year, 2008–2022

State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
New Jersey	974,621	1,035,937	1,226,960	370,481	301,757	229,540	116,885	141,632	330,174	1,035,372	320,966	165,153	179,823	486,591	190,729	473,775
Massachusetts	274,295	33,306	194,841	871	954	3,515	695	337	1,598	3,401	1,252	3,016	15,857	4,103	27,582	37,708
New Hampshire	0	0	0	0	1	0	0	0	0	0	0	168,329	0	0	0	11,222
Rhode Island	8,568	6,023	14,174	9,391	4,031	4,711	4,693	5,236	8,407	3,356	12,497	13,144	13,895	12,509	23,088	9,582
Virginia	22,878	20,665	21,070	8,146	5,001	4,277	3,679	2,262	1,167	562	1,533	1,058	999	2,442	664	6,427
North Carolina	1,950	1,804	1,008	481	163	324	731	685	253	308	108	298	276	4,678	656	915
Maryland	59	2,464	331	812	1,552	343	430	302	692	0	95	113	13	281	0	499
New York	252	1,407	61	170	1	119	0	0	1	0	225	53	524	287	0	207
Connecticut	177	269	110	9	0	126	6	0	0	7	0	0	3	10	0	48
Delaware	0	83	0	0	0	0	0	0	0	0	0	0	0	160	0	16
All states	**1,282,800**	**1,101,959**	**1,458,556**	**390,361**	**313,461**	**242,954**	**127,119**	**150,454**	**342,292**	**1,043,007**	**336,677**	**351,164**	**211,390**	**511,062**	**242,719**	**540,398**

Source: NMFS 2023.

Table B.3-44. Commercial fishing revenue (2022 dollars) in the Project 1 WTA by state and year, 2008–2022

State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
New Jersey	$901,396	$847,411	$1,130,314	$346,101	$273,924	$220,693	$97,413	$182,031	$285,650	$319,894	$252,779	$109,070	$132,056	$222,394	$96,219	$361,156
Virginia	$197,010	$142,766	$193,323	$64,357	$45,373	$43,454	$46,536	$9,735	$14,956	$5,327	$12,625	$6,426	$7,298	$13,629	$1,297	$53,607
Massachusetts	$55,953	$42,487	$76,915	$6,490	$9,141	$44,020	$5,284	$1,703	$20,062	$36,585	$6,115	$8,072	$174,830	$14,149	$35,914	$35,848
Rhode Island	$5,584	$3,563	$7,791	$8,192	$3,387	$3,466	$3,146	$3,936	$10,055	$3,082	$8,691	$10,117	$11,169	$11,116	$14,818	$7,208
North Carolina	$3,606	$2,828	$1,456	$793	$389	$525	$1,921	$1,801	$550	$1,699	$301	$1,155	$572	$60,155	$1,354	$5,274
New Hampshire	$0	$0	$0	$0	$4	$0	$0	$0	$0	$0	$0	$57,385	$0	$0	$0	$3,826
Maryland	$142	$3,994	$767	$1,226	$1,670	$857	$1,921	$267	$571	$0	$352	$410	$13	$560	$0	$850
Connecticut	$1,148	$2,348	$1,184	$17	$0	$145	$6	$0	$0	$78	$0	$0	$6	$219	$0	$343
New York	$253	$1,370	$392	$232	$1	$149	$0	$0	$1	$0	$351	$100	$849	$260	$0	$264
Delaware	$3	$317	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$344	$0	$44
All states	**$1,165,094**	**$1,047,085**	**$1,412,142**	**$427,406**	**$333,889**	**$313,309**	**$156,229**	**$199,474**	**$331,845**	**$366,664**	**$281,214**	**$192,736**	**$326,794**	**$322,826**	**$149,602**	**$468,421**

Source: NMFS 2023.

Table B.3-45. Commercial fishing landings (pounds) in the Project 2 WTA by state and year, 2008–2022

State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
New Jersey	1,080,060	1,288,077	1,079,340	399,214	152,990	417,365	140,609	144,744	530,200	865,707	250,298	147,730	198,609	216,627	90,252	466,788
Massachusetts	135,454	12,264	51,609	631	963	3,662	462	409	1,411	1,212	1,205	2,279	6,238	2,721	9,380	15,327
Rhode Island	6,076	5,239	11,859	6,569	3,752	3,384	3,478	3,729	5,765	2,547	13,196	9,218	10,067	9,646	27,583	8,141
Virginia	13,814	14,862	23,476	6,459	7,887	3,973	3,953	914	1,057	588	1,792	736	1,135	2,284	631	5,571
New Hampshire	0	0	0	0	1	0	0	0	0	0	0	45,979	0	0	0	3,065
Maryland	5	2,088	94	430	445	338	604	4	5,675	0	58	115	78	261	0	680
North Carolina	1,873	1,633	703	435	123	260	650	583	210	238	141	239	201	908	569	584
New York	281	1,557	39	201	3	90	0	0	1	0	191	51	413	197	0	202
Connecticut	119	203	56	11	0	86	5	0	0	0	0	0	0	35	0	34
Delaware	3	22	0	0	0	0	0	0	0	0	0	0	0	100	0	8
All states	**1,237,685**	**1,325,946**	**1,167,176**	**413,950**	**166,162**	**429,158**	**149,761**	**150,382**	**544,318**	**870,292**	**266,881**	**206,348**	**216,740**	**232,779**	**128,415**	**500,400**

Source: NMFS 2023.

Table B.3-46. Commercial fishing revenue (2022 dollars) in the Project 2 WTA by state and year, 2008–2022

State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
New Jersey	$1,006,193	$1,107,986	$948,048	$325,309	$157,421	$363,372	$108,178	$107,917	$373,346	$355,809	$192,852	$98,059	$128,385	$147,848	$67,859	$365,905
Virginia	$119,427	$113,250	$213,911	$52,488	$80,333	$41,519	$50,564	$4,610	$13,563	$5,297	$14,999	$4,110	$8,406	$12,993	$1,450	$49,128
Massachusetts	$29,665	$34,705	$40,804	$4,924	$9,891	$46,919	$3,477	$3,733	$18,580	$12,826	$7,788	$6,488	$51,532	$12,946	$14,428	$19,914
Rhode Island	$4,018	$3,256	$6,956	$5,704	$3,030	$2,569	$2,329	$2,898	$7,011	$2,366	$8,523	$7,372	$8,050	$8,535	$13,651	$5,751
North Carolina	$3,523	$3,219	$1,018	$1,089	$292	$450	$1,555	$1,503	$491	$1,286	$443	$950	$412	$9,523	$1,276	$1,802
New Hampshire	$0	$0	$0	$0	$8	$0	$0	$0	$0	$0	$0	$15,675	$0	$0	$0	$1,046
Maryland	$27	$2,551	$235	$636	$508	$648	$2,832	$21	$4,701	$0	$236	$429	$103	$508	$0	$896
New York	$325	$1,518	$209	$310	$8	$114	$0	$0	$1	$0	$301	$97	$670	$178	$0	$249
Connecticut	$356	$1,752	$601	$18	$0	$99	$5	$0	$0	$0	$0	$0	$0	$797	$0	$242
Delaware	$28	$83	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$199	$0	$21
All states	**$1,163,560**	**$1,268,320**	**$1,211,783**	**$390,478**	**$251,491**	**$455,690**	**$168,940**	**$120,681**	**$417,694**	**$377,585**	**$225,143**	**$133,181**	**$197,558**	**$193,528**	**$98,664**	**$444,953**

Source: NMFS 2023.

Table B.3-47. Commercial fishing landings (pounds) in the combined Project 1 and Project 2 WTAs by state and year, 2008–2022

State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
New Jersey	1,730,654	2,007,715	1,955,153	670,402	377,019	569,031	218,841	248,583	714,573	1,428,132	493,371	271,932	317,521	614,266	256,055	791,550
Massachusetts	363,711	41,634	227,994	1,265	1,663	5,196	1,002	641	2,514	4,042	2,063	4,485	19,982	5,611	33,164	47,665
Rhode Island	12,535	9,498	21,770	13,743	6,768	6,975	7,003	7,745	12,170	5,067	21,501	19,223	20,319	18,609	44,352	15,152
New Hampshire	0	0	0	0	2	0	0	0	0	0	0	199,644	0	0	0	13,310
Virginia	31,717	30,434	37,467	12,515	11,181	6,979	6,345	2,795	1,865	929	2,702	1,471	1,792	3,923	1,080	10,213
North Carolina	3,240	2,921	1,470	771	246	499	1,170	1,086	398	470	209	446	403	5,205	1,065	1,307
Maryland	62	3,762	378	994	1,569	554	886	305	6,074	0	134	184	82	468	0	1,030
New York	453	2,554	85	323	3	179	0	0	2	0	351	79	800	418	0	350
Connecticut	246	402	129	16	0	184	9	0	0	7	0	0	3	35	0	69
Delaware	3	96	0	0	0	0	0	0	0	0	0	0	0	227	0	22
All states	**2,142,621**	**2,099,016**	**2,244,446**	**700,029**	**398,452**	**589,598**	**235,256**	**261,156**	**737,597**	**1,438,647**	**520,331**	**497,463**	**360,904**	**648,762**	**335,716**	**880,666**

Source: NMFS 2023.

Table B.3-48. Commercial fishing revenue (2022 dollars) in the combined Project 1 and Project 2 WTAs by state and year, 2008–2022

State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
New Jersey	$1,604,089	$1,702,767	$1,765,298	$582,369	$358,643	$512,010	$172,315	$258,595	$551,587	$555,329	$388,075	$178,533	$213,361	$308,919	$144,257	$619,743
Virginia	$273,457	$217,204	$342,791	$99,756	$109,025	$71,488	$80,575	$12,337	$23,828	$8,465	$22,443	$8,438	$13,028	$22,055	$2,292	$87,145
Massachusetts	$75,153	$65,213	$102,863	$9,594	$16,574	$65,197	$7,571	$4,663	$32,086	$43,297	$11,723	$12,130	$209,148	$22,057	$45,404	$48,178
Rhode Island	$8,209	$5,820	$12,353	$11,957	$5,571	$5,175	$4,701	$5,896	$14,665	$4,662	$14,372	$14,937	$16,338	$16,558	$24,616	$11,055
North Carolina	$6,019	$5,204	$2,117	$1,592	$586	$829	$2,950	$2,833	$890	$2,550	$620	$1,746	$838	$65,361	$2,286	$6,428
New Hampshire	$0	$0	$0	$0	$10	$0	$0	$0	$0	$0	$0	$68,060	$0	$0	$0	$4,538
Maryland	$158	$5,563	$888	$1,489	$1,711	$1,256	$4,074	$284	$5,016	$0	$509	$683	$106	$922	$0	$1,511
Connecticut	$1,233	$3,491	$1,388	$28	$0	$213	$7	$0	$0	$78	$0	$0	$6	$797	$0	$483
New York	$498	$2,502	$528	$470	$8	$225	$0	$0	$2	$0	$548	$150	$1,297	$380	$0	$440
Delaware	$28	$368	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$476	$0	$58
All states	**$1,968,845**	**$2,008,132**	**$2,228,225**	**$707,255**	**$492,129**	**$656,393**	**$272,193**	**$284,608**	**$628,075**	**$614,381**	**$438,289**	**$284,676**	**$454,122**	**$437,524**	**$218,856**	**$779,580**

Source: NMFS 2023.

Table B.3-49. Commercial fishing landings (pounds) in the Project 1 WTA by fishing gear type and year, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	906,591	978,193	1,173,520	337,112	279,410	214,588	73,612	97,567	317,616	310,014	299,377	136,322	152,395	170,989	45,513	366,188
All others	309,555	60,584	181,092	34	7,410	2,196	26,511	14,496	1,248	719,397	6,971	189,331	21,233	301,665	141,389	132,207
Trawl-bottom	24,148	26,720	21,514	38,788	13,308	12,121	13,508	25,534	11,550	6,127	15,637	18,528	20,274	25,109	27,498	20,024
Dredge-scallop	33,099	31,749	38,142	8,188	7,425	8,019	5,558	7,093	8,580	4,526	4,140	2,060	14,653	6,861	378	12,031
Pot-other	9,131	4,044	7,196	5,313	3,812	5,910	5,488	4,386	3,011	2,713	4,233	4,923	2,835	5,980	27,662	6,442
Trawl-midwater	0	0	36,451	0	0	0	0	0	0	0	0	0	0	0	0	2,430
Gillnet-sink	259	281	630	878	2,079	0	2,441	1,377	287	0	6,212	0	0	222	278	996
Pot-lobster	19	389	11	48	17	119	0	0	0	218	107	0	0	238	0	78
All gear	**1,282,801**	**1,101,959**	**1,458,556**	**390,361**	**313,461**	**242,954**	**127,119**	**150,454**	**342,291**	**1,042,995**	**336,678**	**351,163**	**211,390**	**511,065**	**242,718**	**540,398**

Source: NMFS 2023.

Table B.3-50. Commercial fishing revenue (2022 dollars) in the Project 1 WTA by fishing gear type and year, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	$788,514	$743,243	$986,714	$286,870	$215,821	$172,222	$43,310	$61,603	$177,145	$202,018	$206,051	$78,349	$95,401	$137,254	$35,478	$282,000
Dredge-scallop	$291,751	$268,577	$364,095	$91,415	$89,248	$110,485	$78,475	$104,198	$126,220	$49,071	$44,335	$20,896	$201,418	$101,845	$8,439	$130,031
All others	$46,329	$7,305	$26,211	$5	$975	$906	$4,489	$2,249	$164	$97,076	$1,039	$61,530	$3,135	$41,737	$36,894	$22,003
Trawl-bottom	$19,232	$18,633	$13,170	$35,795	$16,364	$16,318	$11,820	$17,093	$17,108	$7,560	$13,165	$18,528	$18,463	$24,982	$32,873	$18,740
Pot-other	$18,837	$8,265	$17,666	$12,798	$9,295	$12,831	$16,055	$13,601	$11,042	$9,915	$12,070	$13,435	$8,377	$16,104	$35,867	$14,411
Gillnet-sink	$356	$217	$529	$404	$2,143	$0	$2,080	$728	$166	$0	$3,978	$0	$0	$516	$51	$744
Trawl-midwater	$0	$0	$3,703	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$247
Pot-lobster	$73	$847	$52	$119	$43	$546	$0	$0	$0	$1,023	$575	$0	$0	$394	$0	$245
All gear	**$1,165,094**	**$1,047,087**	**$1,412,140**	**$427,406**	**$333,888**	**$313,309**	**$156,229**	**$199,473**	**$331,845**	**$366,663**	**$281,213**	**$192,736**	**$326,795**	**$322,831**	**$149,602**	**$468,421**

Source: NMFS 2023.

Table B.3-51. Commercial fishing landings (pounds) in the Project 2 WTA by fishing gear type and year, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	1,028,941	1,263,848	1,046,268	378,844	143,451	406,657	117,696	120,384	527,132	423,106	242,121	143,772	180,933	138,198	58,691	414,670
All others	164,644	15,230	38,999	120	23	2,507	13,092	9,837	401	440,167	3,393	46,405	14,363	67,256	39,930	57,091
Trawl-bottom	15,921	15,151	15,812	27,385	9,955	8,658	10,619	16,364	9,504	4,069	15,789	13,277	14,654	22,607	20,994	14,717
Dredge-scallop	26,673	26,949	39,026	6,326	10,767	8,568	6,068	2,758	6,348	2,371	3,483	1,289	6,039	2,805	296	9,984
Trawl-midwater	0	3,839	24,417	0	0	0	0	0	0	0	0	0	0	0	0	1,884
Pot-other	1,418	593	1,671	1,245	753	2,768	1,459	898	934	503	1,108	1,604	751	1,582	8,502	1,719
Gillnet-sink	72	253	975	0	1,207	0	828	141	0	0	955	0	0	236	0	311
Pot-lobster	16	83	8	29	7	0	0	0	0	66	32	0	0	102	0	23
All gear	**1,237,684**	**1,325,946**	**1,167,177**	**413,950**	**166,163**	**429,159**	**149,761**	**150,383**	**544,317**	**870,283**	**266,881**	**206,347**	**216,740**	**232,787**	**128,413**	**500,399**

Source: NMFS 2023.

Table B.3-52. Commercial fishing revenue (2022 dollars) in the Project 2 WTA by fishing gear type and year, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	$886,978	$1,026,074	$825,541	$288,225	$108,024	$321,967	$65,325	$64,240	$307,064	$289,045	$172,132	$86,525	$103,556	$107,212	$42,943	$312,990
Dredge-scallop	$235,700	$226,347	$362,532	$72,855	$127,260	$117,869	$85,037	$41,420	$93,844	$25,188	$36,339	$13,151	$76,235	$47,151	$6,536	$104,498
Trawl-bottom	$14,143	$11,973	$10,626	$26,376	$12,961	$10,881	$11,818	$10,927	$13,552	$5,210	$12,604	$13,793	$13,457	$25,202	$26,773	$14,686
All others	$23,709	$1,884	$5,645	$73	$27	$1,478	$2,056	$1,426	$59	$56,280	$508	$16,156	$2,584	$9,781	$11,500	$8,878
Pot-other	$2,863	$1,222	$3,524	$2,873	$1,765	$3,496	$4,043	$2,637	$3,175	$1,578	$2,774	$3,557	$1,725	$3,722	$10,913	$3,324
Gillnet-sink	$93	$218	$1,235	$0	$1,423	$0	$659	$31	$0	$0	$607	$0	$0	$265	$0	$302
Trawl-midwater	$0	$396	$2,642	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$203
Pot-lobster	$73	$207	$38	$76	$31	$0	$0	$0	$0	$285	$179	$0	$0	$210	$0	$73
All gear	**$1,163,559**	**$1,268,321**	**$1,211,782**	**$390,478**	**$251,492**	**$455,691**	**$168,938**	**$120,681**	**$417,694**	**$377,585**	**$225,143**	**$133,182**	**$197,558**	**$193,542**	**$98,664**	**$444,954**

Source: NMFS 2023.

Table B.3-53. Commercial fishing landings (pounds) in the combined Project 1 and Project 2 WTAs by fishing gear type and year, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	1,626,279	1,934,347	1,880,350	623,196	348,633	546,649	161,920	189,614	701,527	624,557	467,040	240,792	279,352	249,606	90,149	664,267
All others	420,033	65,759	205,681	36	7,427	3,988	34,199	20,783	1,454	796,139	9,009	220,958	30,027	343,119	170,986	155,307
Trawl-bottom	34,641	36,686	31,679	57,270	19,754	17,897	20,842	35,547	18,099	8,802	26,312	27,144	29,735	39,894	40,986	29,686
Dredge-scallop	51,421	49,701	64,790	12,453	15,717	13,097	9,526	8,897	12,683	5,899	6,470	2,815	18,529	8,564	598	18,744
Pot-other	9,893	4,366	8,149	6,044	4,248	7,810	6,187	4,864	3,534	2,985	4,815	5,753	3,262	6,867	32,617	7,426
Trawl-midwater	0	7,257	52,257	0	0	0	0	0	0	0	0	0	0	0	0	3,968
Gillnet-sink	322	469	1,525	964	2,656	0	2,582	1,451	299	0	6,565	0	0	414	378	1,175
Pot-lobster	31	432	16	65	20	156	0	0	0	248	120	0	0	307	0	93
All gear	**2,142,621**	**2,099,017**	**2,244,447**	**700,029**	**398,454**	**589,598**	**235,256**	**261,156**	**737,596**	**1,438,630**	**520,331**	**497,463**	**360,904**	**648,772**	**335,713**	**880,666**

Source: NMFS 2023.

Table B.3-54. Commercial fishing revenue (2022 dollars) in the combined Project 1 and Project 2 WTAs by gear type and year, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	$1,403,838	$1,543,469	$1,540,938	$497,671	$266,009	$434,626	$92,071	$110,267	$401,681	$420,362	$328,292	$141,062	$162,523	$196,515	$67,361	$507,112
Dredge-scallop	$453,361	$418,998	$610,609	$140,775	$186,866	$180,733	$134,040	$131,246	$186,885	$63,481	$68,915	$28,591	$250,547	$130,585	$13,357	$199,933
Trawl-bottom	$28,612	$26,564	$20,153	$53,685	$25,074	$23,568	$20,308	$24,227	$26,339	$11,082	$21,508	$27,326	$27,328	$42,965	$50,303	$28,603
All others	$62,120	$8,083	$29,770	$6	$995	$1,810	$5,683	$3,160	$184	$107,535	$1,345	$72,555	$4,433	$48,160	$45,469	$26,087
Pot-other	$20,347	$8,943	$19,604	$14,496	$10,305	$14,947	$17,897	$14,962	$12,804	$10,759	$13,382	$15,143	$9,292	$18,099	$42,296	$16,218
Gillnet-sink	$437	$382	$1,648	$457	$2,819	$0	$2,193	$746	$181	$0	$4,202	$0	$0	$681	$70	$921
Trawl-midwater	$0	$731	$5,427	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$411
Pot-lobster	$129	$962	$76	$164	$62	$707	$0	$0	$0	$1,160	$646	$0	$0	$537	$0	$296
All gear	**$1,968,844**	**$2,008,133**	**$2,228,224**	**$707,254**	**$492,130**	**$656,392**	**$272,192**	**$284,609**	**$628,075**	**$614,379**	**$438,290**	**$284,676**	**$454,122**	**$437,541**	**$218,855**	**$779,581**

Source: NMFS 2023.

Table B.3-55. Commercial fishing landings in the Project 1 WTA as a percentage of commercial fishing landings in the geographic analysis area by fishing gear type, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	1.072	1.236	1.544	0.459	0.372	0.292	0.102	0.135	0.444	0.449	0.439	0.236	0.325	0.334	0.090	0.502
Pot-other	0.084	0.051	0.079	0.075	0.071	0.062	0.075	0.048	0.050	0.041	0.050	0.054	0.027	0.080	0.318	0.078
Dredge-scallop	0.064	0.058	0.070	0.014	0.013	0.020	0.017	0.020	0.022	0.009	0.007	0.003	0.031	0.016	0.001	0.024
Trawl-bottom	0.011	0.013	0.011	0.018	0.007	0.007	0.008	0.017	0.007	0.004	0.009	0.010	0.011	0.014	0.020	0.011
Gillnet-sink	0.001	0.001	0.001	0.002	0.004	0.000	0.006	0.004	0.001	0.000	0.022	0.000	0.000	0.001	0.001	0.003
Trawl-midwater	0.000	0.000	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Pot-lobster	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000

Source: NMFS 2023.

Table B.3-56. Commercial fishing revenue in the Project 1 WTA as a percentage of commercial fishing revenue in the geographic analysis area by fishing gear type, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	1.110	1.067	1.461	0.435	0.307	0.257	0.066	0.090	0.238	0.282	0.296	0.137	0.194	0.263	0.075	0.419
Pot-other	0.123	0.081	0.162	0.106	0.091	0.089	0.130	0.094	0.095	0.091	0.083	0.090	0.052	0.125	0.254	0.111
Dredge-scallop	0.062	0.058	0.064	0.013	0.013	0.020	0.016	0.020	0.022	0.008	0.007	0.003	0.038	0.014	0.002	0.024
Trawl-bottom	0.008	0.010	0.006	0.014	0.007	0.008	0.006	0.009	0.008	0.004	0.007	0.009	0.010	0.013	0.018	0.009
Gillnet-sink	0.001	0.000	0.001	0.001	0.004	0.000	0.005	0.002	0.001	0.000	0.018	0.000	0.000	0.004	0.000	0.002
Trawl-midwater	0.000	0.000	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Pot-lobster	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000

Source: NMFS 2023.

Table B.3-57. Commercial fishing landings in the Project 2 WTA as a percentage of commercial fishing landings in the geographic analysis area by fishing gear type, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	1.217	1.597	1.376	0.516	0.191	0.553	0.163	0.166	0.737	0.612	0.355	0.249	0.386	0.270	0.116	0.567
Pot-other	0.013	0.007	0.018	0.018	0.014	0.029	0.020	0.010	0.015	0.008	0.013	0.018	0.007	0.021	0.098	0.021
Dredge-scallop	0.052	0.049	0.071	0.011	0.019	0.021	0.018	0.008	0.016	0.005	0.006	0.002	0.013	0.007	0.001	0.020
Trawl-bottom	0.007	0.007	0.008	0.013	0.005	0.005	0.006	0.011	0.006	0.002	0.009	0.007	0.008	0.012	0.015	0.008
Trawl-midwater	0.000	0.002	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Gillnet-sink	0.000	0.001	0.002	0.000	0.003	0.000	0.002	0.000	0.000	0.000	0.003	0.000	0.000	0.001	0.000	0.001
Pot-lobster	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: NMFS 2023.

Table B.3-58. Commercial fishing revenue in the Project 2 WTA as a percentage of commercial fishing revenue in the geographic analysis area by fishing gear type, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	1.248	1.473	1.223	0.437	0.154	0.481	0.100	0.094	0.413	0.404	0.248	0.151	0.210	0.205	0.091	0.462
Pot-other	0.019	0.012	0.032	0.024	0.017	0.024	0.033	0.018	0.027	0.015	0.019	0.024	0.011	0.029	0.077	0.025
Dredge-scallop	0.050	0.049	0.064	0.010	0.018	0.021	0.017	0.008	0.017	0.004	0.006	0.002	0.015	0.007	0.001	0.019
Trawl-bottom	0.006	0.006	0.005	0.010	0.005	0.005	0.006	0.006	0.006	0.003	0.006	0.006	0.008	0.013	0.015	0.007
Trawl-midwater	0.000	0.001	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Gillnet-sink	0.000	0.000	0.003	0.000	0.003	0.000	0.002	0.000	0.000	0.000	0.003	0.000	0.000	0.002	0.000	0.001
Pot-lobster	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: NMFS 2023.

Table B.3-59. Commercial fishing landings in the combined Project 1 and Project 2 WTAs as a percentage of commercial fishing landings in the geographic analysis area by fishing gear, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	1.923	2.445	2.474	0.849	0.465	0.744	0.224	0.262	0.981	0.904	0.685	0.417	0.595	0.487	0.178	0.909
Pot-other	0.091	0.055	0.089	0.085	0.079	0.082	0.084	0.053	0.059	0.046	0.056	0.063	0.031	0.092	0.375	0.089
Dredge-scallop	0.100	0.091	0.118	0.022	0.028	0.032	0.029	0.025	0.032	0.012	0.011	0.005	0.039	0.020	0.002	0.038
Trawl-bottom	0.016	0.017	0.016	0.027	0.010	0.010	0.012	0.023	0.011	0.005	0.015	0.014	0.016	0.022	0.030	0.016
Gillnet-sink	0.001	0.001	0.002	0.002	0.006	0.000	0.006	0.005	0.001	0.000	0.024	0.000	0.000	0.002	0.002	0.003
Trawl-midwater	0.000	0.004	0.039	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003
Pot-lobster	0.000	0.002	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000

Source: NMFS 2023.

Table B.3-60. Commercial fishing revenue in the combined Project 1 and Project 2 WTAs as a percentage of commercial fishing revenue in the geographic analysis area by fishing gear, 2008–2022

Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Dredge-clam	1.975	2.215	2.282	0.755	0.378	0.649	0.141	0.161	0.540	0.588	0.472	0.246	0.330	0.376	0.143	0.750
Pot-other	0.133	0.087	0.180	0.120	0.101	0.104	0.145	0.103	0.111	0.099	0.092	0.101	0.058	0.140	0.299	0.125
Dredge-scallop	0.097	0.090	0.108	0.020	0.027	0.032	0.027	0.025	0.033	0.011	0.011	0.004	0.048	0.019	0.003	0.037
Trawl-bottom	0.012	0.014	0.009	0.021	0.010	0.012	0.010	0.012	0.012	0.006	0.011	0.013	0.015	0.022	0.027	0.014
Gillnet-sink	0.001	0.001	0.004	0.001	0.006	0.000	0.005	0.002	0.001	0.000	0.019	0.000	0.000	0.005	0.001	0.003
Trawl-midwater	0.000	0.002	0.025	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002
Pot-lobster	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000

Source: NMFS 2023.

Table B.3-61. Number of for-hire recreational fishing vessel trips to the Project 1 WTA by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Other Ports, NJ	17	35	18	6	3	23	31	4	17	14	8	2	2	0	27	14
Atlantic City, NJ	0	0	0	49	31	0	0	39	0	0	0	0	0	0	0	8
Long Beach, NJ	0	5	0	5	0	0	0	0	0	0	0	0	0	0	0	1
Other Ports, NY	0	0	1	0	0	0	0	0	0	0	0	0	0	0	12	1
Other Ports, MD	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No Port Data	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Total	**18**	**40**	**19**	**60**	**34**	**23**	**31**	**43**	**17**	**14**	**8**	**2**	**2**	**1**	**40**	**23**

Source: NMFS 2023.

Table B.3-62. Number of for-hire recreational angler trips to the Project 1 WTA by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Other Ports, NJ	141	262	111	55	91	186	197	18	128	153	58	12	11	0	130	104
Atlantic City, NJ	0	0	0	307	186	0	0	266	0	0	0	0	0	0	0	51
Other Ports, NY	0	0	34	0	0	0	0	0	0	0	0	0	0	0	332	24
Long Beach, NJ	0	51	0	43	0	0	0	0	0	0	0	0	0	0	0	6
Other Ports, MD	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No Port Data	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0
Total	**147**	**313**	**145**	**405**	**277**	**186**	**197**	**284**	**128**	**153**	**58**	**12**	**11**	**2**	**466**	**186**

Source: NMFS 2023.

Table B.3-63. Number of for-hire recreational fishing vessel trips to the Project 2 WTA by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Other Ports, NJ	4	7	2	2	5	4	2	5	3	2	2	0	0	1	8	3

Source: NMFS 2023.

Table B.3-64. Number of for-hire recreational angler trips to the Project 2 WTA by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Other Ports, NJ	24	42	12	11	27	81	12	51	45	53	14	0	0	10	96	32

Source: NMFS 2023.

Table B.3-65. Number of for-hire recreational fishing vessel trips to the combined Project 1 and Project 2 WTAs by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Other Ports, MD	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Ports, NJ	21	37	20	8	3	22	31	6	19	14	9	2	2	1	32	15
Long Beach, NJ	0	5	0	5	0	0	0	0	0	0	0	0	0	0	0	1
Other Ports, NY	0	0	1	0	0	0	0	0	0	0	0	0	0	0	12	1
Atlantic City, NJ	0	0	0	49	35	0	0	41	0	0	0	0	0	0	0	8
Ocean City, NJ	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
No Port Data	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Total	**22**	**42**	**21**	**62**	**38**	**25**	**31**	**47**	**19**	**14**	**9**	**2**	**2**	**2**	**45**	**25**

Source: NMFS 2023.

Table B.3-66. Number of for-hire recreational angler trips to the combined Project 1 and Project 2 WTAs by fishing port and year, 2008–2022

Port and State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Annual Average
Other Ports, MD	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Ports, NJ	165	274	123	66	91	172	197	46	156	153	64	12	11	10	213	117
Long Beach, NJ	0	51	0	43	0	0	0	0	0	0	0	0	0	0	0	6
Other Ports, NY	0	0	34	0	0	0	0	0	0	0	0	0	0	0	332	24
Atlantic City, NJ	0	0	0	307	207	0	0	283	0	0	0	0	0	0	0	53
Ocean City, NJ	0	0	0	0	0	85	0	0	0	0	0	0	0	0	0	6
No Port Data	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0
Total	**171**	**325**	**157**	**416**	**298**	**257**	**197**	**329**	**156**	**153**	**64**	**12**	**11**	**12**	**549**	**207**

Source: NMFS 2023.

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B.4 Demographics, Employment, and Economics

Table B.4-1. Population trends, 2000–2020

Jurisdiction	Population 2000	Population 2010	Population 2020	% Change 2000–2020	% Change 2010–2020
State of New Jersey	**8,414,350**	**8,791,881**	**9,288,994**	**10.4**	**5.7**
Atlantic County	252,552	274,549	274,534	8.7	0.01
Cape May County	102,326	97,265	95,263	-6.9	-2.1
Gloucester County	254,673	288,274	302,294	18.7	4.9
Monmouth County	615,301	630,364	643,615	4.6	2.1
Ocean County	510,916	576,551	637,229	24.7	10.5
Salem County	64,285	66,084	64,837	0.9	-1.9
Commonwealth of Virginia	**7,078,515**	**8,001,024**	**8,631,393**	**21.9**	**7.9**
Portsmouth City	100,565	95,535	97,915	-2.6	2.5
State of Texas	**20,851,820**	**25,145,558**	**29,145,505**	**39.8**	**15.9**
Nueces County	313,645	340,223	353,178	12.6	3.8
San Patricio County	67,138	64,804	68,755	2.4	6.1

Source: U.S. Census Bureau 2000, 2010, 2020.

Table B.4-2. Demographic data, 2020

Jurisdiction	Population 2020	Population Density (persons per square mile)	Population 18 Years and Over	% of Population 18 Years and Over	% of Population Under 18
State of New Jersey	**9,288,994**	**1,262.99**	**7,281,310**	**78.4**	**21.6**
Atlantic County	274,534	494.20	217,993	79.4	20.6
Cape May County	95,263	378.75	78,971	82.9	17.1
Gloucester County	302,294	43.54	237,281	78.5	21.5
Monmouth County	643,615	1,374.71	511,670	79.5	20.5
Ocean County	637,229	1,014.23	482,600	75.7	24.3
Salem County	64,837	195.37	50,538	77.9	22.1
Commonwealth of Virginia	**8,631,393**	**218.62**	**6,745,054**	**78.1**	**21.9**
Portsmouth City	97,915	2,940.34	76,164	77.8	22.2
State of Texas	**29,145,505**	**111.55**	**21,866,700**	**75.0**	**25.0**
Nueces County	353,178	420.92	270,056	76.5	23.5
San Patricio County	68,755	99.15	51,377	74.7	25.3

Source: U.S. Census Bureau 2020.

Table B.4-3. Age distribution, 2019

Jurisdiction	0–17	18–34	35–64	65+	Median Age
State of New Jersey	**22.1%**	**21.5%**	**40.5%**	**15.9%**	**40**
Atlantic County	21.5%	21.1%	40.0%	17.5%	42
Cape May County	17.6%	17.6%	38.9%	25.8%	50
Gloucester County	22.1%	21.2%	41.3%	15.4%	41
Monmouth County	21.4%	19.1%	42.3%	17.1%	43
Ocean County	23.9%	18.3%	35.4%	22.4%	43
Salem County	21.7%	19.6%	40.4%	18.3%	42
Commonwealth of Virginia	**22.1%**	**23.5%**	**39.4%**	**15.0%**	**38**
Portsmouth City	23.4%	26.2%	35.9%	14.5%	35
State of Texas	**26.0%**	**24.6%**	**37.2%**	**12.3%**	**35**
Nueces County	24.8%	24.6%	36.6%	14.1%	36
San Patricio County	27.0%	22.4%	36.0%	14.6%	36

Source: U.S. Census Bureau 2015–2019.

Table B.4-4. Housing data, 2020

Jurisdiction	Housing Units	Occupied (%)	Vacant (%)
State of New Jersey	**3,761,229**	**91.1**	**8.9**
Atlantic County	132,038	80.8	19.2
Cape May County	99,606	41.2	58.8
Gloucester County	117,208	94.3	5.7
Monmouth County	268,912	91.0	9.0
Ocean County	294,429	81.1	18.9
Salem County	27,763	90.9	9.1
Commonwealth of Virginia	**3,618,247**	**91.8**	**8.2**
Portsmouth City	43,164	91.6	8.4
State of Texas	**11,589,324**	**90.5**	**9.5**
Nueces County	151,255	86.4	13.6
San Patricio County	29,424	84.3	15.7

Source: U.S. Census Bureau 2020.

Table B.4-5. Housing unit data, 2019

Jurisdiction	Housing Units	Seasonal Vacant Units	Vacant Units (Non-Seasonal)	Non-Seasonal Vacancy Rate	Median Value (Owner-Occupied)	Median Monthly Rent (Renter-Occupied)
State of New Jersey	**3,616,614**	**135,990**	**248,750**	**6.9%**	**$335,600**	**$1,334**
Atlantic County	128,251	17,190	11,211	8.7%	$217,900	$1,120
Cape May County	99,312	50,452	8,689	8.7%	$300,500	$1,169
Gloucester County	113,485	320	8,257	7.3%	$219,700	$1,225
Monmouth County	261,579	12,459	13,758	5.3%	$421,900	$1,399
Ocean County	283,297	39,171	17,966	6.3%	$279,000	$1,428
Salem County	27,595	190	3,472	12.6%	$184,600	$1,019
Commonwealth of Virginia	**3,514,032**	**87,550**	**275,437**	**7.8%**	**$273,100**	**$1,234**
Portsmouth City	40,907	87	4,450	10.9%	$170,900	$1,048
State of Texas	**10,937,026**	**247,358**	**998,021**	**9.1%**	**$172,500**	**$1,045**
Nueces County	149,287	4,704	15,132	10.1%	$138,700	$1,017
San Patricio County	28,226	1,035	4,293	15.2%	$122,100	$975

Source: U.S. Census Bureau 2015–2019.

Table B.4-6. Economic data, 2019

Jurisdiction	Per Capita Income (2019)[1]	Total Employment (2019)[2]	Unemployment Rate (2019)[1]	Population Living Below Poverty Level (2019)[1]
State of New Jersey	**$42,745**	**4,018,511**	**5.5%**	**10.0%**
Atlantic County	$33,284	126,385	8.4%	13.3%
Cape May County	$40,389	33,031	6.8%	9.8%
Gloucester County	$39,337	113,722	5.5%	7.4%
Monmouth County	$51,700	261,181	4.9%	6.9%
Ocean County	$36,100	166,205	5.1%	10.1%
Salem County	$34,047	20,602	6.0%	12.4%
Commonwealth of Virginia	**$39,278**	**3,793,011**	**4.6%**	**10.6%**
Portsmouth City	$26,312	32,490	7.8%	16.8%
State of Texas	**$31,277**	**12,433,128**	**5.1%**	**14.7%**
Nueces County	$27,740	159,956	5.7%	16.6%
San Patricio County	$26,054	19,117	5.1%	15.9%

Sources: 1. U.S. Census Bureau 2015–2019; 2. U.S. Census Bureau 2019.

Table B.4-7. At place employment by industry data, 2019

Industry	Atlantic County	Cape May County	Gloucester County	Monmouth County	Ocean County	Salem County	New Jersey	Portsmouth City	Virginia	Nueces County	San Patricio County	Texas
Agriculture, Forestry, Fishing and Hunting	0.4%	0.8%	1.3%	0.2%	0.1%	1.9%	0.2%	0.0%	0.3%	0.3%	1.7%	0.5%
Mining, Quarrying, and Oil and Gas Extraction	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.2%	2.1%	2.4%	2.0%
Utilities	0.9%	0.6%	0.4%	0.7%	0.8%	8.6%	0.5%	0.3%	0.5%	0.9%	1.2%	0.7%
Construction	4.7%	7.7%	5.8%	5.7%	5.9%	6.6%	4.0%	6.6%	5.6%	11.1%	31.2%	6.5%
Manufacturing	2.0%	2.7%	7.6%	3.5%	3.4%	8.9%	6.2%	5.0%	6.5%	4.2%	4.4%	7.4%
Wholesale Trade	2.2%	1.9%	7.5%	3.0%	2.7%	2.9%	5.3%	1.7%	2.9%	3.3%	1.2%	4.9%
Retail Trade	10.5%	15.2%	16.3%	13.9%	15.2%	7.9%	11.0%	9.8%	10.8%	9.8%	10.6%	10.6%
Transportation and Warehousing	1.8%	1.7%	6.4%	1.9%	2.2%	10.3%	5.0%	6.7%	3.5%	3.0%	1.8%	4.3%
Information	0.7%	0.5%	1.2%	2.6%	0.7%	0.2%	1.8%	1.2%	1.9%	0.8%	0.8%	1.7%
Finance and Insurance	1.6%	2.5%	1.6%	3.7%	2.4%	1.8%	4.6%	1.3%	3.7%	2.6%	1.3%	4.4%
Real Estate and Rental and Leasing	1.2%	2.1%	1.0%	1.5%	1.9%	0.8%	1.5%	1.2%	1.5%	1.8%	0.7%	1.9%
Professional, Scientific, and Technical Services	3.8%	3.4%	3.0%	7.4%	5.3%	4.0%	7.8%	4.0%	11.5%	5.3%	2.9%	6.7%
Management of Companies and Enterprises	0.7%	0.4%	0.4%	1.4%	0.4%	0.0%	2.2%	0.1%	2.3%	0.4%	0.4%	1.3%
Administration & Support, Waste Management and Remediation	4.3%	3.4%	5.1%	4.7%	4.6%	4.1%	7.1%	8.1%	6.6%	5.2%	2.0%	6.6%
Educational Services	8.7%	10.4%	11.9%	10.2%	12.1%	11.8%	10.0%	9.9%	9.9%	10.2%	14.1%	10.2%
Health Care and Social Assistance	15.6%	10.6%	13.5%	18.2%	21.7%	15.6%	15.5%	24.7%	13.4%	20.8%	5.7%	13.6%
Arts, Entertainment, and Recreation	1.6%	3.2%	1.4%	3.2%	2.6%	0.8%	1.6%	0.8%	1.7%	1.6%	1.2%	1.4%
Accommodation and Food Services	31.1%	18.8%	8.8%	9.9%	8.9%	6.3%	7.7%	7.3%	9.0%	11.2%	11.3%	9.6%

Source: U.S. Census Bureau 2019.

Table B.4-8. Ocean Economy data, 2019

Jurisdiction	Ocean Economy GDP, All Ocean Sectors	Ocean Economy GDP, Tourism and Recreation Sector	Ocean Economy GDP, Living Resources Sector	Total County GDP (Coastal Economy, Employment Data) Total, All Industries	Ocean Economy GDP, as Percent of Total County GDP (%)
State of New Jersey	**$11,855,762,000**	**$4,584,513,000**	**$310,616,000**	**$634,784,000,000**	**1.9**
Atlantic County	$599,487,000	$574,345,000	$2,833,000	$14,869,684,000	4.0
Cape May County	$627,835,000	$540,831,000	$7,955,000	$3,979,220,000	15.8
Gloucester County	$416,820,000	$50,790,000	Suppressed	$13,148,549,000	3.2
Monmouth County	$835,236,000	$770,634,000	$9,783,000	$36,419,565,000	2.3
Ocean County	$707,612,000	$613,039,000	$17,688,000	$19,076,848,000	3.7
Salem County	$118,903,000	$22,180,000	Suppressed	$2,925,815,000	4.1
Commonwealth of Virginia	**$10,254,369,000**	**$2,452,373,000**	**$641,763,000**	**$556,905,000,000**	**1.8**
Portsmouth City	$1,451,595,000	$76,143,000	Suppressed	$6,275,901,104	23.1
State of Texas	**$81,318,858,000**	**$1,916,764,000**	**$447,138,000**	**$1,843,800,000,000**	**4.4**
Nueces County	$1,436,117,000	$570,971,000	Suppressed	$20,547,623,264	7.0
San Patricio County	$519,919,000	$64,370,000	$0	$2,301,102,556	22.6

Source: NOAA 2019.

Table B.4-9. Coastal tourism and recreation economic value, 2019

Jurisdiction	Establishments	Employment	Wages (millions)	GDP (millions)
State of New Jersey	**8,020**	**98,790**	**$2,347,078,000**	**$4,584,513,000**
Atlantic County	633	11,018	$287,650,000	$574,345,000
Cape May County	1,001	10,407	$266,641,000	$540,831,000
Monmouth County	1,346	18,483	$403,532,000	$770,634,000
Ocean County	1,164	14,597	$311,252,000	$613,039,000

Source: NOEP 2019.

Table B.4-10. Ocean Economy employment, 2019

Jurisdiction	Marine Construction	Living Resources	Offshore Mineral Extraction	Ship and Boat Building	Tourism and Recreation	Marine Transportation	Total, All Sectors
State of New Jersey	**2,775**	**2,528**	**631**	**1,405**	**98,790**	**63,525**	**169,656**
Atlantic County	Suppressed	16	Suppressed	Suppressed	11,017	85	11,254
Cape May County	100	112	Suppressed	Suppressed	10,407	62	11,139
Gloucester County	314	Suppressed	Suppressed	Suppressed	1,522	6,384	8,293
Monmouth County	133	109	Suppressed	0	18,483	280	19,042
Ocean County	213	148	Suppressed	Suppressed	14,597	38	15,342
Salem County	0	Suppressed	0	0	716	1,226	1,955
Commonwealth of Virginia	**2,032**	**2,594**	**322**	**41,147**	**64,547**	**21,456**	**132,100**
Portsmouth City	441	Suppressed	0	11,247	2,438	Suppressed	15,246
State of Texas	**7,289**	**4,028**	**78,687**	**3,697**	**49,517**	**34,668**	**177,888**
Nueces County	Suppressed	Suppressed	2,417	Suppressed	13,516	579	17,514
San Patricio County	Suppressed	0	443	Suppressed	1,821	Suppressed	4,368

Source: NOAA 2019.

Table B.4-11. Jobs during development and construction, and operations and maintenance

Jobs (FTE Job-Years)[1]	Atlantic Shores South Project 1 (1,510 MW)	Atlantic Shores South Project 2 (1,200 MW)[2]	Total
Direct (Development and Construction Phase)	7,445	5,915	**13,360**
Direct (Operation and Decommissioning Phase)	11,105	8,820	**19,925**
Indirect (All Phases)	9,830	7,810	**17,640**
Induced (All Phases)	12,350	9,815	**22,165**
Total	**40,730**	**32,360**	**73,090**

Source: IMPLAN modelling tool drawing from validated government and industry sources including the U.S. Bureau of Economic Analysis, the U.S. Census Bureau, and the Bureau of Labor Statistics: 2019 (COP Volume II; Atlantic Shores 2024)

[1] Full Time Equivalent (FTE) job-years assuming full-time work of 35 hours a week (1,820 hours per year).

[2] Indicative project capacity of 1,200 MW was assumed to align with the BPU's minimum OREC target for the third offshore wind solicitation scheduled to take place in 2022. The actual capacity of Project 2 could be larger than 1,200 MW and result in additional economic benefits than presented in this section. The final size of Project 2 will be dependent not only on the outcome of the pending New Jersey solicitation but also final engineering design (COP Volume II; Atlantic Shores 2024).

B.4.1 References Cited

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B.5 Underwater Sound and Acoustic Modeling Results

B.5.1 Introduction

This section of Appendix B provides an overview of underwater sound sources (Sections B.5.2 through B.5.7) and summarizes the regulation of underwater sound for marine mammals, fish and invertebrates, and sea turtles (Section B.5.8). In addition, this section summarizes the methods, assumptions, and results of the technical acoustic modeling report prepared for the Project (Section B.5.9).

B.5.2 Sources of Underwater Sound

Ocean sounds originate from a variety of sources. Some come from non-biological sources such as wind and waves, while others come from the movements or vocalizations of marine life (Hildebrand 2009). In addition, humans introduce sound into the marine environment through activities like oil and gas exploration, construction, use of military sonars, and vessel traffic (Hildebrand 2009). The acoustic environment, or "soundscape," of a given ecosystem comprises all such sounds, including biological, geophysical, and anthropogenic (Pijanowski et al. 2011). Soundscapes are highly variable across space, time, and water depth, among other factors, due to the properties of sound transmission and the types of sound sources present in each area. A soundscape is sometimes called the "acoustic habitat," as it is a vital attribute of a given area where an animal may live (i.e., habitat) (Hatch et al. 2016).

B.5.3 Physics of Underwater Sound

Sounds are created by the vibration of an object within its medium. When the object's vibration is coupled to the medium (water in the case of underwater sound), that vibration travels as a propagating wave away from the sound source (Figure B.5-1). As this wave moves through the water, the water particles undergo tiny back-and-forth movements (i.e., particle motion), essentially oscillating in roughly the same location. When the particle motion results in more particles in one location (depicted as the area of compression in Figure B.5-1), that location has relatively higher pressure. Particles are then accelerated away from the higher-pressure region, causing the particles to transfer their energy to surrounding particles and propagating the wave. Acoustic pressure is a non-directional (scalar) quantity, whereas particle motion is an inherently directional quantity (a vector). The total energy of the sound wave includes the potential energy associated with the sound pressure as well as the kinetic energy from particle motion.

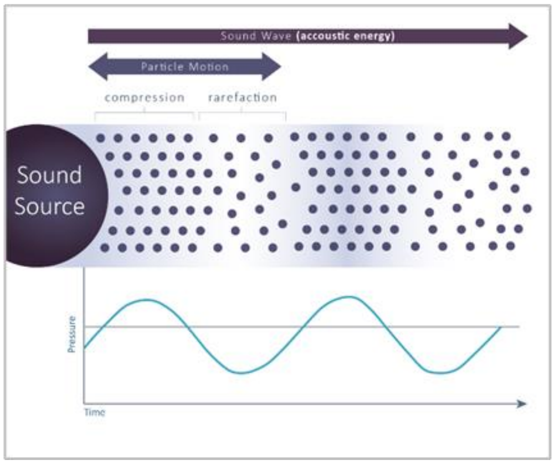

Figure B.5-1. Basic mechanics of a sound wave

B.5.4 Units of Measurement

Sound can be quantified and characterized based on a number of physical parameters. A complete description of the units can be found in ISO 18405:2017. Some of the major parameters (in bold) and their SI units (in parentheses) are:

Acoustic pressure (pascal, Pa): The values used to describe the acoustic (or sound) pressure are peak pressure, peak-to-peak pressure, and root-mean-square (rms) pressure deviation. The peak sound pressure is defined as the maximum absolute sound pressure deviation within a defined time period and is considered an instantaneous value. The peak-to-peak pressure is the range of pressure change from the most negative to the most positive pressure amplitude of a signal (Figure B.5-2). The rms sound pressure represents a time-averaged pressure and is calculated as the square root of the mean (average) of the time-varying sound pressure squared over a given period (Figure B.5-2). The peak level (L_{pk}), peak-to-peak level ($L_{pk\text{-}pk}$), and sound pressure level (L_{rms} or SPL) are computed by multiplying the logarithm of the ratio of the peak or rms pressures to a reference pressure (1 µPa in water) by a factor of 20 and are reported in decibels; see **Sound levels**.

Particle velocity (meter per second, m/s): Particle velocity describes the change in position of the oscillating particle about its origin over a unit of time. Similar to sound pressure, particle velocity is dynamic and changes as the particles move back and forth. Therefore, peak particle velocity and root-mean-square particle velocity can be used to describe this physical quantity. One major difference between sound pressure and particle velocity is that the former is a scalar (i.e., without a directional component) and the latter is a vector (i.e., includes both magnitude and direction). Particle acceleration can also be used to describe particle motion and is defined as the rate of change of velocity of a particle with respect to time. It is measured in units of meters per second squared, or m/s^2.

Sound exposure (pascal-squared second, or Pa^2-s): Sound exposure is proportional to the acoustic energy of a sound. It is the time-integrated squared sound pressure over a stated period or acoustic event (see Figure B.5-2). Unlike sound pressure, which provides an instantaneous or time-averaged value of acoustic pressure, sound exposure is cumulative over a period of time.

Acoustic intensity (watts per square meter, or W/m^2): Acoustic or sound intensity is the amount of acoustic energy that passes through a unit area normal to the direction of propagation per second. It is the product of the sound pressure and the sound velocity. With an idealized constant source, the pressure and particle velocity will vary in proportion to each other at a given location, but the intensity will remain constant.

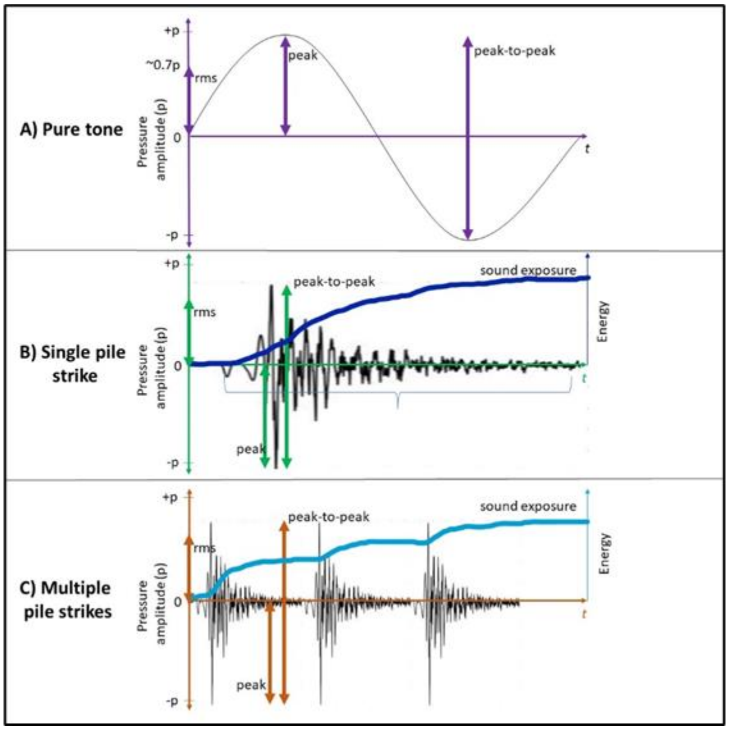

Figure B.5-2. Sound pressure wave representations of four metrics: root-mean-square (L_{rms}), peak (L_{pk}), peak-to-peak ($L_{pk\text{-}pk}$), and sound exposure (SEL).

A) A sine wave of a pure tonal signal with equal positive and negative peaks, so peak-to-peak is exactly twice the peak and rms is approximately 0.7 x peak.
B) A single pile-driving strike with one large positive pulse and a large negative pulse that is not necessarily the same magnitude. In this example, the negative pulse is more extreme so is the reported peak value, and peak-to-peak is less than double that. Sound exposure is shown as it accumulates across the time window. The final sound exposure would be considered the "single-shot" exposure, and the rms value is that exposure divided by the duration of the pulse.
C) Three consecutive pile-driving strikes with peak and peak-to-peak assessed the same way as in (B). Sound exposure is shown accumulating across all three strikes, and rms is the total sound exposure divided by the entire time window shown. The cumulative sound exposure for this series of signals would be considered the total energy from all three pile-strikes.

Sound levels: There is an extremely wide dynamic range of values when measuring acoustic pressure in pascals, so it is customary to use a logarithmic scale to compress the range of values. Aside from the ease it creates for comparing a wide range of values, animals (including humans) perceive sound on a logarithmic scale. These logarithmic acoustic quantities are known as sound levels and are expressed in decibels (dB), which is the logarithm of the ratio of the measurement in question to a fixed reference value. Underwater acoustic sound pressure levels are referenced to a pressure of 1 μPa[1] (equal to 10^{-6} Pa or 10^{-11} bar).

The metrics previously described (sound pressure, particle velocity, sound exposure, and intensity) can also be expressed as levels, and are commonly used in this way:

- root-mean-square sound pressure level (L_{rms} or SPL, in dB referenced to [re] 1 μPa)
- peak pressure level (L_{pk}, in dB re 1 μPa)
- peak-to-peak pressure level ($L_{pk\text{-}pk}$, in dB re 1 μPa)
- particle velocity level (SVL in dB re 1 nanometer per second)
- sound exposure level (SEL, in dB re 1 $\mu Pa^2 \cdot s$)[2]

Source level: Source level is a representation of the amount of acoustic power radiated from the sound source being described. It describes how loud a particular source is in a way that can inform expected received levels at various ranges. It can be conceptualized as the product of the pressure at a particular location and the range from that location to a spherical (omnidirectional) source in an idealized infinite lossless medium. The source level is the sum of the received level and the propagation loss to that receiver. It is often discussed as what the received level would be 1 meter (m) from the source, but this can lead to confusion as an actual measurement at 1 meter is likely to be impossible for large and/or non-spherical sources. The most common type is an SPL source level in units of dB re 1 μPa-m, though in some circumstances an SEL source level (in dB re 1 $\mu Pa^2 \cdot s \cdot m^2$) may be expressed; peak source level (in units of dB re 1 μPa-m) may also be appropriate for some sources.

B.5.5 Propagation of Sound in the Ocean

Underwater sound can be described through a source-path-receiver model. An acoustic source emits sound energy that radiates outward and travels through the water and the seafloor. The sound level decreases with increasing distance from the acoustic source as the sound travels through the environment. The amount by which the sound levels decrease between the theoretical source level and a receiver is called propagation loss. Among other things, the amount of propagation loss that occurs depends on the source-receiver separation, the geometry of the environment the sound is propagating through, the frequency of the sound, the properties of the water column, and the properties of the seafloor and sea surface.

[1] Airborne sound pressure levels have a different reference pressure: 20 μPa.

[2] There are a few time periods commonly used for SEL, including a 24-hour period (used in the U.S. for the regulation of noise impacts to marine mammals [SEL_{24}]), or the duration of a single event, such as a single pile-driving strike or an airgun pulse, called the single strike SEL (SEL_{ss}). A sound exposure for some other period of time, such as the entire installation of a pile, may be written without a subscript (SEL), but in order to be meaningful, should always denote the duration of the event.

When sound waves travel through the ocean, they may encounter areas with different physical properties that will likely alter the propagation pathway of the sound, compared to a homogenous and boundaryless environment. For example, near the ocean's surface, water temperature is usually higher, resulting in relatively fast sound speeds. As temperature decreases with increasing depth, the sound speed decreases. Sounds bend toward areas with lower speeds (Urick 1983). Ocean sound speeds are often slowest at mid-latitude depths of about 1,000 meters, and because of sound's preference for lower speeds, sound waves above and below this "deep sound channel" often bend towards it. Sounds originating in this layer can travel great distances. Sounds can also be trapped in the mixed layer near the ocean's surface (Urick 1983). Latitude, weather, and local circulation patterns influence the depth of the mixed layer, and the propagation of sounds near the surface is highly variable and difficult to predict.

At the boundaries near the sea surface and the sea floor, acoustic energy can be scattered, reflected, or attenuated depending on the properties at the surface (e.g., roughness, presence of wave activity, or bubbles) or seafloor (e.g., bathymetric features, substrate heterogeneity). For example, fine-grain sediments tend to absorb sounds well, while hard-bottom substrates reflect much of the acoustic energy back into the water column. The presence of ice on the ocean's surface can also affect sound propagation. For example, the presence of solid ice may dampen sound levels by scattering incident sounds. The effect will also depend on the thickness and roughness of the ice, among many other factors related to the ambient conditions. As a sound wave moves from a source to a receiver (i.e., an animal), it may travel on multiple pathways that may be direct, reflected, refracted, or a combination of these mechanisms, creating a complex pattern of transmission across range and depth. The patterns may become even more complicated in shallow waters due to repeated interactions with the surface and the bottom, frequency-specific propagation, and more heterogenous seafloor properties. All of these variables contribute to the difficulty in reliably predicting the sound field in a given marine environment at any particular time.

B.5.6 Sound Source Classification

In the current regulatory context, anthropogenic sound sources are categorized as either impulsive or non-impulsive, and either continuous or intermittent, based on their differing potential to affect marine species (NMFS 2018). Specifically, when it comes to potential damage to marine mammal hearing, sounds are classified as either impulsive or non-impulsive, and when considering the potential to affect behavior or acoustic masking, sounds are classified as either continuous or intermittent.

Impulsive noises are characterized as having (ANSI S1.13-2005, Finneran 2016):

- broadband frequency content
- fast rise-times and rapid decay times
- short durations (i.e., < 1 second)
- high peak sound pressures

Characterization of non-impulsive noises is less clear. Characteristics of non-impulsive sound sources may include:

- variable in spectral composition (i.e., broadband, narrowband, or tonal)
- longer rise-times/decay times and total durations compared to an impulsive sound
- continuous (e.g., vessel engine radiated noise) or intermittent (e.g., echosounder pulses)

It is generally accepted that sources like explosions,[3] airguns, sparkers, boomers, and impact pile driving are impulsive and have a greater likelihood of causing hearing damage than non-impulsive sources. Impulsive sounds are more likely to induce physiological effects, including TTS and PTS, than non-impulsive sounds with the same energy. This binary, at-the-source classification of sound types, therefore, provides a conservative framework upon which to predict potential adverse hearing impacts on marine mammals.

For behavioral effects of anthropogenic sound on marine mammals, NMFS classifies sound sources as either intermittent or continuous (NMFS 2018). Continuous sounds, such as drilling or vibratory pile driving, remain “on,” i.e., producing sound, for a given period of time, though this is not well-defined. An intermittent sound typically consists of bursts or pulses of sound on a regular on-off pattern, also called the duty-cycle. Examples of intermittent sounds are those from scientific echosounders, sub-bottom profilers, and even impact pile driving. It is important to recognize that these delineations are not always practical in application, as a continuous yet moving sound source (such as a vessel passing over a fixed receiver) could be considered intermittent from the perspective of the receiver.

In reality, animals will encounter many signals in their environment, which may contain many or all of these sound types, called *complex sounds*. And even for sounds that are impulsive at the source, as the signal propagates through the water, the degree of impulsiveness decreases (Martin et al. 2020). While there is evidence, at least in terrestrial mammals (Hamernik and Hsueh 1991), that complex sounds can be more damaging than continuous sounds of the same energy, there is not currently a regulatory category for this type of sound. One approach for assessing the impulsiveness of a sound that has gained attention is to compute the kurtosis of that signal. *Kurtosis* is a statistical measure that describes the prevalence of extreme values within a distribution of observations, in other words the “spikiness” of the data. By definition, a sound with a kurtosis value of 3 or less has very few extreme values and is generally considered Gaussian (I.e., normally distributed) noise. Martin et al. (2020) showed that a kurtosis value greater than 40 represents a distribution of observations with many extreme values and is very spiky. This generally describes an impulsive noise. A distribution of sound level observations from a time series with a kurtosis value somewhere in between these two values would be considered a complex sound.

[3] Explosions are further considered for non-auditory injury.

B.5.7 Sound Sources Related to Offshore Wind Development

B.5.7.1 Geophysical and Geotechnical Surveys

Geophysical and geotechnical surveys are conducted to characterize the bathymetry (depth), sediment type, and benthic habitat characteristics of the marine environment. They may also be used to identify archaeological resources or obstacles on the seafloor. These types of surveys occur in the site assessment phase in order to inform the placement of offshore wind foundations but may also occur intermittently during and after turbine construction to identify, guide, and confirm the locations of turbine foundations.

The suite of HRG sources that may be used in geophysical surveys includes side-scan sonars (SSS), multibeam echosounders (MBES), magnetometers and gradiometers, parametric SBP, compressed high-intensity radiated pulses SBP, boomers, and/or sparkers. Seismic airguns are not expected to be used for offshore wind applications. These HRG sources may be towed behind a ship, mounted on a ship's hull, or deployed from remotely operated vehicles or autonomous underwater vehicles. Many HRG sources are active acoustic sources, meaning they produce sound deliberately in order to obtain information about the environment. With the exception of some MBES and SSS, they produce sounds below 180 kHz and thus may be audible to marine species. Source levels vary widely depending on source type and operational power level used, from approximately 145 dB re 1 µPa-m for towed SBP up to 245 dB re 1 µPa-m for some MBES (Crocker and Fratantonio 2016). Generally speaking, sources that emit sound in narrow beams directed at the seafloor are less likely to affect marine species because they ensonify a small portion of the water column, thus reducing the likelihood that an animal encounters the sound. While sparkers are omnidirectional, most other HRG sources have narrower beamwidths (e.g., MBES: up to 6°, parametric SBP: 30°, boomers: 30–90°) (Crocker and Fratantonio 2016). Most HRG sources emit short pulses of sound, with periods of silence in between. This means that only several "pings" emitted from a vessel towing an active acoustic source would reach an animal below, even if the animal was stationary (Ruppel et al. 2022). HRG surveys may occur throughout the construction area with the potential for greater effort in some areas.

Geotechnical surveys may use vibracores, jet probes, bottom-grab samplers, deep borings, or other methods to obtain samples of sediments at each potential turbine location and along the cable route. For most of these methods, source levels have not been measured, but it is generally assumed that low-frequency, low-level noise will be introduced as a byproduct of these actions. It is likely that the sound of the vessel will exceed that generated by the geotechnical method itself.

B.5.7.2 Unexploded Ordnance Detonations

UXOs may be discovered on the seabed in offshore wind lease areas or along export cable routes. While non-explosive methods may be employed to lift and move these objects, some may need to be detonated. Underwater explosions of this type create shock waves characterized by extreme changes in pressure, followed by a series of symmetrical bubble pulses. Shock waves are supersonic, so they travel faster than the speed of sound. The explosive sound field is extremely complex, especially in shallow waters. In 2015, (von Benda-Beckmann et al.) measured received levels of explosions in shallow waters at distances ranging from 100–2000 meters from the source, in water depths ranging from 6–22 meters. The measured SEL from the explosive removal of a 263-kilogram charge was 216 dB re 1 μPa^{2}s at a distance of 100 meters and 196 dB re 1 μPa^{2}s at 2,000 meters. They found that SELs were lower near the surface than near the seafloor or in the middle of the water column, suggesting that if an animal is near the surface, the effects may be less damaging. Most of the acoustic energy for underwater explosions is below 1000 Hz.

As an alternative to traditional detonation, a newer method called deflagration allows for the controlled burning of underwater ammunition. Typically, a remotely operated vehicle uses a small, targeted charge to initiate rapid burning of the ordnance; once this process is complete, the remaining debris can be cleared away. Recent work has demonstrated that both peak sound pressure (Lpk) and SEL measured from deflagration events may be as much as 20 dB lower than equivalently sized high-order detonations (Robinson et al. 2020).

B.5.7.3 Construction and Installation Activities

Impact and Vibratory Pile Driving

At present, the installation of turbine foundations is largely done using pile driving. There are several techniques, including impact and vibratory driving, and many pile designs and sizes, including monopile and jacket foundations. Impact pile driving employs a hammer to strike the pile head and force the pile into the sediment with a typical hammer strike rate of approximately 30 to 50 strikes per minute. Typically, force is applied over a period of less than 20 milliseconds, but the pile can generate sound for upwards of 0.5 second. Impact pile driving noise is characterized as impulsive because of its high peak pressure, short duration, and rapid onset time. Underwater sound levels generated during impact pile driving depend on many factors, including the pile material and size, characteristics of the substrate, penetration of the pile in the seabed, hammer energy and size, and water depth. Currently the design envelope for most offshore wind turbine installations anticipates hammer energy between 2,500 and 4,000 kilojoules (kJ), but generally speaking, with increasing pile diameter, greater hammer energy is used. The propagation of pile-driving sounds depends on factors such as the sound speed in the water column (influenced by temperature, salinity, and depth), the bathymetry, and the composition of sediments in the seabed and will therefore vary among sites. Due to variation in these features, sounds may not radiate symmetrically outward from a pile.

BOEM has invested in the Realtime Opportunity for Development of Environmental Observations (RODEO) efforts to measure sound during installation and operation of BIWF and CVOW. Similar studies have been completed at multiple facilities in Europe. Measurements of sounds from impact pile driving at CVOW were conducted at ranges between 0.5 and 19 miles (0.75 and 30 kilometers) from the two 25.6-foot (7.8-meter) diameter monopiles. Results showed that without any noise abatement method in place, the maximum broadband peak sound pressure (L_{pk}) at 0.5 mile (750 meters) from the pile was 190 dB re 1 μPa, and the maximum single strike sound exposure level (SEL_{ss}) at that range was 170 dB re 1 μPa^2·s. Most of the acoustic energy occurred between 30 and 300 Hz (BOEM 2019). At a 4.7-mile (7.5-

kilometer) distance, the maximum measured L_{pk} was 174 dB re 1 µPa, and at 15.5 miles (25 kilometers), it fell to 144 dB re 1 µPa. The peak particle velocity on the seabed, measured 0.3 mile (500 meters) from the foundation, was 114 dB re 1 nanometer per second (Amaral et al. 2021).

Jacket foundations are also common, if not for the main turbine structures, for other structures associated with the wind farm, such as the offshore substations. Jacket foundations are installed using pin piles which are generally significantly smaller than monopiles, on the order of 7 to 16 feet (2 to 5 meters) in diameter, but more pin piles are needed per foundation. The sound levels generated will vary depending on the pile material, size, whether the piles are installed with the jacket in place, substrate, hammer energy, and water depth. At BIWF, the 4.5-foot (1.4-meter) pin piles were installed using less than 160 kJ of energy, compared to the 25.6-foot (7.8-meter) monopiles installed at CVOW, which required more than 320 kJ, sometimes as much as 700 kJ, to install. The maximum SEL_{ss} measured at 0.5 mile (750 meters) from the jacket foundations at BIWF ranged from 160 to 168 dB re 1 $\mu Pa^2 \cdot s$, nearly 10 dB lower than CVOW. Using measurements combined with acoustic modeling, the peak-to-peak source levels for pile driving at BIWF were estimated to be between 233 and 245 dB re 1 µPa-m (Amaral et al. 2018).

Vibratory hammers may be used as an alternative to impact pile driving. The vibratory hammer continuously exerts vertical vibrations into the pile, which causes the sediment surrounding the pile to liquefy, allowing the pile to penetrate the substrate. The vibratory hammer typically oscillates at a frequency of 20 to 40 Hz (Matuschek and Betke 2009) and produces most of its acoustic energy below 2 kHz. Vibratory pile driving is a non-impulsive sound source, but because the hammer is on continuously, underwater sound introduced would be into the water column for a longer period of time than with impact pile driving. While measurements of vibratory pile driving of large monopiles have not been reported, Buehler et al. (2015) measured sound levels at 33 feet (10 meters) distance from a 6-foot (1.8-meter) steel pile and found them to be 185 dB re 1 µPa. Vibratory pile driving is a non-impulsive sound source, and the hammer produces sound continuously, so is assessed using different criteria than impact pile driving for behavioral and physiological effects on marine mammals.

Various noise abatement technologies, such as bubble curtains, arrays of enclosed air resonators, or segmented nets of rubber or foam, may be employed to reduce noise from impact pile driving. Measurements from European wind farms have shown that a single noise abatement system can reduce broadband sound levels by 10 to 15 dB, while using two systems together can reduce sound levels as much as 20 dB (Bellmann et al. 2020). Based on RODEO measurements from CVOW, double Big Bubble Curtains (dBBC) are shown to be most effective for frequencies above 200 Hz, and greater noise reduction was seen in measurements taken in the middle of the water column compared to those near the seabed. Approximate sound level reduction associated with dBBC is 3 to 5 dB below 200 Hz, and 8 to 20 dB above 200 Hz, depending on the characteristics of the bubble curtain (Amaral et al. 2020).

Vessel Traffic

During construction, vessels and aircraft may be used to transport crew and equipment. See Section B.5.7.4, *Operations and Maintenance Activities*, for further detail about sounds related to those activities. Large vessels will also be used during the construction phase to conduct pile driving, and these vessels may use Dynamic Positioning (DP) systems. DP is the process by which a vessel holds station over a specific seafloor location for some time period using input from gyrocompasses, motion sensors, GPS, active acoustic positioning systems, and wind sensors to determine relative movement and environmental forces at work. Generally speaking, most acoustic energy is below 1,000 Hz, often below 50 Hz, with tones related to engine and propeller size and type. The sound can also vary directionally, and this directionality is much more pronounced at higher frequencies. Because this is a dynamic operation, the sound levels produced will vary based on the specific operation, DP system used (e.g., jet or propeller rotation, versus a rudder or steering mechanism), and factors such as the blade rate and cavitation, in some cases. Representative sound field measurements from the use of DP are difficult to obtain because the sound transmitted is often highly directional and context specific. The direction of sound propagation may change as different DP needs requiring different configurations are applied.

Many studies have found that the measured sound levels of DP alone are, counterintuitively, higher than those of DP combined with the intended activities such as drilling (Jiménez-Arranz et al. 2020; Kyhn et al. 2011; Nedwell and Edwards 2004) and coring (Warner and McCrodan 2011). Nedwell and Edwards (2004) reported that DP thrusters of the semi-submersible drill rig Jack Bates produced periodic noise (corresponding to the rate of the thruster blades) with most energy between 3 and 30 Hz. The received SPL measured at 328 feet (100 meters) from the vessel was 188 dB re 1 µPa. Warner and McCrodan (2011) found that most DP related sounds from the self-propelled drill ship, R*/V Fugro Synergy* were in the 110 to 140 Hz range, with an estimated source level of 169 dB re 1 µPa-m. Sounds in this frequency range varied by 12 dB during DP, while the broadband levels, which also included diesel generators and other equipment sounds, varied by only 5 dB over the same time period. All of the above sources report high variability in levels with time. This is due in part to the intermittent usage and relatively slow rotation rates of thrusters used in DP. It is also difficult to provide a realistic range of source levels from the data thus far because most reports do not identify the direction from which sound was measured relative to the vessel, and DP thrusters are highly directional systems.

The active acoustic positioning systems used in DP can be additional sources of high frequency sound. These systems usually consist of a transducer mounted through the vessel's hull and one or more transponders affixed to the seabed. Kongsberg High Precision Acoustic Positioning systems produce pings in the 10 to 32 kHz frequency range. The hull-mounted transducers have source levels of 188 to 206 dB re 1 µPa-m depending on adjustable power settings (Kongsberg Maritime AS 2013). The fixed transponders have maximum source levels of 186 to 206 dB re 1 µPa-m depending on model and beam width settings from 15 to 90° (Jiminez-Arranz et al. 2020). These systems have high source levels, but beyond 1.2 miles (2 kilometers), they are generally quieter than other components of the sound from DP vessels for various reasons including: their pulses are produced in narrowly directed beams, each individual pulse is very short, and their high frequency content leads to faster attenuation.

Dredging, Trenching, and Cable Laying

The installation of cables can be done by towing a tool behind the installation vessel to simultaneously open the seabed and lay the cable, or by laying the cable and following with a tool to embed the cable.

Possible installation methods for these options include jetting, vertical injection, control flow excavation, trenching, and plowing. Burial depth of the cables is typically 3.3 to 6.6 feet (1 to 2 meters). Cable installation vessels may use utilize DP to lay the cables.

Nedwell et al. (2003) recorded underwater sound at 525 feet (160 meters) from trenching, in water depths of 23 to 36 feet (7 to 11 meters), and back-calculated the source level to be 178 dB re 1 µPa-m. They describe trenching sound as generally broadband in nature, but variable over time, with some tonal machinery noise and transients associated with rock breakage. McQueen et al. (2018) summarized results from several studies measuring the sounds of dredging operations. They report source levels from hydraulic and mechanical dredges typically used to excavate sand or rock. Source levels from cutterhead suction dredges range from 168 to 175 dB re 1 µPa-m, and trailing suction hopper dredge source levels are typically 172 to 190 dB re 1 µPa-m. Most of the energy from dredging is below 1,000 Hz (McQueen et al. 2018).

B.5.7.4 Operation and Maintenance Activities

Aircraft Traffic

Manned aircraft consist of fixed-wing aircraft with propellers or jet engines, as well as helicopters. Unmanned systems also exist. For jet engine aircraft, the engine is the primary source of sound. For propeller driven aircraft and helicopters, the propellors and rotors also produce noise. Aircraft generally produce low-frequency sound below 500 Hz (Richardson et al. 1995). While aircraft noise can be substantial in air, penetration of aircraft noise into the water is limited because much of the noise is reflected off the water's surface (Richardson et al. 1995). The noise that does penetrate into the water column does this via a critical incident angle or cone. With an idealized flat sea surface, the maximum critical incident angle is approximately 13° (Urick 1983); beyond this, sound is reflected off the surface. When the sea surface is not flat, there may be some additional penetration into the water column in areas outside of this 13° cone. Nonetheless, the extent of noise from passing aircraft is more localized in water than it is in air.

Jiménez-Arranz et al. (2020) reviewed Richardson et al.'s (1995) sound measurements recorded below passing aircraft of various models. These SPL measurements included 124 dB re 1 µPa (dominant frequencies between 56 and 80 Hz) from a maritime patrol aircraft with an altitude of 249 feet (76 meters), 109 dB re 1 µPa (dominant frequency content below 22 Hz) from a utility helicopter with an altitude of 500 feet (152 meters), and 107 dB re 1 µPa (tonal, 82 Hz) from a turbo propeller with an altitude of 1,500 feet (457 meters). Recent published levels associated with unmanned aircraft (Christiansen et al. 2016; Erbe et al. 2017) indicate source levels around or below 100 dB re 1 µPa-m.

Vessel Traffic

During operations, small vessels may be used to transport crew and supplies. Noise from vessel transit is considered to be continuous, with a combination of broadband and tonal sounds (Richardson et al. 1995; Ross 1976). Transiting vessels generate continuous sound from their engines, propeller cavitation, onboard machinery, and hydrodynamics of water flows (Ross 1976). The actual radiated sound depends on several factors, including the type of machinery on the ship, the material conditions of the hull, how recently the hull has been cleaned, interactions with the sea surface, and shielding from the hull, which reduces sound levels in front of the ship.

In general, vessel noise increases with ship size, power, speed, propeller blade size, number of blades, and rotations per minute. Source levels for large container ships can range from 177 to 188 dB re 1 µPa-m (McKenna et al. 2013) with most energy below 1 kHz. Smaller vessels typically produce higher-frequency sound concentrated in the 1 to 5 kHz range. Kipple and Gabriele (2003) measured underwater sound from vessels ranging from 14 to 65 feet (4.3 to 19.8 meters) long (25 to 420 horsepower) and back-calculated source levels to be 157 to 181 dB re 1 µPa-m. Similar levels are reported by Jiménez-Arranz et al. (2020), who provide a review of measurements for support and crew vessels, tugs, rigid hulled inflatable boats, icebreakers, cargo ships, oil tankers, and more.

During transit to and from shore bases, survey vessels typically travel at speeds that optimize efficiency, except in areas where transit speed is restricted. The vessel strike speed restrictions that are in place along the Atlantic OCS are expected to offer a secondary benefit of underwater noise reduction. For example, recordings from a speed reduction program in the Port of Vancouver (689 to 820 feet [210 to 250 meter] water depths) showed that reducing speeds to 11 knots reduced vessel source levels by 5.9 to 11.5 dB, depending on the vessel type (MacGillivray et al. 2019). Vessel noise is also expected to be lower during geological and geophysical surveys, as they typically travel around 5 knots when towing instruments.

Wind Turbine Generator Operation

Once windfarms are operational, low-level sounds are generated by each WTG, but sound levels are much lower than during construction. This type of sound is considered to be continuous, omnidirectional radially from the pile, and non-impulsive. Most of the energy associated with operations is below 120 Hz. Sound levels from wind turbine operations are likely to increase somewhat with increasing generator size and power ratings, as well as with wind speeds. Recordings from BIWF indicated that there was a correlation between underwater sound levels and increasing wind speed, but this was not clearly influenced by turbine machinery; rather it may have been explained by the natural effects that wind and sea state have on underwater sound levels (Elliott et al. 2019; Urick 1983).

A recent compilation of operational noise from several wind farms (Tougaard et al. 2020), with turbines up to 6.15 MW in size, showed that operational noise generally attenuates rapidly with distance from the turbines (falling to near ambient sound levels within approximately 0.6 mile [1 kilometer] from the source), and the combined noise levels from multiple turbines is lower or comparable to that generated by a small cargo ship. Tougaard et al. (2020) developed a formula predicting a 13.6 dB increase for every 10-fold increase in WTG power rating. This means that operational noise could be expected to increase by 13.6 dB when increasing in size from a 0.5 MW turbine to a 5 MW one, or from 1 MW to 10 MW. The least squares fit of that dataset would predict that the SPL measured 328 feet (100 meters) from a hypothetical 15 MW turbine in operation in 10 m/s (19 knots or 22 miles per hour) wind would be 125 dB re 1 µPa. However, all of the 46 data points in that dataset, with the exception of the two from

BIWF, were from WTGs operated with gear boxes of various designs rather than the newer use of direct drive technology, which is expected to lower underwater noise levels significantly. Stöber and Thomsen (2021) make predictions for source levels of 10 MW turbines based on a linear extrapolation of maximum received levels from WTGs with ratings up to 6.15 MW. The linear fit is likely inappropriate, and the resulting predictions may be exaggerated. Tougaard et al. (2020) point out that received level differences among different pile types could be confounded by differences in water depth and turbine size. In any case, additional data is needed to fully understand the effects of size, foundation type properties (e.g., structural rigidity and strength), and drive type on the amount of sound produced during turbine operation.

B.5.7.5 Decommissioning Activities

The methods that may be used for decommissioning are not well understood at this time. It is possible that explosives may be used. However, given the general trend of reducing the use of underwater explosives that has been observed in the oil and gas industry, it is likely that offshore wind structures will instead be removed by cutting. While it is difficult to extrapolate directly, we can glean some insights from a recent study that measured received sound levels during the mechanical cutting of well conductor casings on oil and gas platforms in California. The cutters operated at 60 to 72 revolutions per minute (RPM), and the cutting time varied widely between cuts (on the order of minutes to hours). At distances of 348 to 384 feet (106 to 117 meters) from the cutting, received SPLs were 120 to 30 dB re 1 µPa, with most acoustic energy falling between 20 and 2,000 Hz (Fowler et al. 2022). This type of sound is considered to be non-impulsive and intermittent (i.e., continuous while cuts are actually being made, with quieter periods between cuts). Additional noise from vessels (see *Vessel Traffic in* Sections B.5.6.2 and B.5.6.3) and other machinery may also be introduced throughout the decommissioning process.

B.5.8 Regulation of Underwater Sound

B.5.8.1 Marine Mammals

Marine mammal species have been classified into functional hearing groups based on similar anatomical auditory structures and frequency-specific hearing sensitivity obtained from hearing tests on a subset of species (Finneran 2015a; NMFS 2018; Southall et al. 2019). Hearing groups utilized in the U.S. regulatory process, identified in the NMFS (2018) technical guidance, include low-, mid-, and high-frequency cetaceans, phocid pinnipeds underwater, and otariid pinnipeds underwater.

The current NMFS (2018) injury thresholds consist of dual criteria of L_{pk} and 24 hour-cumulative SEL (SEL_{24h}) thresholds (Table B.5-1). These criteria are used to predict the potential range from the source within which injury may occur. The criterion that results in the larger physical impact range is generally used to be most conservative. The SEL thresholds are frequency-weighted for each functional hearing group, which means that the sound is essentially filtered based on the group's frequency-specific hearing sensitivity, de-emphasizing the frequencies at which species are less sensitive. The frequency weighting functions are described in detail in Finneran (2016).

NMFS currently uses a threshold for behavioral disturbance of 160 dB re 1 μPa SPL for non-explosive impulsive sounds (e.g., airguns and impact pile driving) and intermittent sound sources (e.g., scientific and non-tactical sonar), and 120 dB re 1 μPa SPL for continuous sounds (e.g., vibratory pile driving, drilling) (NMFS 2022). This is an "unweighted" criterion that is applicable for all marine mammal functional hearing groups. Unlike with sound exposure level-based thresholds, the accumulation of acoustic energy over time is not relevant for this criterion – meaning that behavioral disturbance can occur even if an animal experiences a received SPL of 160 dB re 1 μPa very briefly just once.

While the behavioral disturbance criterion is generally applied in a binary fashion, as alluded to previously, there are numerous factors that determine whether an individual will be affected by a sound, resulting in substantial variability even in similar exposure scenarios. In particular, it is recognized that the context in which a sound is received affects the nature and extent of responses to a stimulus (Ellison et al. 2012; Southall et al. 2007). Therefore, a "step function" concept for behavioral disturbance was introduced by Wood et al. (2012) whereby proportions of exposed individuals experience behavioral disturbance at different received levels, centered at an SPL of 160 dB re 1 μPa. These probabilistic thresholds reflect the higher sensitivity that has been observed in beaked whales and migrating mysticetes (Table B.5-2). The M-weighting functions, described by Southall et al. (2007) and used for the Wood et al. (2012) probabilistic disturbance step thresholds, are different from the weighting functions by Finneran (2016), previously mentioned. The M-weighting was specifically developed for interpreting the likelihood of audibility, whereas the Finneran (2016) weighting functions were developed to predict the likelihood of auditory injury.

In order to predict the number of individuals of a given species that may be exposed to harmful levels of sound from a specific activity, a series of modeling exercises are conducted. First, the sound field of a sound-generating activity is modeled based on characteristics of the source and the physical environment. From the sound field, the range to the U.S. regulatory acoustic threshold isopleths can be predicted. This approach is referred to as acoustic modeling. By overlaying the marine mammal density information for a certain species or population in the geographical area of the activity, the number of animals exposed within the acoustic threshold isopleths is then predicted. This is called *exposure modeling*. Some models further incorporate animal movement to make more realistic predictions of exposure numbers. Animal movement models may incorporate behavioral parameters including swim speeds, dive depths, course changes, or reactions to certain sound types, among other factors. Exposure modeling may be conducted for a range of scenarios including different seasons, energy (e.g., pile driving hammers), mitigation strategies (e.g., 6 dB versus 10 dB of attenuation), and levels of effort (e.g., number of piles per day).

Table B.5-1. Acoustic thresholds for onset of permanent threshold shift (PTS) and temporary threshold shift (TTS) for marine mammals

Functional Hearing Group	Effect	Impulsive Sound Source		Non-Impulsive Sound Source
		L_{pk} (dB re 1 µPa)	Weighted SEL_{24h} (dB re 1 µPa^2·s)	Weighted SEL_{24h} (dB re 1 µPa^2·s)
Low-frequency cetaceans	PTS	219	183	199
	TTS	213	168	179
Mid-frequency cetaceans	PTS	230	185	198
	TTS	224	170	178
High-frequency cetaceans	PTS	202	155	173
	TTS	196	140	153
Phocid pinnipeds underwater	PTS	218	185	201
	TTS	212	170	181
Otariid pinnipeds underwater	PTS	232	203	199
	TTS	226	188	199

Source: NMFS 2018.

Table B.5-2. M-weighted probabilistic disturbance thresholds (SPL) used to predict a behavioral response in marine mammals

Marine Mammal Group	Probability of Disturbance at M-Weighted SPL_{rms} Thresholds (db re 1 µPa)			
	120	140	160	180
Porpoises and beaked whales	50%	90%		
Migrating mysticetes	10%	50%	90%	
Other		10%	50%	90%

Source: Wood et al. 2012.
Note: Probabilities are not additive and reflect single points on a theoretical response curve.

B.5.8.2 Fishes and Invertebrates

During construction of the Bay Bridge in California, researchers observed dead fish near pile-driving operations, suggesting that fish could be killed when in very close proximity (within 33 feet [10 meters]) to the pile (Caltrans 2004). Further work around this construction project led to the formation of dual interim acoustic criteria by the Fisheries Hydroacoustic Working Group (2008), which were later adopted by NMFS. With these interim criteria, the maximum permitted peak SPL for a single pile-driving strike is 206 dB re 1 µPa, and the maximum accumulated SEL is 187 dB re 1 µPa^2·s for fishes greater than 2 grams, and 183 dB re 1µPa^2·s for fishes below 2 grams (Table B.5-3). These criteria remain in use by NMFS, but given the new information obtained since 2008, the appropriateness of these thresholds is being reconsidered (Popper et al. 2019).

These early findings prompted a suite of laboratory experiments in which a special testing apparatus was used to simulate signals from pile driving that a fish would encounter around 33 feet (10 meters) from a pile (Casper et al. 2012, 2013a, 2013b; Halvorsen et al. 2011, 2012a, 2012b). An important component of this work was the ability to simulate both the pressure and particle motion components of the sound field, which is rarely done in laboratory experiments. These studies showed that effects are greater in fishes with swim bladders than those without, and that species with closed swim bladders experienced greater damage than those with open swim bladders. Evidence of barotrauma was observed starting at peak pressures of 207 dB re 1 μPa (Halvorsen et al. 2012a). Larger animals seem to have a higher susceptibility to injury than smaller animals (Casper et al. 2013a). The researchers found that most of the species tested showed recovery from injury within 10 days of exposure, but they note that injured animals may be more vulnerable to predation while they are recovering, and these secondary effects have not been studied. The authors also conclude that SEL alone is not enough to predict potential impacts on fishes; the energy in a given strike and the total number of strikes are also important factors. These studies formed the foundation of the *Guidelines for Fish and Sea Turtles* by Popper et al. (2014), which became ANSI standard (#ASA S3/SC1.4 TR-2014) and have become widely accepted hearing thresholds for fishes and turtles.

No studies have directly measured TTS in fishes as a result of exposure to pile driving noise. Popper et al. (2005) exposed caged fish to sounds of seismic airguns (an impulsive signal which can serve as a proxy), and tested their hearing sensitivity afterwards. Three species with differing hearing capabilities were exposed to five pulses at a mean received L_{pk} of 207 dB re 1 μPa (186 dB re 1 $\mu Pa^2 \cdot s$ SEL). None of the fish showed evidence of barotrauma or tissue damage, nor was there damage to the hearing structures (Song et al. 2008). The species with the least-sensitive hearing—the broad whitefish—showed no evidence of TTS. The northern pike and lake chub, species with more sensitive hearing, did exhibit TTS after exposure to seismic pulses, but showed recovery after 18 hours. The findings suggest that there is a relationship between hearing sensitivity and level of impact, and that species without a connection between the swim bladder and ear are unlikely to experience TTS. Nonetheless, Popper et al. (2014) propose 186 dB re 1 $\mu Pa^2 \cdot s$ SEL as a conservative TTS threshold for all fishes exposed to either seismic airguns or pile driving, regardless of hearing anatomy. They acknowledge that research is needed on potential TTS due to exposure to pile-driving noise, and that future work should measure particle motion as the relevant cue.

A handful of studies have directly investigated the effects of impulsive sounds on eggs and larvae of marine fishes and invertebrates, and most have taken place in the laboratory. Bolle et al. (2012) used a device similar to Halvorsen et al. (2012a) to simulate pile-driving sounds and found no damage to larvae of common sole (which has a swim bladder at certain larval stages) from an SEL of 206 dB re 1 $\mu Pa^2 \cdot s$, which the authors surmise is equivalent to the received level at approximately 328 feet (100 meters) from a 13-foot (4-meter) diameter pile. Further work by Bolle et al. (2014) tested larvae of seabass and herring (both species have swim bladders). Several different life stages were tested, but none of the species showed a difference in mortality between control and exposed animals. The seabass were exposed to SELs up to 216 dB re 1 $\mu Pa^2 \cdot s$ and maximum L_{pk} of 217 dB re 1 μPa, while herring were exposed to SELs up to 212 dB re 1 $\mu Pa^2 \cdot s$ and maximum L_{pk} of 207 dB re 1 μPa. Together, the tested larvae represent the entire range of swim bladder shape types described by Popper et al. (2014). There was no difference in impacts experienced by species with and without a swim bladder, or between those with open or closed swim bladders. Based on this work, Popper et al. (2014) use 210 dB re 1 $\mu Pa^2 \cdot s$ SEL as a threshold for mortality after exposure to both pile driving and seismic airguns.

Popper et al. (2014) provide thresholds for non-recoverable injury, recoverable injury (i.e., mild forms of barotrauma), and TTS for three hearing groups, fish without a swim bladder, fish with a swim bladder not involved in hearing, and fish with a swim bladder involved in hearing, plus an additional category for eggs and larvae (Table B.5-3). Unlike with marine mammals, Popper et al. (2014) do not distinguish between impulsive and non-impulsive sounds; instead they provide thresholds for each sound type (explosions, pile driving, seismic airguns, sonars, and continuous sounds). That said, studies focused on pile driving are sometimes used to draw conclusions about impacts from seismic airguns, and vice versa. This is simply due to a lack of comprehensive data for each source type. The thresholds are all given in terms of sound pressure, not particle motion, though many have acknowledged that particle motion thresholds would be more appropriate (Popper and Hawkins 2018). Currently, there are no underwater noise thresholds for invertebrates, but the effect ranges are expected to be similar to those predicted for fish without a swim bladder.

Table B.5-3. Acoustic thresholds for injury for fishes exposed to pile-driving sound

Fish Hearing Group	Mortality and Non-Recoverable Injury		Recoverable Injury		TTS
	L_{pk} (dB re 1 μPa)	SEL (dB re 1 μPa²·s)	L_{pk} (dB re 1 μPa)	SEL (dB re 1 μPa²·s)	SEL (dB re 1 μPa²·s)
Fish without swim bladder[1]	213	219	213	216	186
Fish with swim bladder not involved in hearing[1]	207	210	207	203	186
Fish with swim bladder involved in hearing[1]	207	207	207	203	186
Eggs and larvae[1]	207	210	--	--	--
Fish ≥ 2 grams[2]			206	187	
Fish < 2 grams[2]			206	183	

[1] Source: Popper et al. 2014.
[2] Source: Fisheries Hydroacoustics Working Group 2008.

NMFS currently uses an SPL criterion of 150 dB re 1 μPa for the onset of behavioral effects in fishes (GARFO 2020). The scientific rationale for this criterion is not well supported by the data (Hastings 2008), and there has been criticism about its use (Popper et al. 2019). Most notably, the differences in hearing anatomy among fishes suggest the use of a single criterion may be too simplistic. Furthermore, a wide range of behavioral responses has been observed in the empirical studies thus far (ranging from startle responses to changes in schooling behavior), and it is difficult to ascertain which, if any, of those responses may lead to significant biological consequences. Interestingly, several recent studies on free-ranging fishes (e.g., Hawkins et al. 2014; Roberts et al. 2016b) have observed the onset of different behavioral responses at similar received levels ($L_{pk\text{-}pk}$ of 152 to 167 dB re 1 μPa), and Popper et al. (2019) suggest that a received level of 163 dB re 1 μPa $L_{pk\text{-}pk}$ might be more appropriate than the current SPL criterion of 150 re 1 μPa. Finally, given that most species are more sensitive to particle motion and not acoustic pressure, the criteria should, at least in part, be expressed in terms of particle motion. However, until there is further empirical evidence to support a different criterion, the 150 dB re 1 μPa threshold remains in place as the interim metric that regulatory agencies have agreed upon.

B.5.8.3 Sea Turtles

Injury thresholds for sea turtles were developed for use by the U.S. Navy (Finneran et al. 2017) (Table B.5-4). These thresholds consist of dual criteria of L_{pk} and SEL thresholds. The SEL thresholds are weighted based on auditory weighting functions developed by Finneran et al. (2017). NMFS currently recommends a threshold for behavioral disturbance of 175 dB re 1 μPa SPL for both impulsive and non-impulsive sources based on exposure studies conducted by McCauley et al. (2000), which demonstrated that sea turtles noticeably increased their swimming activity at received levels above an SPL of 166 dB re 1 μPa and became erratic in their swimming, potentially indicating agitation, when received levels exceeded an SPL of 175 dB re 1 μPa.

Table B.5-4. Recommended acoustic thresholds for onset of permanent threshold shift (PTS) and temporary threshold shift (TTS) for sea turtles

Effect	Impulsive Sound Source		Non-Impulsive Sound Source
	L_{pk} (dB re 1 μPa)	SEL (dB re 1 $\mu Pa^2 \cdot s$)	SEL (dB re 1 $\mu Pa^2 \cdot s$)
PTS	232	204	220
TTS	226	189	200

Source: Finneran et al. 2017.

To predict the number of individuals of a given sea turtle species that may be exposed to harmful levels of sound from a specific activity, acoustic modeling and exposure modeling are conducted, as described for marine mammals in Section B.5.8.1. These modeling efforts take into account sea turtle densities in the geographical area of the activity and available sea turtle behavioral parameters to predict their movements within that geographical area.

B.5.9 Acoustic Modeling for the Project

This subsection provides an overview of the methods, assumptions, and results of the technical acoustic modeling report prepared for the Project (COP Appendix II-L1; Atlantic Shores 2024).

The Project, which encompasses Project 1 and Project 2, would consist of up to 200 WTGs, up to 10 OSSs, 1 permanent met tower, up to 4 temporary metocean buoys, and interarray, interlink, and export cables. The Project would be on the OCS offshore New Jersey in BOEM's Lease Area OCS-A 0499. The primary underwater noise-producing activity for the Project would be impact pile driving during construction. Qualitative assessments of lower noise-level activities, including cable laying and vessel noise are also provided in Appendix II-L1 of the COP (Atlantic Shores 2024).

For the quantitative modeling assessment of impact pile driving for foundation installation, predicted sound fields were generated for 39-foot-diameter (12-meter-diameter) monopiles, 49-foot-diameter (15-meter-diameter) monopiles, and 11-foot-diameter (5-meter-diameter) pin piles for piled jacket foundation. Modeling scenarios included two representative locations (COP Appendix II-L1, Figure 2; Atlantic Shores 2024). For each representative location, modeling was conducted at a maximum hammer energy of 4,400 kJ for monopiles and 2,500 kJ for the pin piles. Modeling scenarios included one or two monopiles driven per day and four pin piles driven per day, either pre- or post-piled. Sound field predictions were made for summertime conditions, which were considered representative for the months of May through October, and different levels of noise attenuation, including 0 (i.e., no mitigation), 6, 10, and 15 dB.

The predicted sound fields for impact pile driving were used to predict ranges to isopleths associated with acoustic criteria for injury and behavioral impacts. These ranges were then used to estimate the number of marine animals that could be exposed to sound levels exceeding acoustic criteria.

B.5.9.1 Acoustic Models and Assumptions

The quantitative assessment of impact pile driving relies upon a variety of acoustic models to predict the potential effect of Project foundation installation on marine animals. The following models were used in the quantitative analyses.

1. GRL Wave Equation Analysis Program (GRLWEAP) Model: to model the force applied to the pile by the impact hammer.

2. Finite Difference Model: to compute pile vibration and near-field sound radiation after the impact hammer strikes the pile to calculate source levels.

3. Full Waveform Range-dependent Acoustic Model (FWRAM): to calculate the time-dependent sound field, SPL, and SEL metrics for impact pile driving.

4. JASMINE Model: the JASCO Applied Sciences animat movement and exposure model used to estimate the number of animals exposed to sound levels exceeding regulatory criteria (Section B.5.9.4).

FWRAM predicts the propagation of the source signal through the physical environment. As such, these models require accurate descriptions of ocean bathymetry, seafloor sediment properties, and sound speed profile (SSP) in the water column. The assumptions of these models and their inputs are critical to the accuracy of the model output.

Physical Environment

The bathymetry information used to model impact pile driving was obtained from the General Bathymetric Chart of the Oceans 2019 grid for the general Lease Area (GEBCO Bathymetric Compilation Group 2019). A simplified geoacoustic profile of the sediment properties for modeling was developed based on the identification of sand as the substrate in the Lease Area during benthic sampling conducted by Atlantic Shores and a generic porosity-depth profile using a sediment grain-shearing model (Buckingham 2005). SSPs used to model impact pile driving were extracted from the U.S. Navy's Generalized Digital Environmental Model (Naval Oceanographic Office 2003). Water temperatures and density change seasonally and vertically within the water column; therefore, representative summer and winter SSPs were assessed for use in modeling. The summer SSP was selected for modeling as it was the most realistic sound propagation environment for foundation installation for the Project. The summer SSP was calculated by averaging monthly SSPs for the months of June through August.

Sound Source Details

Pile dimensions, hammer energy, and number of strikes are required inputs for the modeling of impact pile driving for foundation installation (Table B.5-5).

Installation of the 39-foot-diameter (12-meter-diameter) monopiles with a Menck MHU 4400S hammer was expected to begin with 1,400-kJ hammer strikes that would be scaled up to 4,400 kJ at the end of the pile installation. A total of 12,350 strikes were expected per pile, and the strike rate was estimated at 30 strikes per minute. Decidecade spectral source levels for the 39-foot (11-meter) monopiles were estimated at up to approximately 220 dB re 1 µPa. Installation of the 49-foot-diameter (15-meter-diameter) monopiles with a Menck MHU 4400S hammer was expected to begin with 480-kJ hammer strikes that would be scaled up to 4,400 kJ at the end of the pile installation. A total of 15,387 strikes were expected per pile, and the strike rate was estimated at 30 strikes per minute. Decidecade spectral source levels for the 49-foot (15-meter) monopiles under were estimated at up to approximately 220 dB re 1 µPa. Installation of the 16-foot-diameter (5-meter-diameter) pin piles with an IHC S-2500 hammer was expected to scale from 1,200 to 2,500 kJ during pile installation. A total of 6,750 strikes were expected for each pin pile, with a strike rate of 30 strikes per minute. Decidecade spectral source levels for the pin piles were estimated at up to approximately 215 dB re 1 µPa. No simultaneous pile driving was included in the modeling assumptions.

Table B.5-5. Key assumptions used in the underwater acoustic modeling of impact pile driving

Pile Type	Modeled Maximum Hammer Energy (kJ)	Number of Strikes	Strike Rate (min[1])	Pile Wall Thickness (cm)	Maximum Seabed Penetration (m)[1]	Piles Per Day
12-m monopile	4,400	12,350	30	13	60	1–2
15-m monopile	4,400	15,387	30	16	60	1–2
5-m pin pile	2,500	6,750	30	7.2	70	4

[1] Modeling assumed 15-meter self-penetration of all piles.
cm = centimeter; kJ = kilojoule; m = meter; min = minute

Noise Attenuation

No specific noise-attenuation system was identified for the assessment of impact pile-driving noise associated with foundation installation. However, a minimum sound-source attenuation of 10 dB was assumed to model impact pile driving. This level of attenuation was selected as an achievable reduction in sound levels when one noise-attenuation system is in use (Bellmann et al. 2020). An attenuation of 10 dB produces a 90 percent reduction in sound levels. Additional levels of attenuation (0, 6, and 15 dB) were also modeled for comparison. These results are presented in Appendix F, *Acoustic Radial Isopleths*, and Appendix G, *Animal Movement and Exposure Modeling*, to Appendix II-L1 of the COP (Atlantic Shores 2024).

B.5.9.2 Methodology

Noise Propagation Modeling

To model the sound from impact pile driving, the force of the pile-driving hammers was computed using the GRLWEAP 2010 wave equation model (Pile Dynamics 2010). The forcing functions from GRLWEAP were used as inputs to the Finite Difference model to compute the resulting pile vibrations. The sound radiating from the pile was simulated using a vertical array of discrete point sources. Their amplitudes and phases were derived using an inverse technique, such that their collective particle velocity, calculated using a near-field wave-number integration model, matched the particle velocity in the water at the pile wall. The sound field propagating away from the vertical array was calculated using the FWRAM, which utilizes an array starter method to accurately model sound propagation from a spatially distributed sound source (Atlantic Shores 2024 citing MacGillivray and Chapman 2012).

FWRAM was used to model synthetic pressure waveforms over a 10- to 2,048-Hz frequency range. Pressure wave forms were computed as a function of range and depth using Fourier synthesis of modeled acoustic transfer functions. The modeled pressure waveforms were post-processed to calculate SPL and SEL metrics moving away from the sound source, both vertically (i.e., with depth) and horizontally (i.e., over range).

Ranges to Regulatory Thresholds

A maximum-over-depth approach was used to calculate distances to acoustic thresholds associated with injury and behavioral effects on marine animals (i.e., isopleths) (Section B.5.9.4, *Results*). For this approach, the maximum received sound level that occurs within the water column at a given range was used as the sound level at that distance. The 95th percentile of all isopleth distances from the source ($R_{95\%}$) was used to represent the range to regulatory thresholds for the determination of ensonified areas (Figure B.5-3). As shown on Figure B.5-3, 95 percent of the area exceeding a specific acoustic threshold occurs within this range from the source.

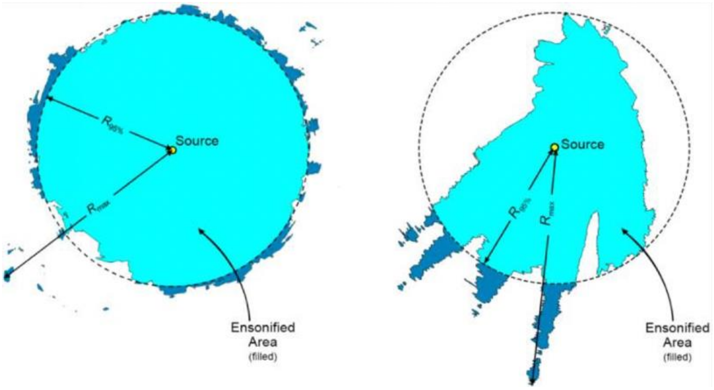

Figure B.5-3. Illustration of ensonified areas based on $R_{95\%}$, which was calculated from maximum isopleth ranges (R_{max}).

Animal Movement Modeling

Predicted animal movements, in combination with predicted ensonified areas, are needed to estimate animal exposures to underwater noise during Project construction. Models using simulated animals, called “animats,” are generally used to predict animal movements (Dean 1998; Frankel et al. 2002). Such modeling is typically conducted for individual species but may be conducted for representative species groups if sufficient data are not available. Animat models require input data describing a variety of species-specific behavioral parameters, such as the range of swimming speeds, dive depths, and course changes. Animat models simulate four-dimensional movements of the animat across latitude, longitude, depth, and time.

The JASMINE animat modeling program was used to simulate animal movement through predicted ensonified areas modeled for the Project to estimate the probability of exposure to sound levels exceeding regulatory thresholds (Section B.5.9.4). As the input parameters for the model are based on observations of swimming behavior collected over relatively short periods (i.e., hours to days) and do not include large-scale movements over relatively long periods (e.g., migration patterns), a simulation period of 7 days was selected for this modeling effort. The simulation area was limited to a maximum distance of 43 miles (70 kilometers) of the Lease Area. All simulations were seeded with an animat density of 0.5 animat per 0.4 square mile (1 square kilometer) over the entire simulation area to generate statistically reliable probability density functions.

Within each simulation, the animat served as a sound receiver, sampling sound levels within the predicted ensonified area as the animat moved. For each simulation, JASMINE provided output quantifying the exposure history (i.e., received sound levels over the course of the simulation period) for each animat as it moved through the environment during impact pile driving. Each animat’s exposure history was used to identify maximum received SPLs, and exposure levels were summed over a 24-hour period to determine received SELs. These SPLs and SELs were then compared to regulatory thresholds (Section B.5.8, *Regulation of Underwater Sound*).

To estimate the number of marine animals likely to be exposed to sound levels exceeding the regulatory thresholds over the duration of the Project, three different construction schedules occurring over a 1- or 2-year period were modeled (Table B.5-6). Two construction schedules (i.e., Schedule 1 and Schedule 3) assume installation of 201 monopile foundations (200 WTGs across Projects 1 and 2, and 1 met tower for Project 1) and 96 pin piles for jacket foundations (4 large OSSs across Projects 1 and 2 with 24 pin piles each). Schedule 1 is a 2-year schedule that assumes only 1 monopile is installed per day, and Schedule 3 is a 1-year schedule that assumes up to 2 monopiles are installed per day. Both schedules assume 4 pin piles are installed per day. The remaining construction schedule (i.e., Schedule 2) assumes installation of 112 monopile foundations (111 WTGs for Project 1, and 1 met tower for Project 1) and 454 pin piles for jacket foundations (89 WTGs for Project 2 with 4 pin piles each and 4 large OSSs across Projects 1 and 2 with 24 pin piles each). Schedule 2 is a 2-year schedule that assumes 1 monopile is installed per day and 4 pin piles are installed per day.

Table B.5-6. Construction schedules, presented as pile-driving days, utilized for estimating exposures to impact pile-driving noise

	Schedule 1				Schedule 2				Schedule 3	
	Year 1		Year 2		Year 1		Year 2		Year 1	
Month	WTG Monopile[1]	OSS Jacket[2]	WTG Monopile[1]	OSS Jacket[2]	WTG Monopile[1]	OSS Jacket[2]	WTG Jacket[2]	OSS Jacket[2]	WTG Monopile[3]	OSS Jacket[2]
May	8	0	5	0	8	0	5	0	12	0
June	20	6	15	6	20	6	15	6	24	6
July	25	0	20	0	25	0	20	0	25	6
August	19	6	18	6	19	6	18	6	25	6
September	18	0	14	0	18	0	14	0	13	6
October	16	0	13	0	16	0	13	0	19	0
November	5	0	4	0	5	0	4	0	4	0
December	1	0	0	0	1	0	0	0	1	0
Total Piling Days	**112**	**12**	**89**	**12**	**112**	**12**	**89**	**12**	**123**	**24**
Total Piles	**112**	**48**	**89**	**48**	**112**	**48**	**356**	**48**	**201**	**96**
Total Foundations	**112**	**2**	**89**	**2**	**112**	**2**	**89**	**2**	**201**	**4**

[1] Monopiles installed at a rate of 1 per day.
[2] Pin piles for jacket foundations installed at a rate of 4 per day.
[3] Monopiles installed at a rate of 1 or 2 per day.

Behavioral aversion to sound sources was modeled for a subset of scenarios for comparison purposes only. Parameters determining aversion at specified sound levels were implemented for two species: NARW (*Eubalaena glacialis*) and harbor porpoise (*Phocoena phocoena*). NARW was selected due to its critically endangered status, and harbor porpoise was selected based on its documented strong aversive response to loud sounds. Aversion for these two marine mammal species was implemented by allowing the animats to change course away from the sound source, with heading changes determined by received sound levels. Aversion thresholds were based on the Wood et al. (2012) step function (COP Appendix II-L1, Tables G-1 and G-2; Atlantic Shores 2024). Animats remained in the aversive state for a specified amount of time based on received sound levels before returning to a normal state.

B.5.9.3 Marine Species Present in the Project Area

Thirty-eight marine mammal species and four species of sea turtles potentially occur near the Project area. Six marine mammal species and all four sea turtle species are listed under the ESA; all marine mammals are protected under the MMPA. Species with common, regular, or uncommon occurrence (Table B.5-7) were selected for quantitative movement modeling and exposure estimates. Rare species were not modeled because acoustic impacts on these species would approach zero due to their low densities.

Marine Mammal Densities

To estimate marine mammal exposures for impact pile driving for foundation installation, estimates of mean monthly density (animals per 39 square miles [100 square kilometers]) for all common, regular, and uncommon marine mammal species occurring in the Project area (Table B.5-7) were obtained from the Duke University Marine Geospatial Ecology Laboratory (Roberts et al. 2016a, 2016c, 2017, 2018, 2021a, 2021b), including the recently updated model results for the NARW. These densities are provided in Table B.5-8. The updated model includes new NARW abundance estimates for Cape Cod Bay in December. The modeling used the most recent 2010 to 2018 density predictions for the NARW.

Densities were calculated for a 2.4-mile (3.9-kilometer) buffered polygon around the Lease Area perimeter. This buffer size was selected as the largest 10 dB-attenuated exposure range, rounded up to the nearest 0.3 mile (0.5 kilometer). All species, scenarios, and threshold criteria were included in this calculation.

Mean density for each month was determined by calculating the unweighted mean density of all grid cells partially or fully within the buffered polygon. Grid cells were 6.2 by 6.2 miles (10 by 10 kilometers), except for NARW, which were 3.1 by 3.1 miles (5 by 5 kilometers). Densities were computed monthly, annually, and for the May through December period to coincide with proposed pile-driving activities for the Project. In cases where monthly densities were unavailable, annual mean densities were used instead.

Although long-finned and short-finned pilot whales were modeled separately, only one density model was available for pilot whales that encompasses both pilot whale species (Roberts et al. 2016a, 2016c, 2017). Densities for each species were calculated by estimating the total pilot whale densities in the buffered polygon and then scaling by relative abundance of both species.

Table B.5-7. Marine mammal and sea turtle species quantitatively analyzed

Species	Stock	Abundance
Mysticetes		
Fin whale *Balaenoptera physalus*	Western North Atlantic	6,802
Humpback whale *Megaptera novaeangliae*	Gulf of Maine	1,396
Minke whale *B. acutorostrata*	Canadian East Coast	21,968
North Atlantic right whale *E. glacialis*	Western North Atlantic	340
Sei whale *B. borealis*	Nova Scotia	3,292
Odontocetes		
Atlantic spotted dolphin *Stenella frontalis*	Western North Atlantic	31,506
Atlantic white-sided dolphin *Lagenorhynchus acutus*	Western North Atlantic	93,233
Bottlenose dolphin *Tursiops truncatus*	Western North Atlantic Offshore	64,587
	Western North Atlantic Northern Migratory Coastal	6,639
Common dolphin *Delphinus delphis*	Western North Atlantic	93,100
Harbor porpoise *Phocoena phocoena*	Gulf of Maine/Bay of Fundy	85,765
Long-finned pilot whale *Globicephala melas*	Western North Atlantic	39,215
Risso's dolphin *Grampus griseus*	Western North Atlantic	44,067
Short-finned pilot whale *Globicephala macrorhynchus*	Western North Atlantic	18,726
Sperm whale *Physeter macrocephalus*	North Atlantic	5,895
Pinnipeds		
Gray seal *Halichoerus grypus*	Western North Atlantic	27,911
Harbor seal *Phoca vitulina*	Western North Atlantic	61,336

Species	Stock	Abundance
Sea Turtles		
Green sea turtle *Chelonia mydas*	--	--
Kemp's ridley sea turtle *Lepidochelys kempii*	--	--
Leatherback sea turtle *Dermochelys coriacea*	--	--
Loggerhead sea turtle *Caretta caretta*	--	--

Sources: COP Appendix II-L1, Tables 11 and 13; Atlantic Shores 2024; Hayes et al. 2020, 2021, 2022, 2023; NMFS 2024.

Sea Turtle Densities

Density estimates for sea turtles in the Project area are limited. Aerial survey data collected in the New York Bight for the New York State Energy Research and Development Authority (Normandeau Associates and APEM 2018, 2019a, 2019b, 2019c, 2020) were used to develop seasonal density estimates for quantitative analysis of acoustic impacts on sea turtles. Maximum seasonal abundance for each species was extracted from the aerial survey data and corrected to represent the entire survey area. Corrected abundance was scaled by the survey area to obtain species density in units of animals per 0.4 square mile (1 square kilometer) (Table B.5-9).

B.5.9.4 Results

Ranges to Acoustic Regulatory Thresholds

The complete results of acoustic modeling for impact pile driving of monopiles and pin piles presented in COP Appendix II-L1 (Atlantic Shores 2024) for the multiple combinations of the two modeled locations, varying levels of attenuation, and three pile-driving schedules are too numerous to replicate here. Instead, summaries of exposure ranges ($ER_{95\%}$) for marine mammals and sea turtles are presented (Tables B.5-10 through B.5-21). Additionally, summaries of ranges to acoustic thresholds ($R_{95\%}$) for fish are presented (Tables B.5-22 through B.5-25). Variation in ranges presented in the tables arises from a number of factors, including differences in model assumptions for different foundation types (e.g., maximum hammer energy, number of strikes), differences in modeled location and the associated differences in environmental inputs (e.g., depth, sediment properties), and differences in schedule assumptions (i.e., number of piles driven per day). Model inputs such as hammer energy, number of strikes (i.e., driving duration) at each energy level, and embedment depth are more significant inputs to the acoustic model than foundation diameter. The amount of sound generated during pile driving varies with the number of required strikes.

Table B.5-8. Mean monthly marine mammal density estimates[1] for impact pile driving for foundation installation

Species	Mean Monthly Density Estimates for Species Animals/39 Square Miles (100 Square Kilometers)[2]												Annual Mean
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Mysticetes													
Fin whale	0.076	0.071	0.103	0.130	0.130	0.169	0.127	0.077	0.130	0.129	0.071	0.070	0.107
Humpback whale	0.072	0.048	0.042	0.025	0.031	0.025	0.008	0.006	0.018	0.040	0.025	0.083	0.035
Minke whale	0.025	0.030	0.028	0.090	0.105	0.055	0.008	0.004	0.009	0.029	0.012	0.018	0.035
North Atlantic right whale	0.562	0.628	0.685	0.607	0.059	0.004	0.002	0.001	0.002	0.003	0.026	0.275	0.238
Sei whale	0.001	0.001	0.000	0.008	0.006	0.001	0.000	0.000	0.000	0.001	0.001	0.001	0.002
Odontocetes													
Atlantic spotted dolphin	0.004	0.002	0.006	0.020	0.028	0.075	0.109	0.200	0.198	0.064	0.051	0.013	0.064
Atlantic white-sided dolphin	0.264	0.177	0.314	0.955	0.815	0.549	0.075	0.029	0.092	0.329	0.424	0.464	0.374
Bottlenose dolphin (northern coastal stock)	2.161	0.046	0.295	3.317	10.280	25.867	36.422	48.858	23.321	10.414	10.093	4.309	14.615
Bottlenose dolphin (offshore stock)	1.597	0.149	0.271	1.224	2.976	8.075	10.010	13.946	9.101	4.332	3.289	2.007	4.748
Common dolphin	4.975	1.513	1.118	1.985	2.197	2.133	2.310	2.424	1.924	4.070	4.702	8.674	3.169
Harbor porpoise	2.340	4.438	5.626	2.345	0.501	0.010	0.020	0.026	0.008	0.112	1.539	2.358	1.610
Long-finned pilot whale	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Risso's dolphin	0.003	0.002	0.001	0.001	0.003	0.004	0.023	0.026	0.009	0.003	0.004	0.007	0.007
Short-finned pilot whale	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027
Sperm whale	0.000	0.000	0.000	0.001	0.004	0.016	0.020	0.017	0.017	0.008	0.004	0.001	0.007
Pinnipeds													
Gray seal	1.706	2.285	1.501	0.669	0.185	0.095	0.003	0.001	0.005	0.061	0.079	1.048	0.636
Harbor seal	3.833	5.133	3.373	1.504	0.415	0.213	0.008	0.003	0.011	0.136	0.178	2.354	1.430

Source: COP Appendix II-L1, Table 12; Atlantic Shores 2024.

[1] Density estimates are from habitat-based density modeling of the entire U.S. Atlantic EEZ from Roberts et al. (2016a, 2016c, 2017, 2018, 2021a, 2021b). NMFS (2023) updated these density estimates based on Roberts et al. (2023) for its calculation of proposed take. The updated densities are provided in Section 3.5.6, *Marine Mammals,* of the EIS.

[2] Based on Lease Area OCS-A 0499 with a 2.4-mile (3.9-kilometer) buffer.

Table B.5-9. Mean seasonal sea turtle density estimates[1] for impact pile driving for foundation installation

Species	Density (animals/39 square miles [100 square kilometers])			
	Spring	Summer	Fall	Winter
Green sea turtle	0.000	0.038	0.000	0.000
Kemp's ridley sea turtle	0.050	0.991	0.190	0.000
Leatherback sea turtle	0.000	0.331	0.789	0.000
Loggerhead sea turtle	0.254	26.799	0.190	0.025

Source: COP Appendix II-L1, Table 14; Atlantic Shores 2024.

[1] Density estimates are derived from seasonal abundance surveys conducted offshore New York (Normandeau Associates Inc., and APEM Inc. 2018, 2019a, 2019b, 2019c, 2020).

Table B.5-10. Exposure ranges ($ER_{95\%}$) (in kilometers) to PTS (MMPA Level A harassment) thresholds (SEL) for marine mammals due to sound from impact pile driving of 39-foot (12-meter) monopiles with 0 and 10 dB of noise attenuation

Species	One Pile per Day		Two Piles per Day	
	0 dB	10 dB	0 dB	10 dB
LFC				
Fin whale	3.24	1.09	3.21	1.30
Humpback whale	3.30	1.84	3.35	1.01
Minke whale	1.93	0.33	1.98	0.38
North Atlantic right whale	2.45	0.56	2.45	0.67
Sei whale	3.42	1.09	3.21	1.30
MFC				
Atlantic spotted dolphin	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0
Bottlenose dolphin, coastal	0	0	0	0
Bottlenose dolphin, offshore	0	0	0	0
Common dolphin	0	0	0	0
Long-finned pilot whale	0	0	0	0
Risso's dolphin	0	0	0	0
Short-finned pilot whale	0	0	0	0
Sperm whale	0	0	0	0
HFC				
Harbor porpoise	1.54	0.39	1.54	0.32
Pinnipeds				
Gray seal	0.87	0.01	0.72	0
Harbor seal	0.83	<0.01	0.62	<0.01

Source: Summarized from COP Appendix II-L1, Tables G-33 and G-34 (Atlantic Shores 2024).

Table B.5-11. Exposure ranges ($ER_{95\%}$) (in kilometers) to behavioral disturbance (MMPA Level B harassment) threshold for marine mammals due to sound from impact pile driving of 39-foot (12-meter) monopiles with 0 and 10 dB of noise attenuation

Species	One Pile per Day		Two Piles per Day	
	0 dB	10 dB	0 dB	10 dB
LFC				
Fin whale	6.38	3.52	6.28	3.62
Humpback whale	6.30	3.48	6.14	3.62
Minke whale	5.75	3.37	5.69	3.37
North Atlantic right whale	6.13	3.60	6.02	3.48

Species	One Pile per Day		Two Piles per Day	
	0 dB	10 dB	0 dB	10 dB
Sei whale	6.38	3.52	6.28	3.62
MFC				
Atlantic spotted dolphin	0	0	0	0
Atlantic white-sided dolphin	6.03	3.37	6.01	3.50
Bottlenose dolphin, coastal	5.32	3.79	5.31	3.82
Bottlenose dolphin, offshore	5.88	3.41	5.85	3.28
Common dolphin	0	0	0	0
Long-finned pilot whale	0	0	0	0
Risso's dolphin	6.08	3.53	6.05	3.55
Short-finned pilot whale	0	0	0	0
Sperm whale	0	0	0	0
HFC				
Harbor porpoise	6.28	3.59	6.01	3.49
Pinnipeds				
Gray seal	6.34	3.72	6.26	3.73
Harbor seal	6.35	3.73	6.24	3.66

Source: Summarized from COP Appendix II-L1, Tables G-33 and G-34 (Atlantic Shores 2024).

Table B.5-12. Exposure ranges ($ER_{95\%}$) (in kilometers) to PTS (MMPA Level A harassment) thresholds (SEL) for marine mammals due to sound from impact pile driving of 49-foot (15-meter) monopiles with 0 and 10 dB of noise attenuation

Species	One Pile per Day		Two Piles per Day	
	0 dB	10 dB	0 dB	10 dB
LFC				
Fin whale	3.33	1.81	3.45	1.83
Humpback whale	3.59	1.25	3.53	1.29
Minke whale	2.11	0.35	2.15	0.41
North Atlantic right whale	2.64	0.72	2.68	0.72
Sei whale	3.33	1.81	3.45	1.83
MFC				
Atlantic spotted dolphin	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0
Bottlenose dolphin, coastal	0	0	0	0
Bottlenose dolphin, offshore	0	0	0	0
Common dolphin	0	0	0	0
Long-finned pilot whale	0	0	0	0
Risso's dolphin	0	0	0.02	0
Short-finned pilot whale	0	0	0	0
Sperm whale	0	0	0	0
HFC				
Harbor porpoise	1.42	0.26	1.41	0.28
Pinnipeds				
Gray seal	0.56	0.02	0.67	0
Harbor seal	0.84	<0.01	0.61	<0.01

Source: Summarized from COP Appendix II-L1, Tables 34 and 35 (Atlantic Shores 2024).

Table B.5-13. Exposure ranges ($ER_{95\%}$) (in kilometers) to behavioral disturbance (MMPA Level B harassment) threshold for marine mammals due to sound from impact pile driving of 49-foot (15-meter) monopiles with 0 and 10 dB of noise attenuation

Species	One Pile per Day		Two Piles per Day	
	0 dB	10 dB	0 dB	10 dB
LFC				
Fin whale	6.41	3.73	6.33	3.74
Humpback whale	6.35	3.77	6.32	3.68
Minke whale	5.92	3.48	5.86	3.45
North Atlantic right whale	6.33	3.65	6.24	3.61
Sei whale	6.41	3.73	6.33	3.74
MFC				
Atlantic spotted dolphin	0	0	0	0
Atlantic white-sided dolphin	6.25	3.56	6.06	3.58
Bottlenose dolphin, coastal	5.54	3.87	5.58	3.90
Bottlenose dolphin, offshore	5.89	3.50	5.98	3.42
Common dolphin	0	0	0	0
Long-finned pilot whale	0	0	0	0
Risso's dolphin	6.29	3.71	6.15	3.68
Short-finned pilot whale	0	0	0	0
Sperm whale	0	0	0	0
HFC				
Harbor porpoise	6.36	3.74	6.23	3.61
Pinnipeds				
Gray seal	6.57	3.77	6.46	3.71
Harbor seal	6.62	3.79	6.35	3.76

Source: Summarized from COP Appendix II-L1, Tables 34 and 35 (Atlantic Shores 2024).

Table B.5-14. Exposure ranges ($ER_{95\%}$) (in kilometers) to PTS (MMPA Level A harassment) thresholds (SEL) for marine mammals due to sound from impact pile driving of 16-foot (5-meter) pin piles with 0 and 10 dB of noise attenuation

Species	Pre-piled		Post-piled	
	0 dB	10 dB	0 dB	10 dB
LFC				
Fin whale	3.71	1.80	4.17	1.90
Humpback whale	3.71	1.07	4.34	1.56
Minke whale	2.41	0.40	3.02	0.69
North Atlantic right whale	3.13	0.73	3.53	1.06
Sei whale	3.71	1.80	4.17	1.90
MFC				
Atlantic spotted dolphin	0	0	0	0
Atlantic white-sided dolphin	0.01	0	0.01	0.01
Bottlenose dolphin, coastal	0	0	0	0
Bottlenose dolphin, offshore	0.13	0	0.21	0
Common dolphin	0	0	0	0
Long-finned pilot whale	0	0	0	0
Risso's dolphin	0.02	<0.01	0.02	<0.01
Short-finned pilot whale	0	0	0	0
Sperm whale	0	0	0	0

Species	Pre-piled		Post-piled	
	0 dB	10 dB	0 dB	10 dB
HFC				
Harbor porpoise	3.23	1.11	3.86	1.48
Pinnipeds				
Gray seal	1.49	0.15	1.90	0.24
Harbor seal	1.52	0.16	2.09	0.32

Source: Summarized from COP Appendix II-L1, Tables 36 and 37 (Atlantic Shores 2024).
Note: Pin piles are installed at a rate of four per day.

Table B.5-15. Exposure ranges ($ER_{95\%}$) (in kilometers) to behavioral disturbance (MMPA Level B harassment) threshold for marine mammals due to sound from impact pile driving of 16-foot (5-meter) pin piles with 0 and 10 dB of noise attenuation

Species	Pre-piled		Post-piled	
	0 dB	10 dB	0 dB	10 dB
LFC				
Fin whale	5.36	2.87	6.20	3.16
Humpback whale	5.31	2.91	6.09	3.18
Minke whale	5.01	2.77	5.62	3.05
North Atlantic right whale	5.25	2.87	5.97	3.16
Sei whale	5.36	2.87	6.20	3.16
MFC				
Atlantic spotted dolphin	0	0	0	0
Atlantic white-sided dolphin	5.27	2.85	5.83	3.11
Bottlenose dolphin, coastal	4.84	0	5.31	0
Bottlenose dolphin, offshore	4.98	2.74	5.65	3.01
Common dolphin	0	0	0	0
Long-finned pilot whale	0	0	0	0
Risso’s dolphin	5.24	2.89	5.90	3.14
Short-finned pilot whale	0	0	0	0
Sperm whale	0	0	0	0
HFC				
Harbor porpoise	5.24	2.90	5.92	3.13
Pinnipeds				
Gray seal	5.53	2.94	6.06	3.19
Harbor seal	5.41	3.02	6.05	3.23

Source: Summarized from COP Appendix II-L1, Tables 36 and 37 (Atlantic Shores 2024).
Note: Pin piles are installed at a rate of four per day.

Table B.5-16. Exposure ranges ($ER_{95\%}$) (in kilometers) to PTS threshold (SEL) for sea turtles due to sound from impact pile driving of 39-foot (12-meter) monopiles with 0 and 10 dB of noise attenuation

Species	One Pile per Day		Two Piles per Day	
	0 dB	10 dB	0 dB	10 dB
Green sea turtle	1.32	0.07	1.32	0.09
Kemp’s ridley sea turtle	0.84	0.02	0.85	0.03
Leatherback sea turtle	0.93	0.02	0.88	0.03
Loggerhead sea turtle	0.45	0	0.30	0

Source: Summarized from COP Appendix II-L1, Tables G-35 and G-36 (Atlantic Shores 2024).

Table B.5-17. Exposure ranges ($ER_{95\%}$) (in kilometers) to behavioral disturbance threshold for sea turtles due to sound from impact pile driving of 39-foot (12-meter) monopiles with 0 and 10 dB of noise attenuation

Species	One Pile per Day		Two Piles per Day	
	0 dB	10 dB	0 dB	10 dB
Green sea turtle	2.97	1.34	2.94	1.36
Kemp's ridley sea turtle	2.91	1.24	2.80	1.23
Leatherback sea turtle	2.57	0.92	2.66	1.14
Loggerhead sea turtle	2.39	0.94	2.46	1.01

Source: Summarized from COP Appendix II-L1, Tables G-35 and G-36 (Atlantic Shores 2024).

Table B.5-18. Exposure ranges ($ER_{95\%}$) (in kilometers) to PTS threshold (SEL) for sea turtles due to sound from impact pile driving of 49-foot (15-meter) monopiles with 0 and 10 dB of noise attenuation

Species	One Pile per Day		Two Piles per Day	
	0 dB	10 dB	0 dB	10 dB
Green sea turtle	1.47	0.18	1.36	0.22
Kemp's ridley sea turtle	1.03	0.02	1.10	0.04
Leatherback sea turtle	1.22	0.02	0.90	0.04
Loggerhead sea turtle	0.57	0	0.41	0

Source: Summarized from COP Appendix II-L1, Tables 38 and 39 (Atlantic Shores 2024).

Table B.5-19. Exposure ranges ($ER_{95\%}$) (in kilometers) to behavioral disturbance threshold for sea turtles due to sound from impact pile driving of 49-foot (15-meter) monopiles with 0 and 10 dB of noise attenuation

Species	One Pile per Day		Two Piles per Day	
	0 dB	10 dB	0 dB	10 dB
Green sea turtle	2.97	1.40	2.94	1.34
Kemp's ridley sea turtle	2.89	1.31	2.93	1.28
Leatherback sea turtle	2.57	1.21	2.73	1.28
Loggerhead sea turtle	2.54	1.15	2.55	1.10

Source: Summarized from COP Appendix II-L1, Tables 38 and 39 (Atlantic Shores 2024).

Table B.5-20. Exposure ranges ($ER_{95\%}$) (in kilometers) to PTS threshold (SEL) for sea turtles due to sound from impact pile driving of 16-foot (5-meter) pin piles with 0 and 10 dB of noise attenuation

Species	Pre-piled		Post-piled	
	0 dB	10 dB	0 dB	10 dB
Green sea turtle	0.76	0.02	1.31	0.04
Kemp's ridley sea turtle	0.60	0.02	0.86	0.03
Leatherback sea turtle	0.46	0.02	0.73	0.01
Loggerhead sea turtle	0.12	0	0.22	0

Source: Summarized from COP Appendix II-L1, Tables 40 and 41 (Atlantic Shores 2024).
Note: Pin piles are installed at a rate of four per day.

Table B.5-21. Exposure ranges ($ER_{95\%}$) (in kilometers) to behavioral disturbance threshold for sea turtles due to sound from impact pile driving of 16-foot (5-meter) pin piles with 0 and 10 dB of noise attenuation

Species	Pre-piled		Post-piled	
	0 dB	10 dB	0 dB	10 dB
Green sea turtle	1.99	0.59	2.43	0.72
Kemp's ridley sea turtle	1.89	0.50	2.32	0.72
Leatherback sea turtle	1.78	0.40	2.16	0.64
Loggerhead sea turtle	1.63	0.41	1.95	0.58

Source: Summarized from COP Appendix II-L1, Tables 40 and 41 (Atlantic Shores 2024).

Note: Pin piles are installed at a rate of four per day.

Table B.5-22. Acoustic ranges ($R_{95\%}$) (in kilometers) to injury and behavioral disturbance thresholds for fish due to sound from impact pile driving of 39-foot (12-meter) monopiles with 0 and 10 dB of noise attenuation

Faunal Group	Injury (L_{pk})		Injury (SEL)		Behavioral Disturbance	
	0 dB	10 dB	0 dB	10 dB	0 dB	10 dB
Fish without swim bladder	0.20	0.05	1.19	0.27	10.99	7.12
Fish with swim bladder not involved in hearing	0.41	0.10	3.95	1.68		
Fish with swim bladder involved in hearing	0.41	0.10	3.95	1.68		
Fish ≥ 2 grams	0.47	0.11	8.90	5.57		
Fish < 2 grams	0.47	0.11	10.51	6.72		

Source: Summarized from COP Appendix II-L1, Tables 42 and F-94 (Atlantic Shores 2024).

Table B.5-23. Acoustic ranges ($R_{95\%}$) (in kilometers) to injury and behavioral disturbance thresholds for fish due to sound from impact pile driving of 49-foot (15-meter) monopiles with 0 and 10 dB of noise attenuation

Faunal Group	Injury (L_{pk})		Injury (SEL)		Behavioral Disturbance	
	0 dB	10 dB	0 dB	10 dB	0 dB	10 dB
Fish without swim bladder	0.21	0.05	1.45	0.34	11.16	7.23
Fish with swim bladder not involved in hearing	0.46	0.10	4.34	1.97		
Fish with swim bladder involved in hearing	0.46	0.10	4.34	1.97		
Fish ≥ 2 grams	0.50	0.11	9.46	5.99		
Fish < 2 grams	0.50	0.11	11.05	7.22		

Source: Summarized from COP Appendix II-L1, Tables 43 and F-97 (Atlantic Shores 2024).

Table B.5-24. Acoustic ranges ($R_{95\%}$) (in kilometers) to injury and behavioral disturbance thresholds for fish due to sound from impact pile driving of 16-foot (5-meter) pin piles (pre-piled) with 0 and 10 dB of noise attenuation

Faunal Group	Injury (L_{pk})		Injury (SEL)		Behavioral Disturbance	
	0 dB	10 dB	0 dB	10 dB	0 dB	10 dB
Fish without swim bladder	0.10	0.02	0.88	0.18	10.16	5.88
Fish with swim bladder not involved in hearing	0.30	0.07	3.82	1.42		
Fish with swim bladder involved in hearing	0.30	0.07	3.82	1.42		

Faunal Group	Injury (L_{pk}) 0 dB	Injury (L_{pk}) 10 dB	Injury (SEL) 0 dB	Injury (SEL) 10 dB	Behavioral Disturbance 0 dB	Behavioral Disturbance 10 dB
Fish ≥ 2 grams	0.33	0.08	9.94	5.72		
Fish < 2 grams	0.33	0.08	11.94	7.24		

Source: Summarized from COP Appendix II-L1, Tables 44 and F-101 (Atlantic Shores 2024).

Table B.5-25. Acoustic ranges ($R_{95\%}$) (in kilometers) to injury and behavioral disturbance thresholds for fish due to sound from impact pile driving of 16-foot (5-meter) pin piles (post-piled) with 0 and 10 dB of noise attenuation

Faunal Group	Injury (L_{pk}) 0 dB	Injury (L_{pk}) 10 dB	Injury (SEL) 0 dB	Injury (SEL) 10 dB	Behavioral Disturbance 0 dB	Behavioral Disturbance 10 dB
Fish without swim bladder	0.17	0.04	1.18	0.24	10.79	6.60
Fish with swim bladder not involved in hearing	0.35	0.09	4.42	1.83		
Fish with swim bladder involved in hearing	0.35	0.09	4.42	1.83		
Fish ≥ 2 grams	0.39	0.09	10.95	6.45		
Fish < 2 grams	0.39	0.09	12.99	8.13		

Source: Summarized from COP Appendix II-L1, Tables 45 and F-102 (Atlantic Shores 2024).

Animal Exposure Estimates

The numbers of individual marine mammals and sea turtles predicted to receive sound levels above threshold criteria during impact pile driving for foundation installation were determined using animal movement modeling, as described in Section B.5.9.2, *Methodology*. The modeled results for impact pile driving, with 0 and 10 dB of noise attenuation, for the three construction schedules (Table B.5-6) are presented in Table B.5-26 through Table B.5-28 and Table B.5-29 through Table B.5-31 for marine mammals and sea turtles, respectively.

Table B.5-26. Number of marine mammals predicted to receive sound levels above regulatory criteria for impact pile driving under Schedule 1 (one monopile per day/four pin piles per day over 2 years)

Species	PTS (L_{pk}) 0 dB	PTS (L_{pk}) 10 dB	PTS (SEL) 0 dB	PTS (SEL) 10 dB	Behavioral Disturbance 0 dB	Behavioral Disturbance 10 dB
LFC						
Fin whale	0.13	0	13.38	5.06	25.25	14.76
Humpback whale	0.09	0	13.28	3.93	27.26	14.76
Minke whale	0.22	0	131.42	18.13	382.56	236.61
North Atlantic right whale	<0.01	<0.01	1.31	0.25	3.83	2.11
Sei whale	0.02	0	1.59	0.60	3.07	1.80
MFC						
Atlantic spotted dolphin	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0.04	0.02	481.01	284.27
Bottlenose dolphin, coastal	0	0	0	0	1,529.64	90.75
Bottlenose dolphin, offshore	4.10	0	3.52	0	10,058.16	5,680.28
Common dolphin	0	0	0	0	0	0
Long-finned pilot whale	0	0	0	0	0	0
Risso's dolphin	<0.01	0	<0.01	<0.01	16.39	9.70

Species	PTS (L_{pk}) 0 dB	PTS (L_{pk}) 10 dB	PTS (SEL) 0 dB	PTS (SEL) 10 dB	Behavioral Disturbance 0 dB	Behavioral Disturbance 10 dB
Short-finned pilot whale	0	0	0	0	0	0
Sperm whale	0	0	0	0	0	0
HFC						
Harbor porpoise	13.44	2.93	24.89	2.45	128.86	76.24
Pinnipeds						
Gray seal	0.75	0	19.84	0.97	339.18	165.80
Harbor seal	3.97	0.82	59.96	2.42	793.88	396.48

Source: Summarized from COP Appendix II-L1, Table 15; Atlantic Shores 2024.

Table B.5-27. Number of marine mammals predicted to receive sound levels above regulatory criteria for impact pile driving under Schedule 2 (one monopile per day/four pin piles per day in Year 1 and four pin piles per day in Year 2)

Species	PTS (L_{pk}) 0 dB	PTS (L_{pk}) 10 dB	PTS (SEL) 0 dB	PTS (SEL) 10 dB	Behavioral Disturbance 0 dB	Behavioral Disturbance 10 dB
LFC						
Fin whale	0.09	0	17.65	6.26	29.45	17.43
Humpback whale	0.07	0	19.18	5.22	34.37	18.15
Minke whale	0.22	0	182.08	26.34	460.94	277.09
North Atlantic right whale	<0.01	<0.01	1.96	0.39	4.80	2.54
Sei whale	0.01	0	2.13	0.75	3.60	2.14
MFC						
Atlantic spotted dolphin	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0.17	0.02	572.29	331.31
Bottlenose dolphin, coastal	0	0	0	0	1,825.67	50.32
Bottlenose dolphin, offshore	2.28	0	9.00	0	11,913.17	5,517.32
Common dolphin	0	0	0	0	0	0
Long-finned pilot whale	0	0	0	0	0	0
Risso’s dolphin	<0.01	0	<0.01	<0.01	19.76	11.61
Short-finned pilot whale	0	0	0	0	0	0
Sperm whale	0	0	0	0	0	0
HFC						
Harbor porpoise	12.98	2.26	56.32	13.91	153.85	89.08
Pinnipeds						
Gray seal	0.60	0	46.51	2.52	392.52	192.76
Harbor seal	3.04	0	119.22	8.32	915.50	448.91

Source: Summarized from COP Appendix II-L1, Table 16; Atlantic Shores 2024.

Table B.5-28. Number of marine mammals predicted to receive sound levels above regulatory criteria for impact pile driving under Schedule 3 (one monopile per day/four pin piles per day over 1 year)

Species	PTS (L_{pk}) 0 dB	PTS (L_{pk}) 10 dB	PTS (SEL) 0 dB	PTS (SEL) 10 dB	Behavioral Disturbance 0 dB	Behavioral Disturbance 10 dB
LFC						
Fin whale	0.11	0	13.01	4.67	25.53	14.36
Humpback whale	0.10	<0.01	11.96	3.40	24.27	13.32
Minke whale	0.56	0	127.66	16.20	371.22	235.02
North Atlantic right whale	<0.01	<0.01	1.24	0.24	3.57	2.00

Species	PTS (L_{pk})		PTS (SEL)		Behavioral Disturbance	
	0 dB	10 dB	0 dB	10 dB	0 dB	10 dB
Sei whale	0.01	0	1.44	0.52	2.70	1.64
MFC						
Atlantic spotted dolphin	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0.02	0.01	412.93	251.58
Bottlenose dolphin, coastal	0	0	0	0	1,459.21	80.00
Bottlenose dolphin, offshore	2.48	1.62	3.52	0	9,354.05	5,330.67
Common dolphin	0	0	0	0	0	0
Long-finned pilot whale	0	0	0	0	0	0
Risso's dolphin	<0.01	0	<0.01	<0.01	14.12	8.58
Short-finned pilot whale	0	0	0	0	0	0
Sperm whale	0	0	0	0	0	0
HFC						
Harbor porpoise	13.74	2.55	25.79	2.11	136.99	81.88
Pinnipeds						
Gray seal	1.01	0	17.15	0.60	322.34	161.06
Harbor seal	4.19	0	53.73	1.91	751.38	378.76

Source: Summarized from COP Appendix II-L1, Table 17; Atlantic Shores 2024.

Table B.5-29. Number of sea turtles predicted to receive sound levels above regulatory criteria for impact pile driving under Schedule 1 (one monopile per day/four pin piles per day over 2 years)

Species	PTS (L_{pk})		PTS (SEL)		Behavioral Disturbance	
	0 dB	10 dB	0 dB	10 dB	0 dB	10 dB
Green sea turtle	0.01	0	1.46	0.11	4.05	1.32
Kemp's ridley sea turtle	0	0	37.59	1.96	131.79	47.13
Leatherback sea turtle	0	0	12.96	0.95	73.57	24.42
Loggerhead sea turtle	0	0	248.11	9.01	2,157.44	815.64

Source: Summarized from COP Appendix II-L1, Table 19; Atlantic Shores 2024.

Table B.5-30. Number of sea turtles predicted to receive sound levels above regulatory criteria for impact pile driving under Schedule 2 (one monopile per day/four pin piles per day in Year 1 and four pin piles per day in Year 2)

Species	PTS (L_{pk})		PTS (SEL)		Behavioral Disturbance	
	0 dB	10 dB	0 dB	10 dB	0 dB	10 dB
Green sea turtle	<0.01	0	1.36	0.08	4.10	1.16
Kemp's ridley sea turtle	0.17	0	41.12	2.32	136.20	50.18
Leatherback sea turtle	0	0	13.28	1.14	72.25	23.01
Loggerhead sea turtle	0	0	256.27	4.93	3,336.89	787.10

Source: Summarized from COP Appendix II-L1, Table 20; Atlantic Shores 2024.

Table B.5-31. Number of sea turtles predicted to receive sound levels above regulatory criteria for impact pile driving under Schedule 3 (one monopile per day/four pin piles per day over 1 year)

Species	PTS (L_{pk})		PTS (SEL)		Behavioral Disturbance	
	0 dB	10 dB	0 dB	10 dB	0 dB	10 dB
Green sea turtle	<0.01	0	1.51	0.15	3.98	1.44
Kemp's ridley sea turtle	0.17	0	41.12	2.32	136.20	50.18
Leatherback sea turtle	0	0	13.28	1.14	72.25	23.01
Loggerhead sea turtle	0	0	298.31	14.29	2,943.18	914.12

Source: Summarized from COP Appendix II-L1, Table 21; Atlantic Shores 2024.

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B.6 Climate Resilience

Atlantic Shores has considered the resilience of proposed infrastructure that may be vulnerable to the impacts associated with climate change, such as sea level rise and more frequent storms. Atlantic Shores has put considerable effort into understanding and characterizing the site-specific conditions in which the project will be constructed and operated and has incorporated the findings into the design of the proposed Project.

Sea level rise is the most predictable component of climate change, while there are also changes in the patterns of extreme events with potential increase in their frequency and severity. Both sea level rise and storm surge can impact coastal facilities more seriously than those farther offshore. To find the trend of sea level rise in the area, data collected between 1910 and 2020 from NDBC Buoy No. 8534720 (located in the Atlantic City Steel Pier) shows a linear trend increment of the tide level of 0.16 inch per year (4.12 millimeters per year) based on monthly sea level data. A tidal elevation record obtained from a separate buoy (NDBC Buoy No. 8531680) located in Sandy Hook, New Jersey, shows the exact same sea level rise of 0.16 inch per year (4.12 millimeters per year for the period of 1932–2020) (COP Volume II, Section 2.2.1.6; Atlantic Shores 2024).

The WTGs and OSSs would be designed according to site-specific conditions, including winter storms, hurricanes, and tropical storms, based on industry standards such as American Clean Power Association (ACP), International Electrotechnical Commission (IEC), American Petroleum Institute (API), and International Organization for Standardization (IS) standards. The WTG design is suitable for offshore wind sites with reference speeds of 111.8 to 127.5 miles per hour (50 to 57 meters per second) over a 3-second average for type certification (COP Volume I, Section 4.3.1; Atlantic Shores 2024). Additionally, neither of the potential onshore substation and/or converter station sites for interconnection at Cardiff are within a designated floodplain or other flood hazard area.

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B.7 Marine Mammals

Descriptions of non-ESA-listed species that commonly or regularly occur in the Project area or are expected to experience acoustic effects of the Proposed Action are provided below. See Section 3.5.6, *Marine Mammals*, for an assessment of impacts on marine mammals, including these species.

Humpback whale: Humpback whales could be found in the Project area year-round. Monthly density of humpback whales is provided on Figure 4.7-2 in COP Volume II, Section 4.7.1 (Atlantic Shores 2024) and available through the Duke University Marine Geospatial Ecology Lab (Roberts et al. 2016, 2023). Mean monthly densities of humpback whale in the Lease Area range from 0.006 animal per 39 square miles (100 square kilometers) in August to 0.121 animal per 39 square miles (100 square kilometers) in December. Humpback whales found in the Project area belong to the Gulf of Maine stock. The best abundance estimate for this stock is 1,396 individuals (Hayes et al. 2020). The Gulf of Maine stock is currently exhibiting an increasing trend (Hayes et al. 2020), although humpback whales in the Atlantic have been experiencing a UME since 2016 (NMFS 2024a). Since then, 30 humpback whales have stranded off New Jersey, with 221 coastwide (NMFS 2024a). The suspected cause of this event is vessel strikes. However, more research is necessary to be definitive.

Minke whale: Minke whales could be found in the Project area throughout the year. Monthly density of minke whales is provided on Figure 4.7-3 in COP Volume II, Section 4.7.1 (Atlantic Shores 2024) and available through the Duke University Marine Geospatial Ecology Lab (Roberts et al. 2016, 2023). Mean monthly densities of minke whale in the Lease Area range from 0.015 animal per 39 square miles (100 square kilometers) in September to 0.810 animal per 39 square miles (100 square kilometers) in May. Minke whales in the Project area belong to the Canadian East Coast stock. The best abundance estimate for this stock is 21,968 individuals (NMFS 2024c); a trend analysis has not been conducted for this stock due to low statistical power. Minke whales in the Atlantic have been experiencing a UME since 2017 (NMFS 2024b). A total of 169 individuals have stranded from Maine to South Carolina. The suspected cause of this event is human interaction (e.g., entanglement, vessel strike) and disease based on preliminary necropsy results. However, more research is needed to determine the cause of the UME (NMFS 2024b).

Atlantic spotted dolphin: Atlantic spotted dolphins are rare in the Project area but have the highest likelihood of occurrence from spring through fall. Monthly density of Atlantic spotted dolphin is available through the Duke University Marine Geospatial Ecology Lab (Roberts et al. 2016, 2023). Mean monthly densities of Atlantic spotted dolphin in the Lease Area range from 0.000 animal per 39 square miles (100 square kilometers) in February to 0.147 animal per 39 square miles (100 square kilometers) in October. Atlantic spotted dolphins found in the Project area belong to the Western North Atlantic stock. The best abundance estimate for this stock is 31,506 individuals (NMFS 2024c). This stock is currently exhibiting a decreasing trend.

Atlantic white-sided dolphin: Atlantic white-sided dolphins are uncommon in the Project area but have the highest likelihood of occurrence from fall through spring. Monthly density of Atlantic white-sided dolphin is provided on Figure 4.7-7 in COP Volume II, Section 4.7.1 (Atlantic Shores 2024) and available through the Duke University Marine Geospatial Ecology Lab (Roberts et al. 2016, 2023). Mean monthly densities of Atlantic spotted dolphin in the Lease Area range from 0.004 animal per 39 square miles (100 square kilometers) in August to 0.755 animal per 39 square miles (100 square kilometers) in May. Atlantic white-sided dolphins found in the Project area belong to the Western North Atlantic stock. The best abundance estimate for this stock is 93,233 individuals (NMFS 2024c). A trend analysis has not been conducted for this species.

Bottlenose dolphin: Bottlenose dolphins could be found in the Project area throughout the year. Bottlenose dolphins in the Project area belong to either the Western North Atlantic—Offshore stock or the Western North Atlantic—Northern Coastal Migratory stock. Monthly density of bottlenose dolphins is provided on Figure 4.7-8 in COP Volume II, Section 4.7.1 (Atlantic Shores 2024) and available through the Duke University Marine Geospatial Ecology Lab (Roberts et al. 2016, 2023). Mean monthly densities of bottlenose dolphin in the Lease Area range from 1.024 animal per 39 square miles (100 square kilometers) in February to 32.096 animals per 39 square miles (100 square kilometers) in September for the coastal stock and 0.489 animal per 39 square miles (100 square kilometers) in February to 9.485 animals per 39 square miles (100 square kilometers) in August for the offshore stock. The best abundance estimate for the offshore stock is 64,587 individuals (NMFS 2024c); this stock is not currently exhibiting any population trend. The best abundance estimate for the coastal migratory stock is 6,639 individuals (Hayes et al. 2021). As of 2017, there were no statistically significant trends detected for this stock.

Common dolphin: Common dolphins could be found in the Project area year-round. Monthly density of common dolphins is provided on Figure 4.7-11 in COP Volume II, Section 4.7.1 (Atlantic Shores 2024) and available through the Duke University Marine Geospatial Ecology Lab (Roberts et al. 2016, 2023).

Mean monthly densities of common dolphin in the Lease Area range from 0.085 animals per 39 square miles (100 square kilometers) in September to 5.876 animals per 39 square miles (100 square kilometers) in December. Common dolphins found in the Project area belong to the Western North Atlantic stock. The best abundance estimate for this stock is 93,100 individuals (NMFS 2024c). A trend analysis has not been conducted for this stock due to insufficient data.

Harbor porpoise: Harbor porpoises could be present in the Project area year-round, with peak abundances in winter. Monthly density of harbor porpoises is provided on Figure 4.7-13 in COP Volume II, Section 4.7 (Atlantic Shores 2024) and available through the Duke University Marine Geospatial Ecology Lab (Roberts et al. 2016, 2023). Mean monthly densities for harbor porpoise in the Lease Area range from 0.003 animal per 39 square miles (100 square kilometers) in September to 4.161 animals per 39 square miles (100 square kilometers) in April. Harbor porpoises in the Project area belong to the Gulf of Maine/Bay of Fundy stock. The best abundance estimate for this stock is 85,765 individuals (NMFS 2024c). A trend analysis has not been conducted for this stock due to low statistical power.

Pilot whales: Two species of pilot whale, long-finned pilot whale and short-finned pilot whale, could be present in the Project area. Long-finned pilot whales are expected to be uncommon but could occur year-round. Short-finned pilot whales are expected to be rare. Annual density of pilot whales is provided on Figure 4.7-9 in COP Volume II, Section 4.7 (Atlantic Shores 2024) and available through the Duke University Marine Geospatial Ecology Lab (Roberts et al. 2016, 2023). Annual density for each species of pilot whale was estimated by scaling the Duke University Marine Geospatial Ecology Lab taxon estimate by relative stock sizes from NMFS Stock Assessment Reports, resulting in an estimated density of long-finned and short-finned pilot whales in the Lease Area of 0.016 and 0.012 animal per 39 square miles (100 square kilometers), respectively.

Long-finned pilot whales in the Project area belong to the Western North Atlantic stock. The best abundance estimate for this stock is 39,215 individuals (NMFS 2024c). A trend analysis has not been conducted for this stock. Short-finned pilot whales in the Project area belong the Western North Atlantic stock. The best abundance estimate for this stock is 18,726 individuals (NMFS 2024c). There are no statistically significant trends detected for this stock.

Risso's dolphin: Risso's dolphins are expected to be rare in the Project area. Monthly density of Risso's dolphins is provided on Figure 4.7-10 in COP Volume II, Section 4.7.1 (Atlantic Shores 2024) and available through the Duke University Marine Geospatial Ecology Lab (Roberts et al. 2016, 2023). Mean monthly densities of Risso's dolphin in the Lease Area range from 0.002 animal per 39 square miles (100 square kilometers) in February to 0.115 animal per 39 square miles (100 square kilometers) in December. Risso's dolphins found in the Project area belong to the Western North Atlantic stock. The best abundance estimate for this stock is 44,067 individuals (NMFS 2024c). A trend analysis has not been conducted for this stock.

Pinnipeds: Gray seal and harbor seal could occur in the Project area year-round. There are three major harbor seal haul-out sites in New Jersey: (1) Great Bay, which is adjacent to the Project area and the largest haul-out south of Long Island, New York, (2) Barnegat Inlet/Barnegat Lighthouse, and (3) Sandy

Hook (CWF 2023; Geo-Marine 2010; Slocum et al. 2005; see Figure 4.7-14 in COP Volume II, Section 4.7; Atlantic Shores 2024). Mean monthly densities for seals are available through the Duke University Marine Geospatial Ecology Lab (Roberts et al. 2016, 2023). Monthly density for each pinniped species was estimated by scaling the Duke University Marine Geospatial Ecology Lab taxon estimate by relative abundance from NMFS Stock Assessment Reports. Monthly densities in the Lease Area range from 0.054 animal per 39 square miles (100 square kilometers) in August to 4.881 animals per 39 square miles (100 square kilometers) in January for gray seals and from 0.122 animal per 39 square miles (100 square kilometers) in August to 10.967 animals per 39 square miles (100 square kilometers) in January for harbor seals.

Gray seals in the Project area belong to the Western North Atlantic stock. The best abundance estimate for this stock in U.S. waters is 27,911 individuals (NMFS 2024c). In the U.S., pupping rates increased at surveyed pupping locations through 2021 (NMFS 2024c citing Wood et al. 2022), indicating that seals may be recruiting to the U.S. breeding colonies from colonies in Canada (NMFS 2024c). Harbor seals found in the Project area belong to the Western North Atlantic stock. The best abundance estimate for this stock in U.S. waters is 61,336 individuals (Hayes et al. 2022). This stock is not currently exhibiting statistically significant population trends. Since July 2018, increased numbers of gray seal and harbor seal mortalities have been recorded across Maine, New Hampshire, and Massachusetts (NMFS 2022). This event has been declared a UME by NMFS and encompasses 3,152 seal strandings from Maine to Virginia (NMFS 2022). Off New Jersey, 101 seals stranded between July 2018 and March 2020 (NMFS 2022). The pathogen phocine distemper virus was the main pathogen found in seals that have had full or partial necropsy examinations. This 2018–2022 UME is non-active with closure pending.

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