Empire Wind 2023 Acoustic Telemetry Study

Annual Report

Prepared for:

Empire Offshore Wind LLC
Stamford Office - 600 Washington Blvd. - Suite 800
Stamford, CT 06901

Prepared by:

Monmouth University
West Long Branch, New Jersey

and

INSPIRE Environmental
513 Broadway
Newport, RI 02840

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PROJECT DISTRIBUTION LIST

Name	Project Role	Email	Company
Elizabeth Marchetti	Fisheries Liaison Officer		Equinor
EJ Marohn	Marine Affairs Manager		Equinor
Brian Gervelis	Program and Contract Manager		INSPIRE
Keith Dunton	Acoustic Telemetry Lead		Monmouth University

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BOEM	Bureau of Ocean Energy Management
BRUV	baited remote underwater video
cm	centimeter(s)
eDNA	environmental DNA (deoxyribose nucleic acid)
Empire	Empire Offshore Wind LLC
EW 1	Empire Wind 1
EW 2	Empire Wind 2
F/V	fishing vessel
FBMP	Fisheries and Benthic Monitoring Plan
ft	feet
GPS	Global Positioning System
HMS	Highly Migratory Species
km	kilometer(s)
m	meter(s)
mg/L	milligrams per liter
mi	mile
nm	nautical mile
NYSERDA	New York State Energy Research and Development Authority
OWF	offshore wind farm
ROSA	Responsible Offshore Science Alliance
R/V	research vessel
SD	standard deviation
WEA	wind energy area

1.0 INTRODUCTION

Empire Offshore Wind LLC (Empire) proposes to construct and operate an offshore wind farm located in the designated Renewable Energy Lease Area OCS-A 0512. The Empire Wind Lease Area covers approximately 79,350 acres (32,112 hectares) and is located approximately 14 statute miles (mi) (12 nautical miles [nm], 22 kilometers [km]) south of Long Island, New York and 19.5 mi (16.9 nm, 31.4 km) east of Long Branch, New Jersey (Figure 1-1). The Empire Wind Lease Area will be developed as two wind farms, known as Empire Wind 1 (EW 1) and Empire Wind 2 (EW 2), which will consist of up to 174 wind turbines. Monitoring efforts are combined for the proposed wind farms, covering the entire Empire Wind Lease Area and along both planned export cable routes as described in the Empire Wind Fisheries and Benthic Monitoring Plan (FBMP) (INSPIRE Environmental 2023). This report pertains to efforts conducted across the entire Empire Wind Lease Area and along both planned export cable routes.

The New York Bight supports diverse fish and invertebrate assemblages (Guida et al. 2017; Thorne et al. 2020; NJDEP 2022). Fisheries monitoring was designed to assess potential impacts of construction and operation activities within the Empire Wind Lease Area on these biological communities. A monitoring plan was developed in accordance with recommendations made by the Bureau of Ocean Energy Management's (BOEM) *Guidelines for Providing Information on Fisheries for Renewable Energy Development on the Atlantic Outer Continental Shelf* (BOEM 2019), New York State Energy Research and Development Authority's (NYSERDA) *New York State Offshore Wind Master Plan: Fish and Fisheries Study* (NYSERDA 2017), and the Responsible Offshore Science Alliance's (ROSA's) O*ffshore Wind Project Monitoring Framework and Guidelines* (ROSA 2021). The FBMP was created using an iterative process with the Empire Wind team coordinating with regional fishing organizations, working groups, and individual fishermen. In addition, through the permitting and development process the Empire Wind team consulted with state and federal fisheries resource management agencies and solicited feedback directly from stakeholders. The FBMP outlines several survey types designed to monitor potential Empire Wind impacts on fish and invertebrates while, when practicable, limiting the impacts of the monitoring itself. Fisheries surveys outlined in the FBMP for Empire Wind monitoring include the use of a bottom trawl, baited remote underwater video (BRUV), environmental DNA (eDNA), and acoustic telemetry (INSPIRE Environmental 2023).

A summary of the first year of the acoustic telemetry monitoring effort in the Empire Wind Lease Area and along both planned export cable routes is provided in this report. This study is designed to document habitat use, movement, residency patterns, and relative abundance of fish in the Empire Wind Lease Area and along the Project's two planned export cable routes. Focal fish include federally protected, prohibited, and commercially and recreationally important species. Acoustic telemetry is an effective method of studying the spatial movements of fish in

the marine environment (Keller et al. 2017; Hogan et al. 2023) and has been used to document coastal migratory activity (e.g., Kneebone et al. 2014; Haulsee et al. 2018) and seasonal migrations through wind energy areas (WEAs) (Ingram et al. 2019; Rothermel et al. 2020; Secor et al. 2020; Gervelis et al. 2022). Acoustic telemetry surveys also are useful for examining fish responses to disturbances such as noise (McQueen et al. 2023) and have been used to assess the potential impacts of several European offshore wind farms (OWFs). These European studies include examinations of the movement and distribution of Atlantic cod (Reubens et al. 2013), flatfish (Buyse et al. 2023), and European lobster (Thatcher et al. 2023) relative to OWF construction and/or operation. The Empire Wind Lease Area is located within the migratory routes of several species of concern. For example, Frisk et al. (2019) used acoustic telemetry to monitor habitat use of Atlantic sturgeon, winter flounder, summer flounder, black sea bass, striped bass, and several species of elasmobranch in the Empire Wind Lease Area. The current acoustic telemetry monitoring study will add baseline information to the pre-construction findings of Frisk et al. (2019) and will continue during construction and post-construction time periods to better understand movements and utilization of the Project Area by these species.

1.1 Overview

Acoustic receivers passively record the presence/absence and relative abundance of animals tagged with acoustic transmitters. Detection data are used to calculate residency (time spent in regions) and movement rates of animals within monitored regions. Focal fishes to be tagged in this study include species that are ecologically, commercially, and/or recreationally important, which include but are not limited to the federally endangered Atlantic sturgeon (*Acipenser oxyrhinchus*), federally prohibited coastal sharks (e.g., dusky, sand tiger, sandbar), other elasmobranchs (e.g., winter skate, smooth dogfish, and spiny dogfish), commercially and recreationally important finfish species (e.g., winter flounder, summer flounder, black sea bass, tautog, striped bass etc.) and Highly Migratory Species (HMS; e.g., bluefin tuna, shortfin mako). Tags, or transmitters, have an operating life of two to ten years (depending on transmitter size appropriate for each species), providing successful long-term data collection over time. This acoustic telemetry study complements an existing regional infrastructure of acoustic telemetry arrays that are currently deployed by state, federal, and academic institutions and include detection coverage in and around the Empire Wind Project Area (Lease Area and planned export cable routes). Monmouth University is collaborating with INSPIRE Environmental Inc. to deploy acoustic receivers as well as monitor and tag a variety of fish species for the Empire Wind acoustic telemetry study.

This report documents the first year (2023) of pre-construction acoustic telemetry monitoring in the Empire Wind Lease Area and along the planned export cable routes to satisfy the following goals of providing:

- Site-specific information about commercially and recreationally important fish species baseline movements, usage, and residency patterns; and
- Baseline data to be used to examine potential spatial and/or temporal shifts in fish movements and usage patterns that may be associated with wind farm construction or operation.

The Empire Wind acoustic telemetry study includes two years of monitoring prior to offshore construction, sampling during construction, and two years of post-construction monitoring in accordance with the guidance of NYSERDA (NYSERDA 2017) and ROSA (ROSA 2021). In addition, the use of acoustic telemetry as a method to census a select number of marine fishes is consistent with existing guidelines for offshore wind fisheries monitoring from BOEM and ROSA (BOEM 2019; ROSA 2021) and meets ROSA's objectives by providing a reliable index of changes in community composition that has minimal impact on fisheries because it is a no-take methodology.

2.0 METHODS

2.1 Tagging

Striped bass in Raritan Bay were targeted for tagging using rod and reel. This location was chosen because striped bass migrated to this area post deployment of the arrays and Raritan Bay is close to the Project Area. Post capture and prior to implantation of acoustic transmitters, fish were placed in a tank of ambient seawater and anesthetized through immersion of MS-222 with a dose of approximately 70 milligrams per liter (mg/L). Following sedation, fish were immobilized by being placed upside down in a padded surgery cradle in order to prep the fish for surgical implantation of an acoustic transmitter (Figure 2-1). A lateral incision approximately 3-4 centimeters (cm) in length was made at a location 4-6 cm anterior to the pelvic fin and the acoustic transmitter was implanted into the fish (Figure 2-2). Once the transmitter was inserted (Figure 2-3), the incision was closed with a minimum of three sutures using an interrupted suture technique. The incision was cleaned with a betadine/petroleum ointment to deter bacterial infection and the fish was released (Figure 2-4).

2.2 Acoustic Telemetry Receivers

Innovasea acoustic release receivers (Model VR2AR-X) were rigged with a recoverable acoustic release mooring system (Mooring Systems Inc.) which included two flotation buoys, connected to a canister of 61 meters (m; 200 feet [ft]) of dyneema rope affixed with 1.8-m (6-ft) tethers and moored to the sea bed with a 45-kilogram (100-pound) pyramid anchor (Figure 2-5). Receivers in the Lease Area and along the planned EW 1 export cable route were deployed 25-27 October and receivers along the planned EW 2 export cable route and the onshore landing area were deployed on 13 December from Monmouth University's research vessel (R/V) *Heidi Lynn Sculthorpe* (Figures 2-6 to 2-9).

The VR2AR-X receiver has a built-in transmitter that enables remote communications from the surface with deployed receivers using the VR100 mobile tracking receiver equipped with a transponding hydrophone, which allows remote retrieval of the unit using an integrated acoustic release, typically within one minute. This system eliminates the need for deployment of large concrete blocks (previous deployment method) that could impact commercial fishing in the region. Acoustic arrays can be deployed for up to 16 months (one battery cycle), but in this study will be recovered, downloaded, and maintained twice per year (late spring and late fall) to ensure successful data retrieval and collection after expected peak fish migrations through the region. Acoustic receivers will be checked for presence, maintenance, and functionality approximately once every six months. Retrieval of VR2AR-X receivers is performed aboard the vessel with communication from a VR100 (https://www.innovasea.com/wp-content/uploads/2022/03/Innovasea-Fish-Tracking-vr100-300_0322.pdf) and an omni-directional transponding hydrophone that triggers the release mechanism which allows the unit to float to

the surface to be recovered. The VR100 detects receivers that are within range of the hydrophone, and also estimates distance between the VR2AR-X and VR100, to provide a successful recovery. The receiver's internal transponder allows for remote monitoring of tilt, temperature, battery level, available storage space, and noise levels, reducing the number of times the receiver needs to be hauled to the surface for operational checks and redeployed with new Global Positioning System (GPS) coordinates. Once the receiver is signaled to release, it floats to the surface and is retrieved. An onboard pot hauler is used to recover the moorings.

In the event that an acoustic receiver is not detected at the site of deployment, the VR100 will be used to attempt to locate the missing VR2AR-X. The VR100 detects the receivers that are within range of the VR100 and estimates the distances to the unit so if a unit is not communicating with the VR100, a systematic search within a 1-km radius of the epicenter of deployment is conducted to locate the receiver. Once the VR100 is within range, the VR2AR-X can be released from the mooring.

3.0 RESULTS

3.1 Tagging

A total of twenty striped bass, *Morone saxatilis* (mean size = 83.22 cm; fork length ± 8.11 standard deviation [SD]), were tagged in Raritan Bay during the 2023 survey effort (Table 3-1). Nineteen fish were tagged on 1 November and a single fish was tagged on 6 November.

3.2 Acoustic Telemetry Receiver Deployment

Forty-eight Innovasea acoustic release receivers (Model VR2AR-X) were deployed within the Project Area (Table 3-2). Twenty-three receivers were deployed in a wedge-shaped grid within the Empire Wind Lease Area at approximate 4 km intervals. Receivers also were positioned along the EW 1 (n = 10) and EW 2 (n = 5) cable routes at approximate 8 km intervals and an array of receivers (n = 10) lined the eastern and western portions of the EW 2 cable landing site within New York state waters (Figure 3-1).

3.3 Challenges Encountered

3.3.1 Equipment Delays

Challenges in purchasing and receiving acoustic telemetry equipment resulted in delays. Purchase orders for acoustic telemetry were issued by Monmouth University within two weeks of receiving the executed contract from INSPIRE Environmental. Purchases could not be initiated prior to setting up the award for liability reasons. Equipment had significant production times. Innovasea acoustic telemetry equipment was received on 28 August. Mooring Systems Inc. (recoverable acoustic release mooring) had major delays in supply chain shortages of key components (anchors and dyneema rope) as well as Covid-19 related delays of employees in their shop. A partial shipment of moorings was first received on 18 October and not fully received until 17 November. Thereafter, deployments were mobilized in under a week.

3.3.2 Receiver Issue

Empire Array Receiver #3 originally deployed on 25 October was prematurely released on the initial deployment and was an estimated 900 m off the planned deployment location. Equinor was notified of the premature deployment and requested that Receiver #3 be moved as it potentially interrupted other operations in the Project Area. A Monmouth University small craft vessel was mobilized on 6 November and the receiver was moved back to the agreed-upon latitude and longitude. Prior to redeployment, detection data were downloaded from this receiver. Within the 13 days that Empire Array Receiver #3 was initially deployed, 16 unique transmitters were detected for a total of 178 overall detections.

3.3.3 Gear Interaction

On 12 December it was reported that the commercial clam fishing vessel (*F/V*) *Caroline Christine* dredged up a receiver. The receiver was brought back to the Point Pleasant Packing Plant where Monmouth staff met with the vessel captain to recover the receiver and discussed the project(s) and offshore wind fisheries monitoring strategies etc. on 11 December 2023.

3.3.4 Weather Delays

Continuous and intense storms occurred during winter 2023, which interfered with deployment of acoustic receivers. In particular, large swells prevented the deployment of receivers at locations furthest from shore.

Table 3-1. Biological Data of Tagged Striped Bass

Year	Date	Tagging Source	Location	Common Name	Fork Length (cm)	Total Length (cm)	Weight (kg)	External Tag	Acoustic Tag #	Tag Serial Number
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	74.4	78	4.715	7781	49966	1572616
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	83	87	6.15	7786	49967	1572617
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	82	85	5.92	7785	49968	1572618
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	82	86	6.105	-	49969	1572619
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	80	84	5.26	7785	49970	1572620
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	82	86	5.501	7739	49971	1572621
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	74	77	4.9	7794	49972	1572622
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	78	82	5.32	7782	49973	1572623
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	82	85	5.826	-	49974	1572624
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	97	103	11.105	7787	49975	1572625
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	82	85	5.87	8095	49976	1572626
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	87	93	7.44	7722	49977	1572627
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	80	83	6.13	7730	49978	1572628
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	77	79	4.92	7737	49979	1572629
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	80	85	4.73	7720	49980	1572630
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	90	95	7.63	7703	49981	1572631
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	83	86	-	7660	49982	1572632
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	81	85	-	7744	49983	1572633
2023	11/1/2023	Empire Wind	Raritan Bay	Striped Bass	110	116	-	7743	49984	1572634
2023	11/6/2023	Empire Wind	Sandy Hook	Striped Bass	80	86	-	1702	49985	1572635

Table 3-2. Metadata on Deployed Acoustic Receivers

Station Name	Receiver Serial Number	Deployed Date/Time	Latitude	Longitude	Deployed Depth (m)	Height of Receiver tether (m)	Receiver Depth (m)
Empire Wind Array 03	553924	2023-10-25T09:25:00	40.369433	-73.553817	23.01	1.83	21.18
Empire Wind Array 04	553905	2023-10-25T09:47:00	40.35759329	-73.51725339	26.52	1.83	24.69
Empire Wind Array 05	553919	2023-10-25T10:14:00	40.34644083	-73.47825774		1.83	
Empire Wind Array 06	553901	2023-10-25T10:35:00	40.33328717	-73.43645235	29.56	1.83	27.74
Empire Wind Array 07	553897	2023-10-25T10:54:00	40.31721898	-73.41760773	29.87	1.83	28.04
Empire Wind Array 08	553886	2023-10-25T11:12:00	40.33364253	-73.38047804		1.83	
Empire Wind Array 11	553903	2023-10-25T12:35:00	40.32236425	-73.32072118	30.17	1.83	28.34
Empire Wind Array 10	553894	2023-10-25T13:13:00	40.30596202	-73.3538492	32.92	1.83	31.09
Empire Wind Array 09	553898	2023-10-25T13:32:00	40.29889847	-73.3834928	34.44	1.83	32.61
Empire Wind Array 12	553916	2023-10-25T12:59:00	40.27980671	-73.34524157		1.83	
Empire Wind Array 13	553890	2023-10-25T13:25:00	40.29645057	-73.306919	33.22	1.83	31.39
Empire Wind Array 14	553892	2023-10-25T13:39:00	40.31283092	-73.27174712	37.49	1.83	35.66
Empire Wind Array 17	553899	2023-10-25T13:58:00	40.30316733	-73.22350279	36.88	1.83	35.05
Empire Wind Array 16	553895	2023-10-25T14:16:00	40.28568321	-73.25937021	35.05	1.83	33.22
Empire Wind Array 15	553887	2023-10-26T11:03:00	40.26145587	-73.30065284	37.18	1.83	35.35
Empire Wind Array 18	553904	2023-10-26T11:17:00	40.23980033	-73.26901167	36.57	1.83	34.75
Empire Wind Array 19	553922	2023-10-26T11:33:00	40.2583942	-73.23023698	37.49	1.83	35.66
Empire Wind Array 20	553896	2023-10-26T11:46:00	40.27510742	-73.19721027	37.49	1.83	35.66
Empire Wind Array 21	553900	2023-10-26T12:00:00	40.29123129	-73.16159343	38.71	1.83	36.88
Empire Wind Array 25	553921	2023-10-26T12:17:00	40.28542177	-73.11158224	38.71	1.83	36.88
Empire Wind Array 24	553888	2023-10-26T12:35:00	40.26476993	-73.14940788	39.01	1.83	37.18
Empire Wind Array 23	553917	2023-10-26T12:53:00	40.24006916	-73.18957121	38.71	1.83	36.88
Empire Wind Array 22	553902	2023-10-26T13:08:00	40.22169408	-73.22269825	24.38	1.83	22.55
EW1 Export Cable Route 10	553923	2023-10-26T15:11:00	40.43346761	-73.50533577	21.94	1.83	20.12
EW1 Export Cable Route 9	553908	2023-10-26T15:44:00	40.44404487	-73.60556858	26.82	1.83	24.99
EW1 Export Cable Route 8	553910	2023-10-26T16:16:00	40.45039711	-73.70816683	25.91	1.83	24.08
EW1 Export Cable Route 7	553920	2023-10-26T16:48:00	40.48068064	-73.80390231	13.72	1.83	11.89
EW1 Export Cable Route 6	553909	2023-10-26T17:17:00	40.49214976	-73.90333501	6.40	1.83	4.57
EW1 Export Cable Route 5	553913	2023-10-27T08:39:00	40.52072874	-73.98128094	10.97	1.83	9.14
EW1 Export Cable Route 4	553906	2023-10-27T09:10:00	40.55062585	-74.02239217	7.92	1.83	6.10
EW1 Export Cable Route 3	553891	2023-10-27T09:43:00	40.58847964	-74.01464049	10.36	1.83	8.53
EW1 Export Cable Route 2	553893	2023-10-27T10:37:00	40.63138857	-74.04282424	11.58	1.83	9.75
EW1 Export Cable Route 1	553889	2023-10-27T10:58:00	40.65815647	-74.02193151		1.83	
Empire Wind Array 03	553942	2023-11-06T16:27:00	40.36772633	-73.55477137		1.83	
EW2 Export Landing West 5	553933	2023-12-13T09:45:00	40.53438	-73.66515	16.76	1.83	14.93
EW2 Export Landing West 4	553936	2023-12-13T09:55:00	40.54554	-73.66862	15.85	1.83	14.02
EW2 Export Landing West 3	553932	2023-12-13T10:04:00	40.55635	-73.67172	13.11	1.83	11.28
EW2 Export Landing West 2	553911	2023-12-13T10:14:00	40.56687	-73.67489	10.06	1.83	8.23
EW2 Export Landing West 1	553914	2023-12-13T10:23:00	40.57754	-73.67792	7.77	1.83	5.94
EW2 Export Landing East 1	553934	2023-12-13T10:40:00	40.57997	-73.62095	6.40	1.83	4.57
EW2 Export Landing East 2	553943	2023-12-13T10:59:00	40.56959	-73.61789	8.23	1.83	6.40
EW2 Export Landing East 3	553940	2023-12-13T11:09:00	40.55908	-73.61485	10.36	1.83	8.53
EW2 Export Landing East 4	553858	2023-12-13T11:18:00	40.54956	-73.61111	10.06	1.83	8.23
EW2 Export Landing East 5	553941	2023-12-13T11:29:00	40.53785	-73.60827	14.93	1.83	13.11
EW2 Export Cable Route 1	553912	2023-12-13T12:03:00	40.53427	-73.53683	14.32	1.83	12.50
EW2 Export Cable Route 2	553915	2023-12-13T12:38:00	40.49621	-73.4776	22.25	1.83	20.42
EW2 Export Cable Route 3	553907	2023-12-13T13:17:00	40.45242	-73.42743	22.86	1.83	21.03
EW2 Export Cable Route 4	553925	2023-12-13T13:55:00	40.4096	-73.37494	29.56	1.83	27.74

4.0 DISCUSSION

The acoustic telemetry survey for Empire Wind was successfully initiated in 2023 with the deployment of 48 acoustic receivers in the lease area and along the planned export cable routes. Additionally, 20 striped bass were tagged in Raritan Bay. Detection data will be downloaded from the receivers in the late spring and late fall of 2024 to coincide with known seasonal migratory activity of fish species of interest. It is important to note that information on the timing and duration of habitat use in the Lease Area and along the planned export cable routes will be obtained not only from the striped bass tagged in Raritan Bay in 2023, but from fish and elasmobranchs in the Project Area with transmitters compatible with detection by the Empire Wind receiver array. These fish taxa include Atlantic sturgeon, coastal sharks, skates, dogfish, flounder, and black sea bass. The information retrieved when one receiver that had been deployed for only 13 days was relocated (16 unique transmitters detected and 178 total detections) indicates the survey will provide copious amounts of data on fish habitat use in the Project Area.

Acoustic telemetry monitoring of fish and invertebrates near European OWFs has yielded important information on habitat use, movement patterns and seasonal occurrences for a broad array of taxa. Acoustic telemetry monitoring of Atlantic cod, a structure-oriented species, around a Belgian OWF revealed that juvenile cod exhibit a high degree of residency within the wind farm and use it as foraging habitat during crepuscular periods, with overall cod wind farm habitat use varying seasonally (Reubens et al. 2013). Plaice, a flatfish, exhibits diel movement patterns near Belgian a wind farm, moving closer to scour protection layers during the day, ostensibly to forage (Buyse et al. 2023). Plaice also exhibits site fidelity and seasonal movements in and out of the wind farm. The European lobster, which seeks shelter in rocky crevices, was detected most frequently within 35 m of the rocky scour protection layer surrounding monopile turbine foundations of a United Kingdom wind farm (Thatcher et al. 2023). These forms of habitat use around European OWFs revealed by acoustic telemetry studies are consistent with what is known about the life history characteristics of these species and their movement patterns around artificial reefs. Similar to artificial reefs, OWFs alter the environment through the introduction of structure, but OWFs also introduce additional changes, e.g., electromagnetic fields, noise, and vibrations, which could potentially affect biological resources. Therefore, acoustic telemetry studies at OWFs provide essential information about fish habitat use that cannot reliably be inferred from other studies in other systems.

5.0 SUMMARY

The first year of the acoustic telemetry monitoring study in the Empire Wind Project Area was completed in 2023 with the deployment of 48 acoustic receivers in the lease area and along the planned export cable routes. Additionally, 20 striped bass were tagged in Raritan Bay. Project delays occurred due to supply chain-related equipment shortages and inclement weather. Detection data will be retrieved starting in the spring of 2024. These data will provide information on the seasonal habitat use of the Project Area by Atlantic sturgeon, coastal sharks, skates, dogfish, flounder, striped bass, and black sea bass

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Empire Wind 2023 Acoustic Telemetry Study

Annual Report

FIGURES

Prepared for:

Empire Offshore Wind LLC
Stamford Office - 600 Washington Blvd. - Suite 800
Stamford, CT 06901

Prepared by:

Monmouth University
West Long Branch, New Jersey

and

INSPIRE Environmental
513 Broadway
Newport, RI 02840

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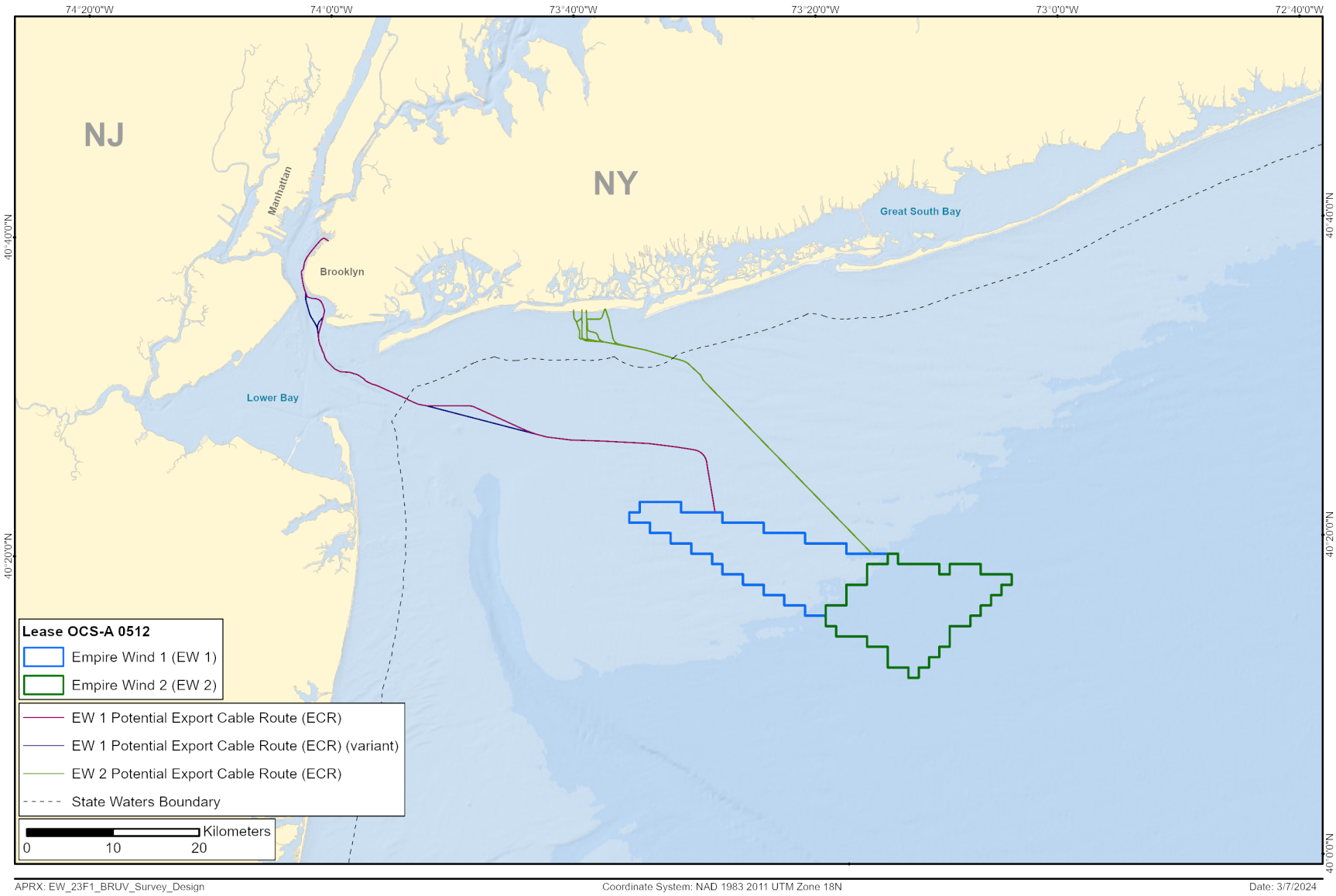

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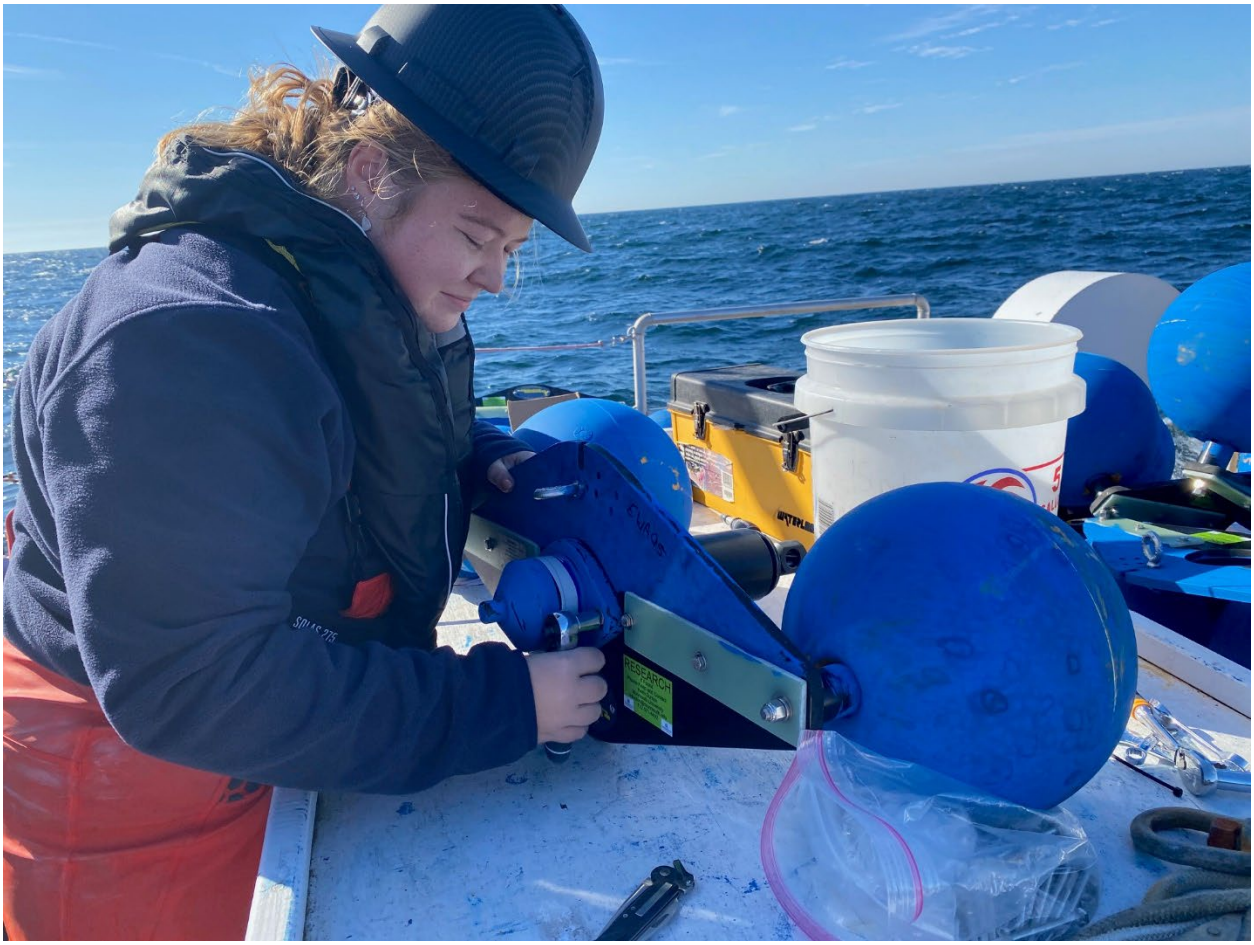

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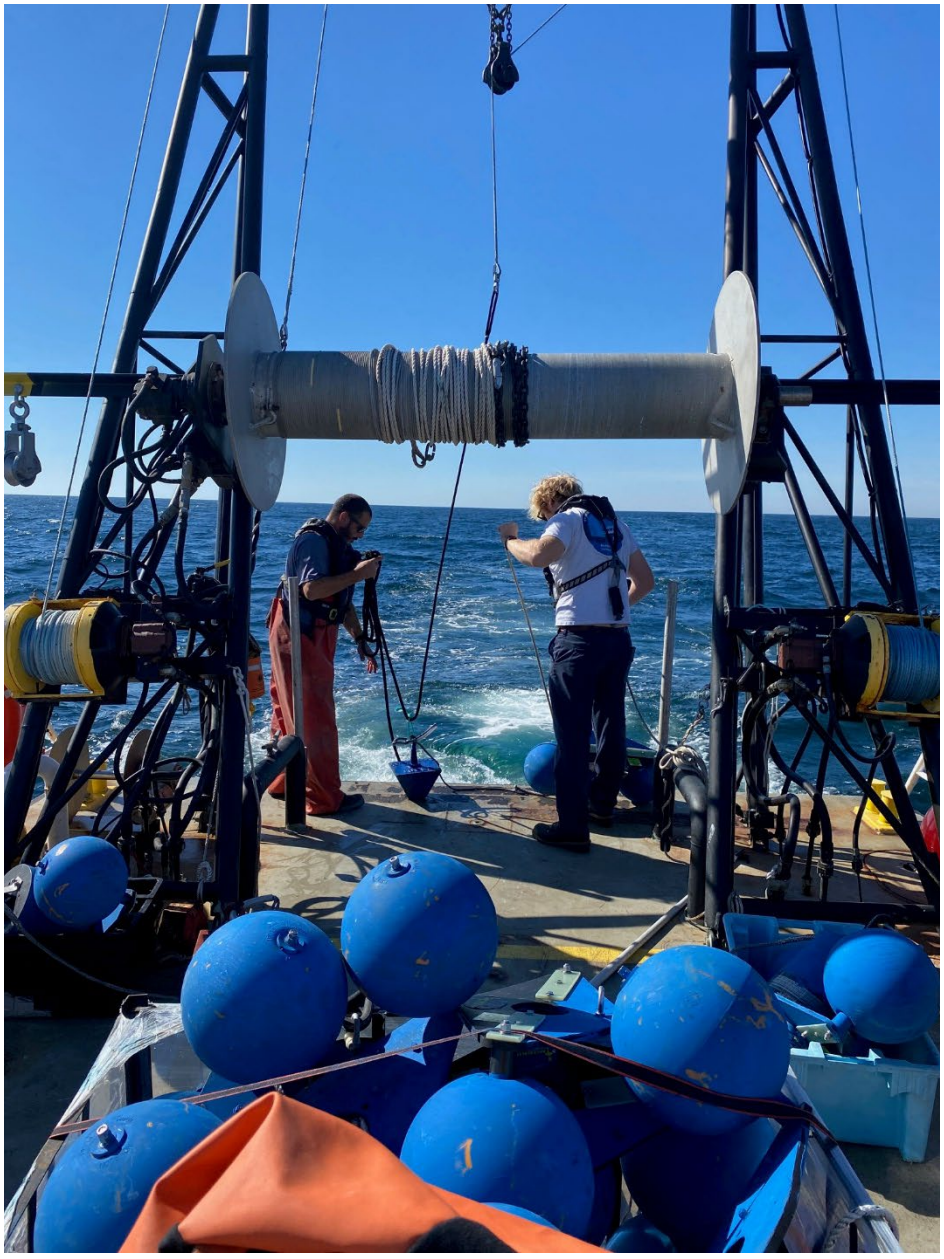

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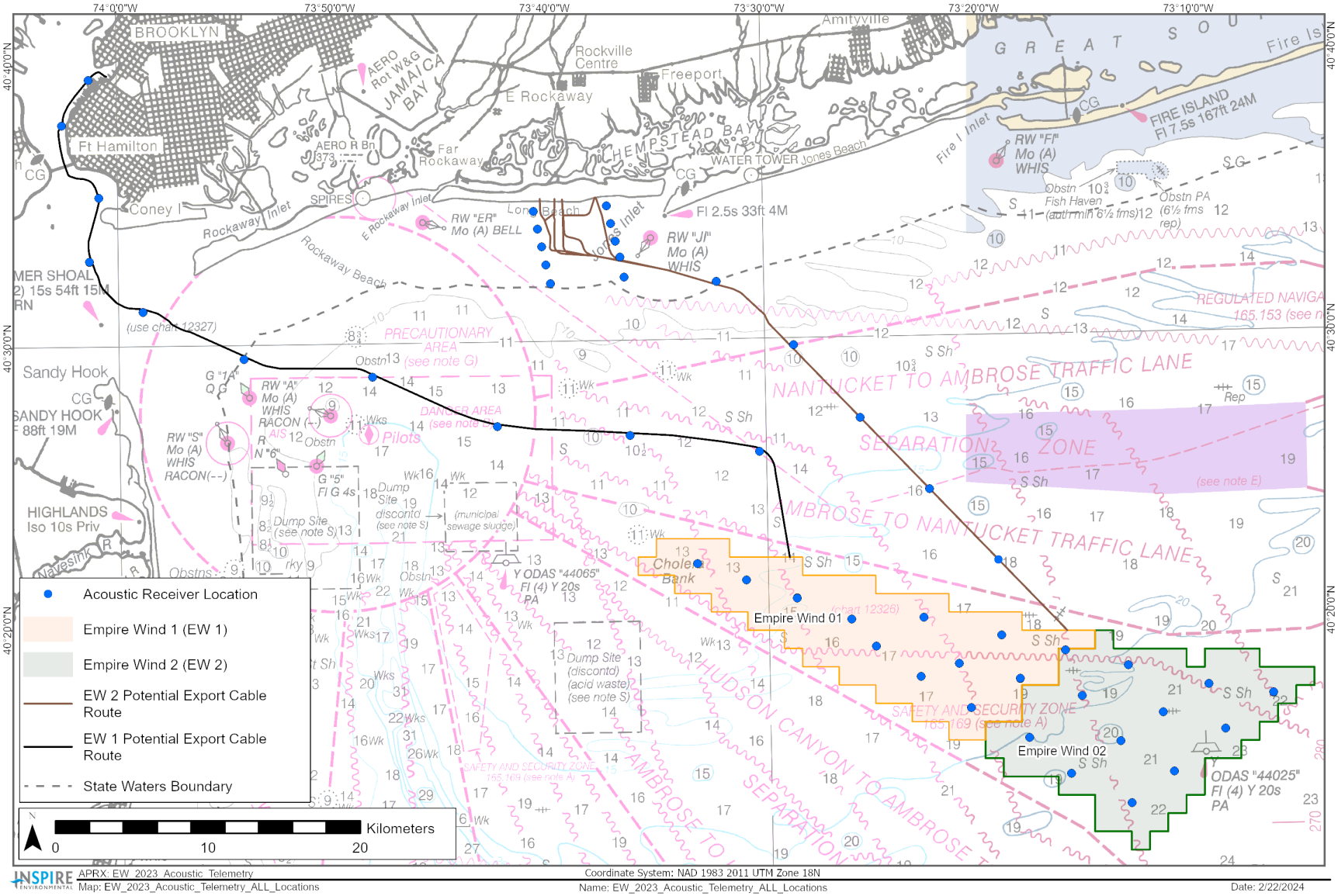

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