J1. Visual Impact Assessment (July 2023)

Visual Impact Assessment

Revised July 2023

Maryland Offshore Wind Project

Prepared For:

US Wind, Inc.
Baltimore, MD

Prepared By:

TRC Companies
Waltham, MA

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List of Abbreviations

Notation	Definition
ADLS	Aircraft Detection Lighting System
AMSL	Above Mean Sea Level
APE	Area of Potential Effects
BLM	Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
COP	Construction and Operations Plan
DPL	Delmarva Power & Light
FAA	Federal Aviation Administration
FOV	Field of View
FPM	Flashes per Minute
GIS	Geographic Information System
HDD	Horizontal Directional Drilling
km	Kilometer
LSZ	Landscape Similarity Zone
MHHW	Mean Higher High Water
mi	Mile
mm	Millimeter
MSL	Mean Sea Level
MW	Megawatts
NAIP	National Aerial Imagery Program
NLCD	National Land Cover Database
NM	Nautical Mile
NRHP	National Register of Historic Places
OCS	Outer Continental Shelf
OSS	Offshore Substation
PDE	Project Design Envelope
SHPO	State Historic Preservation Office
U.S.	United States of America
USACE	United States Army Corps of Engineers

Notation	Definition
USCG	United States Coast Guard
USGS	United States Geological Survey
VA DCR	Virginia Department of Conservation and Recreation
VDOT	Virginia Department of Transportation
VIA	Visual Impact Assessment
VSA	Visual Study Area
WTG	Wind Turbine Generator
ZTV	Zone of Theoretical Visibility

1.0 Introduction

TRC Companies (formerly ESS Group, LLC (ESS)), was retained by US Wind, Inc. (US Wind) to prepare a Visual Impact Assessment (VIA) for the proposed Maryland Offshore Wind Project (the Project) within OCS-A 0490 (the Lease), a Lease area of approximately 80,000 acres located approximately 18.5 km (11.5 miles) off the coast of Maryland on the Outer Continental Shelf.

1.1 Visual Impact Assessment Process

The following methodology was utilized to produce the Visual Impact Assessment herein:

1. Establish an appropriate Visual Study Area (VSA) and Area of Potential Effects (APE).
2. Identify historic properties and visually sensitive resources within the APE.
3. Identify the Landscape Similarity Zones (LSZs) and User Groups within the VSA.
4. Complete a viewshed analysis of the VSA.
5. Field Photography - Visit and photograph the wind farm location from publicly accessible key observation points.
6. Prepare simulations from representative viewpoints.
7. Assess the visual impacts associated with the PDE.

2.0 Project Description

2.1 Project Design Envelope

The Project Design Envelope (PDE) considers wind turbines with nameplate capacity rating of up to 18 megawatts (MW). The offshore components in the PDE consist of up to 121 wind turbine generators (WTGs), up to 4 offshore substations (OSSs), a Meteorological (Met) Tower, inter-array cables, and up to four export cables buried beneath the seabed. The inter-array and offshore export cables would not be visible during operation of the Project and have therefore been excluded from this assessment.

2.2 Wind Turbine Generators

The nacelle and blade tip height of WTGs in the PDE will vary based on the turbine capacity rating, up to a maximum nacelle height of 161 meters (528 feet) above mean sea level (MSL) and a maximum rotor diameter of 250 meters (820 feet), for a maximum blade tip height of 286 meters (938 feet). The maximum number of WTGs in the PDE is 121. For purposes of the visual assessment, the maximum size (286 meters [938 feet]) and number of WTGs (121) in the PDE was selected for evaluation based on the assumption it would be the most visible. Figure 2-1, below, shows a schematic diagram of the representative WTG used in the visual impact assessment. Figure 1[1] illustrates the proposed WTG layout. In the proposed layout, the WTGs are oriented in a grid pattern with spacing of approximately 1.02 nautical miles (NM) (1.17 miles) north to south by 0.77 NM (0.89 miles) east to west.

[1] Figures 1 through 13 are included as attachments to this Visual Impact Assessment.

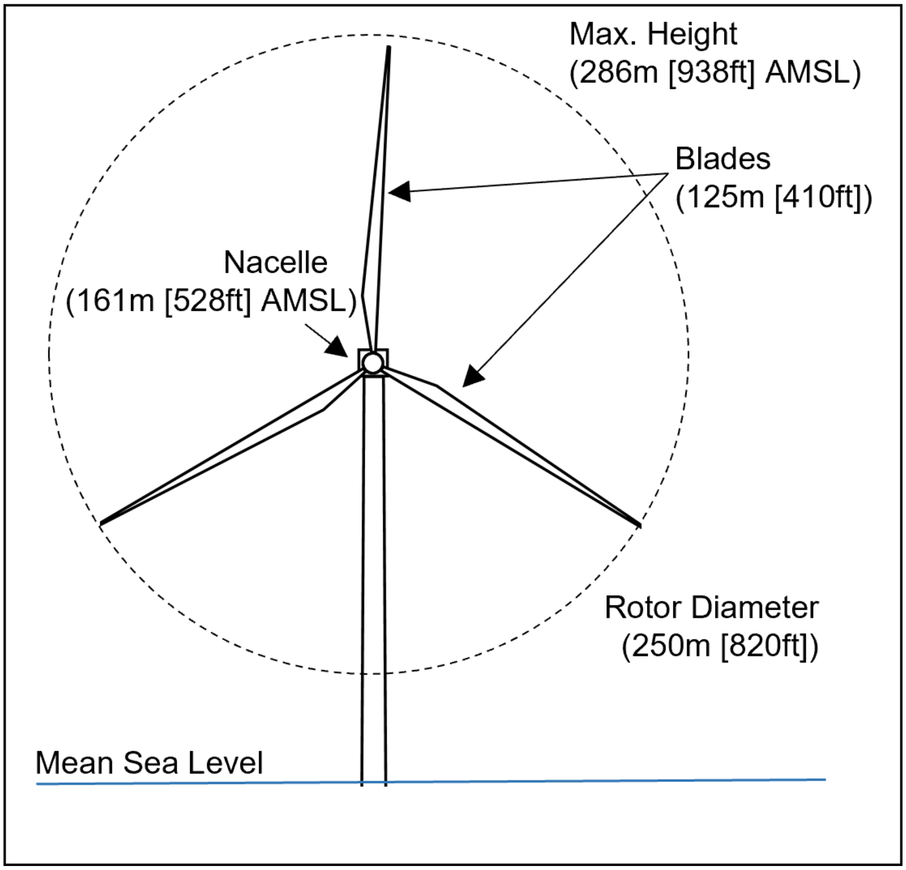

Figure 2-1. Wind Turbine Generator Schematic Diagram

2.3 Offshore Substations

The WTGs would be connected to up to four (4) OSSs where the voltage would be increased, and the power would be transmitted to the interconnection point via the offshore export cables. The OSSs would be installed on a foundation in the proposed locations shown on Figure 1. Under the PDE, the maximum height would be 60 meters (197 feet) (see COP Volume I, Section 2.3 for more details). Simulated OSS designs have a maximum height of 43 meters (144 feet) and 39 meters (128 feet) above MSL for the 400MW and 800MW substations, respectively. The OSSs would not be visible above the horizon from the majority of the inland areas of the shoreward VSA, although OSSs would be visible from much of the shoreline within the VSA, extending from Delaware Seashore State Park to portions of Assateague Island National Seashore.

2.4 Met Tower

A Met Tower would be located along the southern edge of the Lease area. The height of the Met Tower including the mast and foundation will be approximately 100 m (328 ft) above the mean sea level. The mast atop the foundation would be a lattice structure nominally 6.4 m (21 ft) at the base tapering to 1.5 m (5 ft) at the top (see COP Appendix I-K3). The Met Tower would not be visible above the horizon in the majority of the shoreward VSA.

2.5 Lighting and Marking of Structures

US Wind's proposed lighting and marking scheme is included in Appendix II-K2 of the Construction and Operations Plan (COP). The lighting and marking described below is proposed and subject to approval by BOEM, the Federal Aviation Administration (FAA), the U.S. Coast Guard (USCG), and other relevant agencies.

Lighting and marking of structures would comply with FAA guidance regarding aviation obstruction lighting of structures and BOEM's Lighting and Marking of Structures Supporting Renewable Energy Development (BOEM 2021a). US Wind would place lighting and signage on applicable structures to aid navigation per USCG circular NVIC 01-19 Guidance on the Coast Guard's roles and responsibilities for Offshore Renewable Energy Installations (USCG 2019) and comply with any other applicable USCG requirements. An Aircraft Detection Lighting System (ADLS) is planned for the Project if technically feasible, commercially available, and approved for use by FAA, BOEM, and USCG. FAA obstruction lighting on the WTGs, OSSs, and Met Tower would only illuminate when aircraft are approaching the Lease area.

Perimeter structures of the wind farm, located on the corners or other significant peripheral points, would be marked with quick flashing yellow marine lanterns with 360° visibility and an operational range of at least 5 NM. Intermediate perimeter structures, located along the outside boundary, would be marked with 2.5-second flashing yellow marine lanterns with 360° visibility and an operational range of at least 3 NM. Inner boundary structures would be marked with 6 or 10 second yellow flashing marine lanterns with 360° visibility and with a 2 NM operational range. Lights servicing the same structure designation would be synchronized.

2.5.1 Wind Turbine Generators

Aviation safety lighting consisting of two medium intensity flashing red obstruction aviation lights are proposed atop the nacelles, four low-intensity flashing red obstruction lights mid-tower around the tower in a ring, and a helicopter hoist status light. The aviation lights would flash simultaneously at 30 flashes per minute (FPM). The structure aviation safety lights would be visible in all directions in the horizontal plane. See Appendix II-K2 for the PDE lighting and marking scheme. When ADLS is activated upon detection of a nearby aircraft, obstruction lighting would be illuminated, but would otherwise be turned off. An ADLS efficiency assessment is included as Appendix E and discussed further in Section 4.2.5 of the VIA. If ADLS is not approved for use in the Project, all FAA lights would need to be illuminated to adhere to FAA guidance noted above, which prohibits unlit gaps greater than 1 statute mile between structures.

WTGs would be marked conspicuously and distinctly for both day and night recognition. Amber flashing navigation beacons of different intensities would be installed on all WTGs. The amber flashing navigation lights would be energized from sunset to sunrise and from sunrise to sunset in restricted visibility. Navigation lights would be visible in all directions horizontally.

The foundation of all WTGs would be painted yellow (RAL 1023) from the level of Mean Higher High Water (MHHW) to 15 meters (50 feet) above MHHW. Ladders at the foundation base of all turbines would be painted in a color that contrasts with the recommended yellow for ease ofidentification for operations and maintenance personnel. All major upper WTG components, including nacelles, blades, and towers, would be painted with color no lighter than RAL 9010 Pure White and no darker than RAL 7035 Light Grey (BOEM 2021a). The WTG paint color will be determined in consultation with BOEM, FAA, and USCG. The simulations presented in this Visual Impact Assessment conservatively use RAL 9010 Pure White to represent a maximum impact scenario.

Each WTG would be designated, marked, and charted with a unique alphanumeric designation for quick recognition and reference by mariners and agencies for search and rescue, law enforcement, and other purposes. The bottom of the alphanumeric designation would be located at least 9 meters (30 feet) and no more than 15 meters (50 feet) above MHHW. They would be approximately 3 meters (10 feet) in height, would be visible above any service platforms in a 360-degree arc from the water's surface, and would be applied with retro-reflecting paint to enhance visibility under low light conditions. Each WTG's unique alphanumeric designation would be duplicated below the service platforms.

2.5.2 Offshore Substations

Proposed lighting and marking of each OSS would include yellow flashing (6- or 10-second frequency) marine lanterns with 360° visibility and with a 2 NM operational range. The maximum height of the OSSs is less than 60.7 m (199 ft) and therefore are not anticipated to require aviation obstruction lighting, pending FAA concurrence. If aviation obstruction lighting is required, US Wind anticipates two medium intensity flashing red obstruction aviation lights, four low-intensity flashing red obstruction lights in a ring, and a helicopter hoist status light. The aviation lights would flash simultaneously at 30 flashes per minute (FPM). The structure aviation safety lights would be visible in all directions in the horizontal. If aviation lighting is deployed on the OSSs the lights would be part of the ADLS described in Section 2.5.1.Nighttime simulations include aviation obstruction lighting activated on all WTGs to represent a maximum impact scenario.

2.5.3 Met Tower

In addition to the FAA lighting with ADLS, as described above, the Met Tower is proposed to be equipped with white marine lanterns with an operational range of 10 NM.

2.6 Onshore Facilities

The proposed aboveground onshore facilities would consist of new US Wind substations and interconnection to the Delmarva Light & Power (DPL) Indian River 230 kV substation located adjacent to NRG's Indian River Power Station near Millsboro, Delaware (Figure 2), as well as an Operations and Maintenance (O&M) facility in the Ocean City, Maryland region.

2.6.1 Substations

The proposed new US Wind substations are expected to be arranged generally west and southwest of the existing DPL Indian River substation. The onshore export cables would exit the horizontal directional drilling (HDD) duct, into underground transition vaults, and traverse underground to be terminated at the respective US Wind substation block. A short overhead line (less than 152 m (500 ft) long) would make the connection from each substation block to the Indian River substation. The nominal location of the substations and interconnection are shown in Figure 2. It is assumed that the existing DPL Substation would be expanded by DPL to accommodate the Project and new US Wind substations. Limited tree clearing may be required for the new Project substations and for expansion of the existing DPL Substation, which would be determined following further design, archaeological studies, and negotiations with the landowner.

The US Wind substations have a maximum height of approximately 18 m (60 ft). The size of the new substations and material used will depend on the final design, although equipment and color used is assumed to be consistent with the existing substations in the immediate area. The proposed US Wind substations, once constructed, would be connected to the DPL Substation by an overhead line less than 152 m (500 ft) long. This is consistent with the existing substation visual character and appearance in terms of components and height (see Figure 2-2).

Figure 2-2. Existing Indian River Substation in Millsboro, Delaware

The onshore substations and DPL substation expansion are proposed in the immediate vicinity of the NRG Indian River Power Plant. The facility is highly industrialized and consists of multiple buildings, coal conveyors, a large coal pile, two substations (in addition to the existing DPL Substation), transmission lines in, around, and exiting the site, and three tall stacks (see Figure 2-4 and 2-4). Due to the nature of the facility, public access to the site is limited by a gate and fencing.

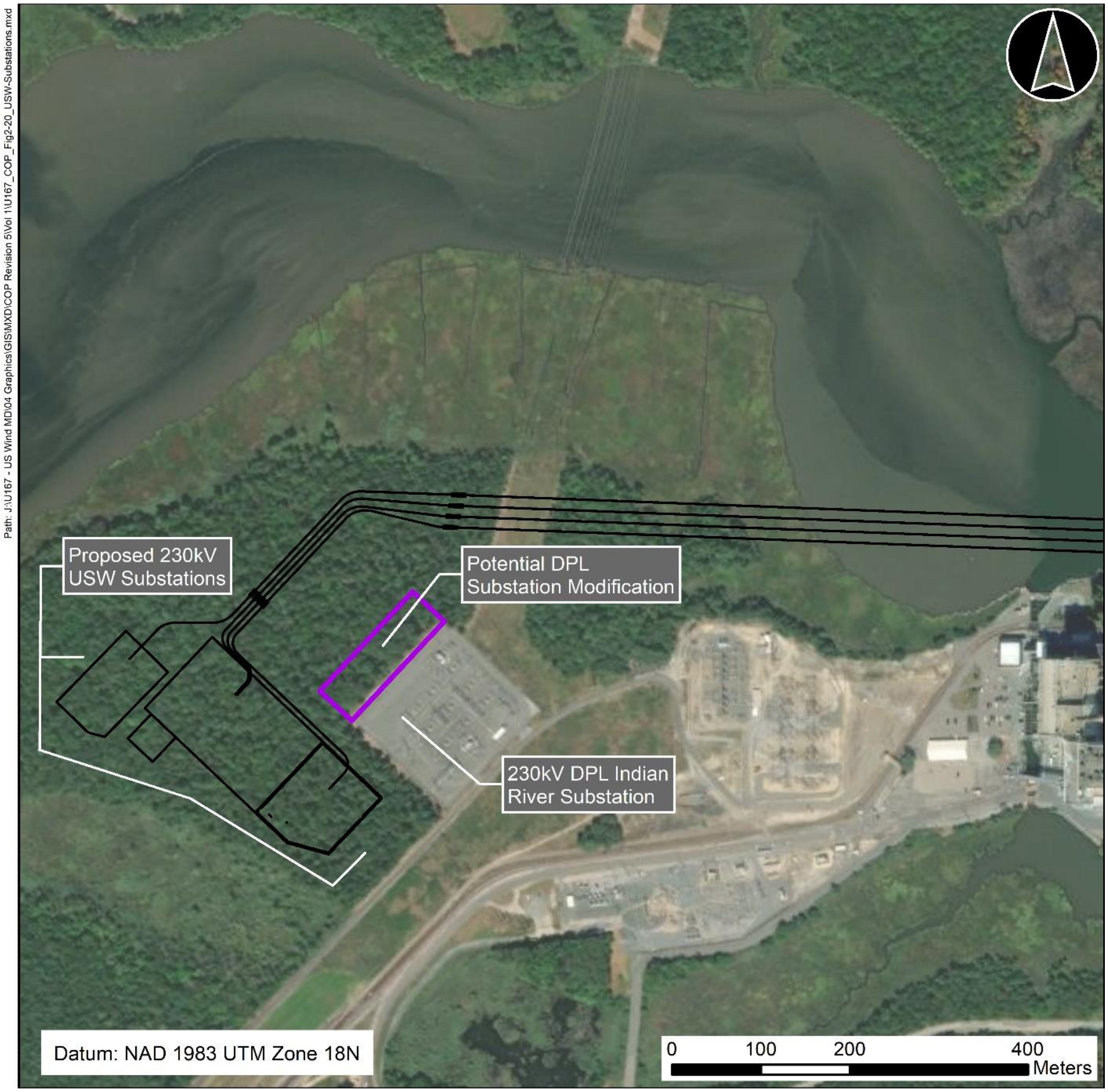

Figure 2-3. NRG Indian River Power Plant, Aerial View.
Aerial view of the existing NRG Indian River Power Plant and related infrastructure. The proposed HDD approach for cables and potential footprint of the US Wind Substations and expansion of the DPL substation are also shown.

Figure 2-4. NRG Indian River Power Plant

2.6.2 O&M Facility

The proposed O&M Facility would be located near the Ocean City Inner Harbor and consist of a quayside for crew transfer vessels and material on- and off-loading, as well as a warehouse, administrative building, and other supporting facilities. The harbor area is characterized by industrial development, maritime industrial use, and commercial activities (see Figures 2-5 and 2-6). Examples of development within the Ocean City Inner Harbor area include multiple marinas and boathouses, parking lots, piers and bulkheads, charter companies, and restaurants.

Figure 2-5. Proposed Location of O&M Facility

Figure 2-6. Potential Ocean City Harbor Quayside Operations Site

3.0 Existing Visual Character

The existing visual character of the Project area was established after the height and location of all visible Project components were identified. First a viewshed analysis was conducted to identify all areas from which Project components could theoretically be visible. Separate viewshed analyses were conducted for offshore and onshore Project components because of the large difference in size and height between the offshore and onshore components. The viewshed analysis results were then used to identify seascape character areas (SCAs) and landscape character areas (LCAs) that may be affected by the Project, and to identify the spatial extent of visual impact consideration. All locations from which the Project may be visible were considered to be potentially affected.

Once the locations from which the Project may be visible were identified, viewer groups that may experience views of the Project were identified and described. Important views and viewpoints from which the Project components would be visible were then identified, including the key observation points (KOPs) which were used in the impact assessment. The presence of sensitive historic and natural resources from which the Project would be visible was a key consideration in the selection of KOPs. The nature of the view toward the Project area from each KOP was described. The effects of the visual presence of the Project on these views is the basis of this VIA.

Once the affected environment was established, the visual impact assessments were conducted. The sensitivity of each KOP was determined based on its susceptibility to impacts and its perceived value. The magnitude of the impact was determined based on the size and scale of the change to existing conditions caused by the Project, the geographic extent of the area subject to the Project's effects, and the duration and reversibility of the Project's effects. The sensitivity of the KOP and the magnitude of the impact were then combined to assess the Project's visual impact at each KOP.

3.1 Visual Study Area

In order to address Project visibility from visually sensitive resources, a VSA was first established. The VSA is the approximate area in which there is a potential for visual impacts associated with the Project. The Bureau of Land Management (BLM) uses the following range of distance zones when considering land use decisions for managing visually sensitive resources in BLM Resource Management Plans: Foreground to middle ground views extend from the viewing location out up to 8 km (5 mi), background views range from 8 to 24 km (5 to 15 mi), and views beyond 24 km (15 mi) are classified as the “Seldom Seen” zone (Sullivan et al. 2012). Observations of existing offshore facilities suggest that night visibility of aviation hazard signals are visible at distances greater than 39 km (24 mi) (Sullivan et al. 2013) and onshore wind turbines aviation lighting seen at distances greater than 58 km (36 mi) (Sullivan et al. 2012) (Note: Only the aviation lighting may be visible at these distances, not the structures.). Based on the BLM zones and the calculated Zone of Theoretical Visibility (ZTV) of the proposed turbine models, 69 kilometers (43 miles) (applied as a radius buffer around each WTG) was determined to be an appropriate distance for the purposes of establishing a visual threshold and to represent the VSA. The visibility calculation used to determine the ZTV is described in Section 4.1 and accounts for viewer and WTG height and curvature of earth, including atmospheric refraction under optimal viewing conditions. For daytime observations, this study area is likely overly conservative.

The resulting VSA is 20,373 km^2 (7,866 mi^2) in area and encompasses 144 km (89mi) of oceanfront shoreline in Maryland, Delaware, Virginia, and New Jersey. Approximately 4,574 km^2 (1,766 mi^2) (22 percent) of the area is landward of the shoreline (henceforth: the shoreward study area). The balance is area within the Atlantic Ocean (Figure 3). The VSA includes portions of the counties and communities listed in Table .

Table 3-1. Cities and Towns within the Visual Study Area

Name	County
Delaware	
Bethany Beach*	Sussex
Bethel	Sussex
Blades	Kent/Sussex
Dagsboro	Sussex
Delmar	Sussex
Dewey Beach*	Sussex
Ellendale	Sussex
Fenwick Island*	Sussex
Frankford	Sussex
Georgetown	Sussex
Henlopen Acres*	Sussex

Name	County
Laurel	Sussex
Lewes	Sussex
Milford	Kent/Sussex
Millsboro	Sussex
Millville	Sussex
Milton	Sussex
Ocean View	Sussex
Rehoboth Beach*	Sussex
Seaford	Kent/Sussex
Selbyville	Sussex
Slaughter Beach	Sussex
South Bethany*	Sussex
Maryland	
Berlin	Worcester
Delmar	Wicomico
Fruitland	Wicomico
Ocean City*	Worcester
Pittsville	Wicomico
Pocomoke City	Worcester
Salisbury	Wicomico
Snow Hill	Worcester
Willards	Worcester
New Jersey	
Avalon Borough*	Cape May
Cape May City*	Cape May
Cape May Point (Borough)*	Cape May
Lower Township*	Cape May
Middle Township	Cape May
North Wildwood City*	Cape May

Name	County
Stone Harbor (Borough)*	Cape May
West Cape May (Borough)	Cape May
West Wildwood (Borough)	Cape May
Wildwood City*	Cape May
Wildwood Crest (Borough)*	Cape May
Virginia	
Chincoteague*	Accomack

**Indicates coastal municipality*

Within the VSA, Project visibility in the communities listed above is most prevalent in the coastal cities and towns on the immediate Atlantic shoreline. Throughout the VSA, visibility can be restricted by intervening terrain, vegetation, man-made structures, and by atmospheric conditions. Meteorological conditions such as rain, fog, or haze have the potential to reduce the visual threshold distance dramatically, even for objects directly in the viewer's line of sight. Appendix D includes a detailed analysis of the annual and seasonal frequency of such conditions and the impact of such meteorological conditions on visibility.

3.2 Existing Policies and Regulations

In addition to federal regulation, states, municipalities, and localities have developed regulations and policies to conserve scenic and visual resource values in particular locations or related to specific resources such as parks or cultural resources. At the time of this submission, none of the states within the VSA, Delaware, Maryland, New Jersey, and Virginia, have regulations specifically related to the visual effects of offshore wind turbines. Zoning laws in multiple counties have regulations for small and/or large wind energy systems on land, which have not been included here due to the offshore location of the proposed WTGs. Table 3-2 below summarizes the current existing regulations and policies relating to visual and scenic resources.

Table 3-2. Existing Regulations Related to Visual Character

Regulation or Policy	Description	Applicability
Delaware		
Coastal Management Program *(Certification included as COP Volume II Appendix II-M2)*	Policy 5.4.22.3: The DNREC shall consider the public interest in any proposed activity which might affect the use of subaqueous lands, which includes: The potential effect on the public with respect to commerce, navigation, recreation, aesthetic enjoyment, natural resources and other uses of the subaqueous lands.	This policy is applicable to the Visual Impact Assessment of the Project, as the Project proposes a use of subaqueous land. However, any subaqueous effects from the Project would be temporary during construction, as all permanent subaqueous Project components within Delaware waters would be buried under the seafloor, bay bottom, or river bottom. Visual impacts to Delaware lands are discussed in Section 4.0.
	Policy 5.5.1: State public lands shall be protected to preserve the scenic, historic, scientific, prehistoric and wildlife values of such areas.	This policy is applicable to the Visual Impact Assessment of the Project, as the scenic values of state public lands (i.e., Delaware Seashore State Park) may be affected by the Project. Historic resources, with respect to visual effects, are discussed in the HRVEA. State public lands are discussed in Section 3.6. Visual impacts to Delaware lands are discussed in Section 4.0.
Delaware Byways Program. Delaware Code, Chapter 1, Title 17, Chapter 1, Subchapter VI.	Protect scenic, historical, natural, archaeological and cultural resources in areas adjacent to the highway. § 191(6)	This policy is applicable to the Visual Impact Assessment of the Project, as the scenic resources adjacent to Delaware Byways (i.e., Delaware Bayshore Bay Byway, the historic Lewes Byway) may be impacted by the Project. Historic resources, with respect to visual, are discussed in the HRVEA. Visual impacts to Delaware lands are discussed in Section 4.0.

Regulation or Policy	Description	Applicability
Maryland		
Coastal Zone Management Program *(Certification included as COP Volume II Appendix II-M1)*	Quality of Life Policy 4 – Protection of State Lands & Cultural Resources. The safety, order, and natural beauty of State parks and forests, State reserves, scenic preserves, parkways, historical monuments and recreational areas shall be preserved. DNR (B1) Md. Code. Ann., Nat. Res. § 5-209.	This policy is applicable to the Visual Impact Assessment of the Project, as the natural beauty of State parks and forests, State reserves, scenic preserves, parkways, historical monuments and/or recreational areas (i.e., Ocean City boardwalk and beaches) may be affected by the Project. Historic resources, with respect to visual effects, are discussed in the HRVEA. State public lands are discussed in Section 3.6. Visual impacts to Maryland lands are discussed in Section 4.0.
	Quality of Life Core Policy 5: The natural character and scenic value of a river or waterway must be given full consideration before the development of any water or related land resources including construction of improvements, diversions, roadways, crossings, or channelization. MDE/DNR (C7) Md. Code Ann., Nat. Res. § 8-405; COMAR 26.17.04.11.	This policy is applicable to the Visual Impact Assessment of the Project, as the Project proposes a development of water resources which may affect scenic value. Visual impacts to Maryland lands are discussed in Section 4.0.
	Quality of Life Core Policy 8: Activities which will adversely affect the integrity and natural character of Assateague Island will be inconsistent with the State's Coastal Management Program and will be prohibited. MDE/DNR (B1) Md. Code. Ann., Nat. Res. §§ 5-209, 8-1102.	This policy is applicable to the Visual Impact Assessment of the Project, as the natural character of Assateague Island may be impacted by the Project. Visual impacts to Maryland lands, including a direct evaluation of impacts to Assateague Island, are discussed in Section 4.0.

Regulation or Policy	Description	Applicability
Maryland Scenic Byways Program (MDDOT SHA n.d.)	To enhance the quality of life and pride in local communities and visitor appeal by identifying and promoting, as well as encouraging the responsible management and preservation of the state's most scenic, cultural and historic roads and surrounding resources.	This policy is applicable to the Visual Impact Assessment of the Project, as the visual landscape of Maryland Scenic Byways may be affected by the Project (i.e., Cape to Cape Scenic Byway). Historic resources, with respect to visual, are discussed in the HRVEA. Visual impacts to Maryland lands are discussed in Section 4.0.
New Jersey		
Cape May County. Article VII Historic Preservation Districts. § 525-39F	Windmills and wind turbines that affect historic sites outside of historic districts must follow the standards adopted by the Historic Preservation Community under Ord. No. 335-2017.	This policy is applicable to the Visual Impact Assessment of the Project, as the visual landscape of historic sites outside of historic districts (i.e., Cape May Lighthouse, Brandywine Shoal Light, Wildwood Boardwalk, and Battery 223) may be affected by the Project. Historic resources, with respect to visual effects, are discussed in the HRVEA.
New Jersey Scenic Byways Program (NJDOT 2013)	The program encourages land uses that complement the state's most scenic, cultural and historic roads, and surrounding landscapes.	This policy is applicable to the Visual Impact Assessment of the Project, as the Project proposes a use of land that may impact the visual surroundings of New Jersey Scenic Byways (i.e., Bayshore Heritage Scenic Byway). Historic resources, with respect to visual, are discussed in the HRVEA. Visual impacts to New Jersey lands are discussed in Section 4.0.
Virginia		
Virginia Outdoors Plan 2018 (VA DCR 2018)	Chapter 10, entitled "Scenic Resources," discusses initiatives and recommendations to protect, manage, and recognize the scenic resources of Virginia.	This policy is applicable to the Visual Impact Assessment of the Project, as scenic resources may be affected by the Project. State public lands are discussed in Section 3.6. Visual impacts to Virginia lands are discussed in Section 4.0.

Regulation or Policy	Description	Applicability
State Scenic Highway and Virginia Byways (VDOT 2022)	A Scenic Highway is a highway with a protected scenic corridor located, designed, and constructed in a manner to preserve and enhance the natural beauty and cultural value of the countryside. A Scenic Byway is a road having relatively high aesthetic or cultural value, leading to or within areas of historical, natural or recreational significance.	This policy is potentially applicable to the Visual Impact Assessment of the Project. However, no designated VA Scenic Highways or Virginia Byways are located within the VSA of the Project.
Virginia Scenic Rivers Act of 1970, §10.1-400; Virginia Scenic Rivers Program (VA DCR, n.d.)	Virginia Scenic Rivers Program's intent is to identify, designate, and help protect rivers and streams that possess outstanding scenic, recreational, historic and natural characteristics of statewide significance for future generations. A Scenic River is a section, portion, or the entirety of a river that possesses superior natural and scenic beauty, fish and wildlife, and historic, recreational, geologic, cultural, and other assets. The Scenic River Advisory Committee may consider and comment on any federal, state, or local governmental plans to approve, license, fund, or construct facilities that would alter any of the assets that qualified the river for scenic designation.	This policy is potentially applicable to the Visual Impact Assessment of the Project, as the Project proposes a facility that may impact the visual surroundings and scenic landscape of waterways. However, no designated Virginia Scenic Rivers are located within the VSA of the Project.

Regulation or Policy	Description	Applicability
Federal		
OCS Renewable Energy Program/ National Environmental Policy Act	30 CFR 585.627: Under the Energy Policy Act of 2005, Section 338, BOEM has regulatory authority for the development of offshore wind, including issuing leases and easements for wind projects. VIA can be required by BOEM as part of the COP for Archaeological Resources and Social and Economic Resources impact analysis and for NEPA review.	This Act applies to all OCS wind activities for which a COP is required by BOEM.
Section 106: National Historic Preservation Act of 1966	30 CFR 800.5 (a)(1)(v): Assessment of Adverse Effects: An example of an adverse effect is the introduction of visual elements that diminish the integrity of the site's historic features.	This Act applies to the Project, since the turbines will be new visual elements introduced into the viewshed of historic properties. Historic resources, with respect to visual, are discussed in the HRVEA.
National Parks Service Night Skies Program (NPs 2023)	The National Parks Service recognizes the importance of natural lightscapes and seeks to preserve these natural and cultural resources.	The turbines will be lighted according to FAA, USCG, and BOEM guidance, which will affect natural lightscapes. The Project proposes to use ADLS (as stated in Section 2.5) reduce impacts to the night sky.

3.3 User Groups

Viewer sensitivity was established by identifying specific user groups within the VSA that are most likely to observe changes within the surrounding landscape and seascape. User groups were divided into five categories and are described below. Provided descriptions of sensitivity as high, medium, or low are relative to the other user groups and are based on the differences in familiarity with existing views and activities within the VSA, understanding that sensitivity can also vary due to proximity to shore and intervening terrain or objects. Viewers with higher sensitivity are more aware of existing views and more likely to perceive subtle movement or change to landscape. Viewers with lower sensitivity may be less familiar with existing views or are engaged in activities that do not involve careful observation of the horizon or seascape.

Viewer opinion concerning the Project is subjective and may not be easily determined. For example, a user standing on the beach on a clear day would have an unobstructed view of the Project, but three different users could respond differently. One user may not care that the Project is present in their line of sight and ignore it. This would signify a less significant change in how they view the landscape, or their landscape experience. A second user may be concerned that there are man-made turbines visible on the open ocean. A third user may be in awe of the turbines and their role in renewable energy. These latter two users with stronger opinions regarding offshore wind would undergo a major change in their landscape experience, but in either a positive or negative way. Public scoping comments for the Project were accepted in June and July 2022. Commenters demonstrated a range of opinions, expressing both negative and positive sensitivities towards the visual effects of development of the Project. Some commenters stated their opinions that the Project would destroy the natural viewshed, while others stated that the Project would be a welcome addition to a landscape already impacted by many human activities (BOEM 2022).

3.3.1 Commuters and Through-Travelers

Commuters and through-travelers are viewers in vehicles who are typically passing through or within an area to reach a destination with only the occasional opportunity to view the landscape and seascape. Drivers would be more focused on the roadway conditions and surroundings in the direction of travel but may occasionally glance at the rest of the surrounding landscape. Passengers are more likely to view their surroundings than drivers as they are not focused on the act of driving. The views available to drivers and passengers can be obstructed by other cars, buildings, infrastructure, vegetation, and weather. This depends on which roadway the user group is utilizing to reach their destination. If the user is passing through a state park or a similar undeveloped area (i.e., Delaware Seashore State Park), there may be an unobstructed view of the Project for a period of time. If the user is passing through an urban center (i.e., along Route 1 in Ocean City, Maryland), the view of the Project would be blocked by existing buildings.

Project visibility would vary for drivers and passengers in this user group. Drivers would not have extended unobstructed views of the Project. Passengers could have temporary unobstructed views in the direction of the Project, depending on the location of the road, either inland or coastal, respectively, and the potential obstructions along the roadway. Passengers are more likely than drivers to have the opportunity for an extended, close viewing of the landscape. However, passengers may not be able to focus in the direction of the Project long enough for it to be visible because they are in a moving vehicle. The low visibility for both drivers and passengers would result in a minor change to their landscape experience. Therefore, the overall sensitivity of commuters and through-travelers would likely be low.

3.3.2 Local Residents

Local residents are viewers who live, work, and recreate within the VSA. Residents could view the landscape from potentially anywhere within the VSA at a given time. This can include but is not limited to homes, neighborhoods, workplaces, town centers, parks, and waterways. As a result, residents could be anywhere from on the water in the immediate vicinity of the Project, to well inland with no view of the ocean, or in between, with limited or partial views of the ocean or the Project area.

Project visibility for these users would vary depending on the location of the viewer when looking in the direction of the Project. Local residents several miles inland from the coast (e.g., Salisbury, Maryland), would have no visibility unless they focused in the direction of the Project for an extended period of time. Local residents on the water in oceangoing vessels in the immediate vicinity of the Project or those on the waterfront (e.g., standing on the Ocean City beach or boardwalk) would experience high levels of visibility, as the Project would dominate their view. A viewer one block away from the ocean may be able to see the Project clearly from a certain angle but views may be occupied by buildings, telephone poles, or other objects in the foreground with a more dominant visual presence than the distant WTGs. Variation in Project visibility would result in either a minor or major change to the user groups landscape experience.

3.3.3 Business Employees

Business employees are viewers who work within the VSA. This user group can encompass many different types of employees, including maritime industry employees, office workers, tourism employees, agricultural workers, commercial workers, and retail workers. The maritime industry employees are discussed in more detail below as a separate user group. In traveling to their place of work, business employees would have limited but occasional chances to view the landscape during their commute. Office workers working within an office building would be focused on work activities and have limited views of adjacent buildings, parking lots, roads, cars, and the occasional landscaped shrubbery. Employees in the coastal tourism industry (e.g., restaurant staff, hotel staff, tour guides) would also be focused on work activities but would likely have more opportunities to view the landscape unobstructed since these businesses are catering to tourists who want the best views possible. Employees within this industry would only be present in significant numbers during the summer season. Agricultural workers would usually be outside in an unobstructed landscape but would be focused on work activities and not the surrounding area. Both commercial and retail workers would likely be inside buildings focused on work activities, but those working in businesses located immediately on the coast would have more opportunities to view an unobstructed landscape (e.g., Ocean City or Bethany Beach boardwalks).

Project visibility rating would vary depending on the users' place of employment. Agricultural workers would likely not have any project visibility, since most agricultural areas within the VSA are not along the coast and therefore the Project would rarely be visible to them (see Section 3.4). Office, commercial, and retail workers would likely have no visibility of the Project unless focused in the direction or the Project Area for an extended period of time. However, depending on the buildings' proximity to the coast and building height, these workers may have an unobstructed view of the Project area. Employees in the coastal tourism industry would also have opportunity to view the Project from a coastally located building. This variation in Project visibility would result in either a minor or major change to the user groups landscape experience. Therefore, the sensitivity of business employees would range from low to high based on from where they are viewing the Project.

3.3.4 Recreational Users

Recreational users are viewers, both locals and tourists, who travel to an area for leisure, which could occur anywhere within the VSA. Users could be undertaking a variety of activities, including but not limited to hiking, biking, fishing, boating, swimming, taking in the scenery, looking for wildlife or enjoying a landscape (e.g., Delaware Seashore State Park, Cape Henlopen State Park, numerous private beaches). Activities such as fishing, boating, and swimming may take place near shore at coastal beaches or offshore from a personal vessel. Other users may be visiting restaurants for a meal, shopping, attending concerts, or other nighttime-based activities (e.g., Ocean City boardwalk). Based on the activity, users may or may not have an unobstructed view of the Project area. For example, a user hiking in a state forest (e.g., Redden State Forest in Delaware) would be unlikely to see the Project area while a boater on the Delaware or Maryland coast or offshore would have a relatively unobstructed view.

Project visibility ratings for recreational users would vary depending on the users' location. Users located at inland locations may be focused on the landscape but would be far away from the Project with a variety of obstructions between them and the Project Area. Users located on the water near coastal beaches would have an unobstructed view of the Project, however it would be in the background. For users located on the water on the Atlantic Outer Continental Shelf in the immediate vicinity of the Project, the Project would be the dominant feature on the landscape. It is possible that some users would seek out the Project as a tourist attraction. This variation in Project visibility would result in either a minor or major change to the user groups landscape experience. Therefore, the sensitivity of recreational users would range from low to high based on from where they are viewing the Project within the VSA.

3.3.5 Maritime Industry Users

Maritime industry users are viewers who earn a livelihood offshore on the Atlantic Ocean, including commercial fishers, vessel crews, and other offshore workers. These users would be able to view the landscape and the Project from a nearby location, likely adjacent to or in the immediate vicinity of the Project on the Outer Continental Shelf. Obstructions would result mostly from weather (e.g., fog, mist, heavy rain) or large vessels such as tankers or container ships in the direct line of sight rather than from distance from the Project. These users may also view the landscape from a coastal location, such as a local marina, dock, or pier (e.g., within Ocean City Harbor or Indian River Bay).

Project visibility rating for this user group would vary based on the activity of the user at a given time. As stated above, the main obstructions for those working directly on the Atlantic Ocean would be weather related or due to other vessels. For those users transiting offshore from land, the Project would be the dominant feature on the landscape. It is likely that a user actively working (i.e., oriented towards the water's surface pulling in crab pots, loading passengers at a pier, unloading catch, work on or around the dock) would be less sensitive than a user transiting between locations, focusing on the landscape to reach their destination. A user actively engaged in working would have less opportunity to view the Project. Sensitivity for this user group would therefore range from low to high.

3.4 Landscape/Seascape Character and Visual Setting

To quantify the visual impact a project may have on a VSA, it is helpful to delineate and define the various character defining zones within the VSA. Landscape Similarity Zones (LSZs) are defined as homogeneous geographic areas that exhibit similar vegetation, topography, water resources, and land use patterns, contributing to a similar sense of place and visual character throughout. Established visual assessment methodologies (Smardon 1988), such as the use of regional and local knowledge, field observations, and Geographic Information System (GIS) analysis of the U.S. Geological Survey (USGS) National Land Cover Dataset (USGS 2019), were accessed to assist in identifying LSZs within the VSA.

The National Land Cover Database (NLCD) served as the basis for this analysis. Because land cover refers to the actual surface cover of the earth, it is typically analyzed using remote-sensing, or spatial analysis. The NLCD classification system was developed using impervious threshold values resulting from Percent Developed Imperviousness and Percent Imperviousness Change Analysis based on a series of remote-sensing data. The resulting values were hand edited using high resolution National Aerial Imagery Program (NAIP) Imagery to reduce omission and commission error. In total, there are eight (8) NLCD Classes that are further categorized into 21 unique classification descriptions, or values (MRLC 2019).

The Project VSA includes 19 unique NLCD classification descriptions or values. Because land cover, when combined with field observations and regional knowledge, can be used to infer land use, TRC was able to delineate ten (10) distinct LSZs within the VSA. The LSZs identified within the study area are illustrated in Figure 4, Overview of Landscape Similarity Zones, and in detail in Figure 5, Landscape Similarity Zones.

Table 3-4, *Prevalence of Landscape Similarity Zones within the Visual Study Area*, provides an outline of the NLCD descriptions within each LSZ and provides an estimate of the area and percentage of each NCLD class within the VSA. Table 3-5, *Prevalence of Landscape Similarity Zones within the Shoreward Visual Study Area*, provides an outline of the NLCD descriptions within the shoreward portion of the visual study area. Each of these LSZs is described below. Both potential visibility and sensitivity to visual change varies greatly between each LSZ and slightly within each LSZ, as described below.

The LSZ information included in Figures 4 and 5 and in Tables 3-4 and 3-5 use the LSZ information as defined by USGS NLCD. The classification of landscape and seascape areas in the following sections and in Section 4.2 have been modified based on the guidance outlined in the *Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States* (BOEM 2021b).

3.4.1 Atlantic Ocean

The most prominent cover type within the VSA is open water. Open water covers approximately 80.4 percent of the 69-kilometer (43-mile) VSA and includes two distinct LSZs, one of which is the Atlantic Ocean LSZ. The Atlantic Ocean LSZ makes up approximately 77.6 percent of the total VSA, extending from waters offshore southern New Jersey as far south as northern Virginia, and is primarily used by maritime industry users and recreational boaters. Views in this LSZ are almost entirely unobstructed except by large waves, buoys, weather conditions, or other vessels. The character of this LSZ is defined by expansive views of open water in all directions, with some artificial and natural shorefront elements such as piers, jetties, buildings, dunes, and forests visible when looking toward shore. The Ocean City Pier (prevalent in the simulation for the Ocean City Boardwalk KOP) is an important tourist attraction and recreation area as part of the larger Ocean City Boardwalk. Other KOPs, including the Indian River Lifesaving Station, the Cape May Lighthouse, and Fort Miles, are important aspects of the maritime history of the area and are also areas that experience high tourism as a result. The Indian River Inlet and the Ocean City Inlet, both adjacent to KOPs, are areas of high recreational vessel use for access to both nearshore waters and to the Atlantic Ocean. The entrance to Delaware Bay, adjacent to Fort Miles and Cape May, is an area of high recreational and commercial vessel traffic (Figure 3-1).

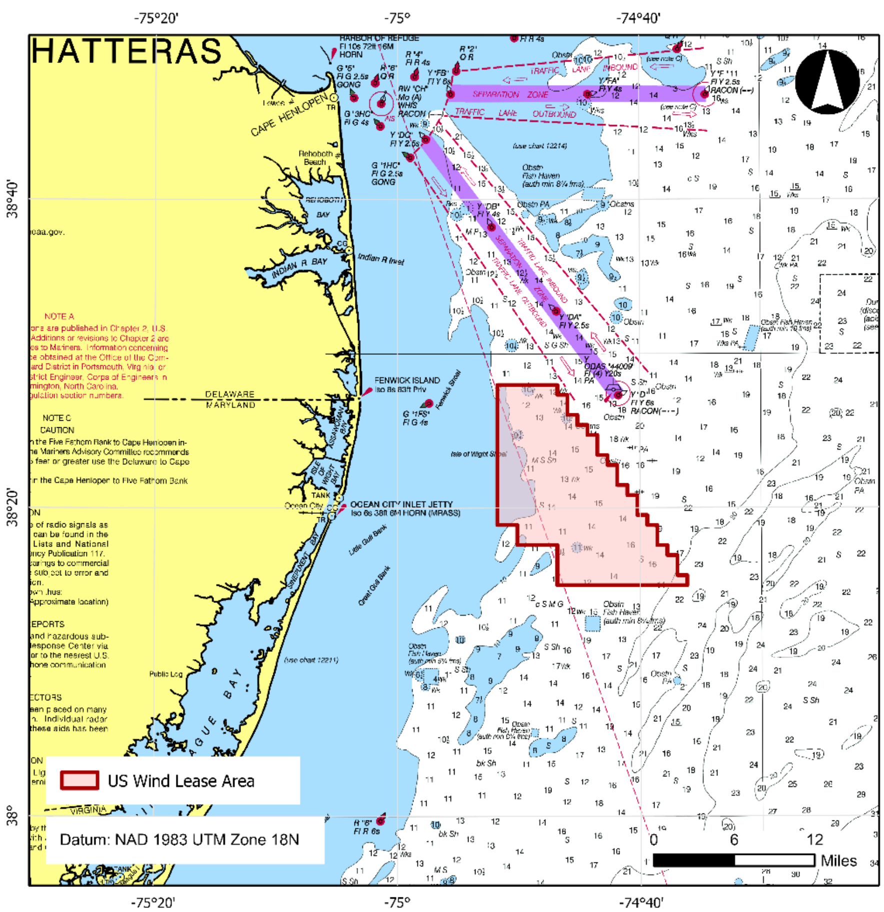

Figure 3-1. Traffic Separation Scheme

The prominence of natural and artificial elements as compared to the open water depends mainly on the distance from the viewer to the shore. New visual elements introduced within the Atlantic Ocean LSZ would contribute to a significant change to the visual character of the immediately surrounding area. The ocean is an area of high sensitivity to visual change due to the uniformity of visual elements (sea and sky, primarily). The majority of the proposed Project, including all WTGs and OSSs, would be located within the Atlantic Ocean.

No KOPs are located within the Atlantic Ocean, although all photosimulation KOPs contain some representation of this LSZ.

3.4.2 Inland Bays, Lakes, and Ponds

Open water within the shoreward study area includes inland bays, lakes, and ponds. This second open water LSZ excludes the Atlantic Ocean beyond the barrier islands of Maryland and Delaware and covers approximately 12.7 percent of the shoreward VSA. Extensive inland bays exist along the Delaware and Maryland coastline, including parts of Delaware Bay, Rehoboth Bay, Indian River Bay, Assawoman Bay, Isle of Wight Bay, and Chincoteague Bay. The inland bays are considered important natural resource areas and are adjacent to or overlap many conservation areas, specifically Sinepunxet Bay Wildlife Management Area, Assawoman Wildlife Area, Assateague Island National Seashore, Wallops Island and Chincoteague National Wildlife Refuges, among others, which can be important areas of local recreation and tourism.

Users in this landscape zone include local residents, some maritime industry users (e.g., commercial fishers and charter boat crews), and recreational boaters. These users' activities may include transiting to and from the ocean or other adjacent waterbodies, fishing, hunting, and birdwatching.

Expansive views are typically available from open water locations, similar to the Atlantic Ocean character area, but with increased presence of onshore visual elements located along closer shorelines of the mainland and barrier islands. Views of the Atlantic Ocean, where available, are often framed by human developments along the intervening shoreline, like residences, high-rise buildings, utility structures (water towers, transmission towers/lines), and bridges/causeways.

Due to these expansive views and the mostly natural character of the LSZ, this LSZ can have a variable sensitivity to visual change, depending on the evidence of human development visible. Many publicly accessible areas within this LSZ include human developments like marinas and housing developments. Inland bays shoreward of heavily developed areas like Ocean City and Rehoboth Beach will have views of extensive commercial development along the shore. Inland bays shoreward of undeveloped areas like Assateague Island or Delaware National Seashore will have much less obstructed views and therefore higher sensitivity to change in the Project area. The Mansion House NRHP Site and Public Landing is a representative KOP for this LSZ.

3.4.3 Forest and Forested Wetlands

Forest and forested wetlands can be found throughout the shoreward study area and accounts for approximately 37.5 percent of the shoreward VSA. Large concentrations occur within bordering emergent wetlands adjacent to open water areas. These large tracts of forest (e.g., Assawoman Wildlife Area, Redden State Forest) are typically undeveloped but are occasionally interspersed with either agricultural fields or residential developments. These areas can be protected areas, either as wildlife or restoration areas, but can also be sites of recreation. Assawoman Wildlife Area, near Berlin, Delaware, is a popular destination for tourists, who may kayak, crab, fish, or watch for birds in this area (DE State Parks 2023). Assawoman Wildlife Area also serves as protected land for many species in the area, including migratory birds and native species, including the Delmarva fox squirrel (Southern Delaware Tourism 2023). Redden State Forest, located north of Georgetown, Delaware, includes campgrounds and trails for hiking, biking, and horseback riding through forests of predominantly loblolly pine mixed with stands of hardwoods (Delaware Department of Agriculture 2023). An historic lodge, open to public, is available for visitors who wish to stay the night (Delaware Department of Agriculture 2023).

Users within this zone may include recreationists, agricultural workers, business employees, and local residents, and sensitivity to visual change is high in this LSZ due to the generally pristine natural setting. However, exposure to coastal views from forested areas would be minimal, especially as distance increases, due to the high amount of visual screening provided by tall vegetation.

3.4.4 Agricultural Land

Agricultural land (typically associated with production of corn, soybeans, barley, and winter wheat) accounts for approximately 29.1 percent of the shoreward VSA, are concentrated almost entirely along the western portion of the VSA and include large open field lots bordered by mature hedgerows and interspersed with rural residential lots. The user base in agricultural areas would be comprised of agricultural workers, local residents, and business employees. Sensitivity to visual change is low to medium; there is low visual clutter and high uniformity of landscape, but ocean views are not a primary source of scenic value for this LSZ and susceptibility to change would be lowered for users engaged in agricultural work. Land within this zone has little exposure to coastal views and therefore low exposure to visual change within the Project area.

3.4.5 Developed Open Space

Developed open space accounts for approximately 6.0 percent of the shoreward VSA and typically includes golf courses and recreation fields. Specific examples of this LSZ include golf courses such as Peninsula Golf and Country Club in Millsboro, Delaware; Cripple Creek Golf and Country Club, in Dagsboro, Delaware; Eagle's Landing Golf Course and Rum Pointe Seaside Golf Links in Berlin, Maryland; as well as athletic fields like those located at the US Coast Guard Training Center in Cape May, New Jersey. The actual number of open recreation areas is expected to be much lower than suggested by the NLCD data due to the inclusion of expansive road shoulders, residential grass lots, and some roads due to the similar cover types. This zone may be comprised of commuters and through-travelers, recreationists, business employees, and local residents, with views often focused within the zone. In the case of golf courses, the views are generally framed with wood lots or forest to give a pastoral impression, thus expansive views beyond the zone are not typical. Sensitivity to visual change ranges from low to high in this LSZ due to variability in surrounding human development that affects scenic value and the wide range of uses that affect viewer susceptibility.

3.4.6 Wetlands

Wetlands account for approximately 5.1 percent of the shoreward VSA and occur almost entirely along the perimeter of open water portions of the VSA bordering the bays, rivers and tributaries. Wetlands are typically void of any development. Users in this zone would include recreationists, local residents, and possibly maritime industry users. Sensitivity to visual change is high in wetland areas given the pristine natural environment, although low elevations and bordering vegetation typically offer little opportunity for expansive views beyond the LSZ.

The Great Cypress Swamp, located in the southernmost portion of Sussex County, is the largest freshwater wetland and forestland within the State of Delaware (Delaware Wildlands 2023). There is active restoration within the Swamp working to restore native plants and wetland areas, including the Atlantic white cedar and bald cypress (Delaware Wildlands 2023).

3.4.7 Developed Areas

Developed areas of low, medium, and high intensity are contiguous throughout the VSA. The pattern formed by these categories follows typical urban development patterns where there are multiple cores of high intensity development leading to medium and then low intensity development, similar to when an urban area becomes increasingly rural residential as one travels away from the center. In the VSA, the high intensity areas are generally clustered along the outer beaches (Ocean City and Bethany Beach) and with less development extending to the west. Along major road routes, such as Route 28 in Bethany Beach and Route 20 in Fenwick Island, some pockets of high intensity development are surrounded by medium and low intensity development. There are also areas of high intensity development in Cape May and Wildwood, New Jersey, at the outer edge of the VSA. Together these developed areas make up approximately 8.1 percent of the shoreward VSA. Sensitivity to visual change in the Project area generally varies from low to medium within these areas, increasing to high sensitivity for developed areas with direct sightlines to the ocean and for areas with historical significance (detailed in Section 3.5), regardless of development density.

3.4.7.1 Rural Residential Development

Low density developed areas include rural residential areas (mostly across inland Delaware and Maryland), state parks, coastal beaches, and some historic districts. Users here would include residents, business employees, agricultural workers, and recreationists. Scenic value is medium to high and is driven by seascape view particularly in oceanfront or bayfront residential areas and by historical significance in select areas. Users have medium to high susceptibility as they are more likely to be at home or sightseeing than working. Inland residential development has a lower sensitivity to changes within the ocean LSZ, as views of the seascape are already more limited to gaps between other structures or roadway corridors and are not as intrinsic to the scenic value of the properties.

3.4.7.2 Urban Fringe

Medium density developed areas are primarily located adjacent to popular oceanfront destinations (West Ocean City, areas inland of Bethany and Rehoboth Beaches in Delaware), and include suburban commercial, village urban centers, coastal beach front residential, and some historic districts (Fort Miles Historic District and Wildwood Shore Resort Historic District). Users here include business employees, local residents, and occasionally recreationists. Oceanfront and bayfront residential or commercial tourism properties have scenic value based on views of the nearby seascape that may be diminished with increasing magnitudes of visual change.

3.4.7.3 Commercial and Industrial Centers

High intensity developed areas like Ocean City, Maryland and Wildwood, New Jersey include urban centers, industrial or public works infrastructure, and mixed-use areas, typically with industrial and commercial development. More retail and commercial uses than industrial development occur in the VSA due to the coastal location. Users in these areas would include residents, workers, and recreationists. Urban centers, industrial, and inland commercial zones have limited views of the seascape, often partially obstructed by multi-story buildings or distracted by visual clutter or an abundance of visual interest within the zone itself. Exposure to expansive ocean views is limited to unobstructed shore-facing development, particularly from upper floors, decks, and balconies overlooking the ocean.

3.4.8 Beaches

Beaches account for approximately 0.7 percent of the shoreward VSA. Beaches are located along the entire Atlantic Ocean shorefront of the VSA and vary in width depending on the proximity of development. Beach areas are the recreational draw for much of the VSA and are the most exposed to ocean views, which represent a defining characteristic of this LSZ, along with vegetated dunes, open sandy beaches, and piers or shorefront buildings in some areas. Popular beaches for tourism and recreation have significant adjacent commercial development (boardwalks, hotels, restaurants, etc.) and include Wildwood Beach and Cape May Beach in New Jersey, Bethany Beach and Rehoboth Beach in Delaware, and Ocean City Beach in Maryland. Ocean City Beach is the closest example of the beach LSZ to the project area and is approximately 10 miles in length, directly west of the proposed WTGs. Nearly the entire length of Ocean City Beach is heavily developed, with hotels, condominiums, restaurants, and boardwalks.

Several beaches in the VSA include more shorefront residential development, such as Dewey Beach and South Bethany Beach in Delaware. Many beaches in the VSA are almost entirely undeveloped due to designations as state parks or conservation areas for the protection of threatened and endangered migratory birds and shore birds. These include Cape Henlopen, Delaware Seashore State Park and Fenwick Island State Park in Delaware, and nearly all of 37-mile-long Assateague Island in Maryland and Virginia. Historic sites are scattered across many of these beaches, notably including Fort Miles in Cape Henlopen State Park, the Indian River Lifesaving Station south of Rehoboth Beach, and World War II observation towers in Cape Henlopen State Park, Delaware Seashore State Park, and Fenwick Island State Park.

Predominant users in this zone would include local residents and recreationists engaged in a variety of activities including walking, sunbathing, swimming, birding, and fishing. Although this LSZ is a relatively small area, it is more closely located to the Project area than the other LSZs and offers high exposure to expansive (typically 180-degree), uninterrupted views of the ocean LSZ along the coast. Beaches, especially when visitation is lower, generally have high sensitivity to visual change due to the mostly pristine natural setting, uniformity of visual elements and lack of focal points or competing visual elements in the direction of the ocean.

3.4.9 Low Vegetation

Scrub/shrub and grassland areas were combined in this analysis and account for approximately 0.7 percent of the shoreward VSA. The difference between the two land cover types is based on vegetation height, but neither class is likely to obstruct visibility. Users likely found in this zone would be recreationists, local residents, and possibly agricultural workers. This landscape zone is scattered throughout the VSA. Sensitivity to visual change is medium to high in this LSZ given the natural environment, unobstructed views, and likely activities of users, although access can be limited due to lack of surrounding infrastructure or conservation regulation that restricts visitation.

Appendix C includes a photo log of representative LSZs found within the VSA. Table 3-3 summarizes these LSZs, including key visual elements, likely visibility of the Project Area, and estimated sensitivity to visual change.

Table 3-3. Landscape Similarity Zones Summary

Landscape Similarity Zone	Key Elements	Sensitivity to Change
Atlantic Ocean	Expansive unobstructed views over water, vessels and wave activity	High
Inland Bays, Lakes, and Ponds	Partial views over water, barrier islands, vessel activity	High
Forest and Forested Wetlands	Heavily obstructed views, tall vegetation	High
Agricultural Land	Expansive views over uniform landscape, low to medium vegetation and open fields	Low to Medium
Developed Open Space	Expansive views framed by other developed areas or vegetation	Low to High
Wetlands	Low elevations, bordering vegetation, limited access	High
Rural Residential	Partially obstructed views, low density development (1- or 2-story homes)	Medium to High
Urban Fringe	Partially obstructed views, medium-density development (houses, motels, retail, restaurants)	Medium to High
Commercial and Industrial Centers	Heavily obstructed views except on immediate shoreline, high-density development (high-rise condos, hotels, retail along shoreline, commercial/industrial farther inland)	Low to High
Beach	Expansive unobstructed views of the ocean, sandy shoreline and breaking waves, low elevations	High
Low Vegetation	Mostly unobstructed views, shrub/scrub vegetation, limited access	Medium to High

Tables 3-4 and 3-5 include the prevalence of these Landscape Similarity Zones across the overall 43-mile Visual Study Area and across the shoreward VSA (excluding the Atlantic Ocean). Also included in the tables is the area of each LSZ that falls within the potential viewshed of the proposed project to demonstrate how much of each LSZ may be visually affected.

Table 3-4. Prevalence of Landscape Similarity Zones within the Overall Visual Study Area

Landscape Similarity Zone	NLCD Classification	Total Sq. Mi. (%)	Sq. Mi. Visually Affected (%)
Atlantic Ocean		**6,100 (77.6)**	**6,076 (99.6)**
	Open Water	6,100	6,076
Inland Bays, Lakes, and Ponds		**224 (2.8)**	**173 (77.2)**
	Open Water	224	173
Forest and Forested Wetlands		**661 (8.4)**	**2.7 (0.4)**
	Deciduous Forest	29	0.03
	Evergreen Forest	114	0.04
	Mixed Forest	88	0.01
	Woody Wetlands	431	2.6
Agricultural Land		**515 (6.5)**	**13 (2.5)**
	Cultivated Crops	510	13
	Pasture/Hay	4	0.02
Developed Open Space		**106 (1.3)**	**2.1 (2.1)**
	Developed, Open Space	106	2.1
Wetlands		**91 (1.2)**	**40 (44.0)**
	Emergent Herbaceous Wetlands	91	40
Residential		**76 (1.0)**	**2.3 (3.0)**
	Developed, Low Intensity	76	2.3
Urban Fringe		**48 (0.6)**	**2.9 (6.0)**
	Developed, Medium Intensity	48	2.9
High-Density Residential/Commercial		**19 (0.2)**	**1.6 (8.4)**
	Developed, High Intensity	19	1.6
Beach		**13 (0.2)**	**7.8 (60.0)**
	Barren Land (Rock/Sand/Clay)	13	7.8
Low Vegetation		**13 (0.2)**	**0.2 (1.5)**
	Grassland/Herbaceous	5	0.2
	Shrub/Scrub	9	0.1
Grand Total		**7,866**	**6,321 (80.4)**

Table 3-5. Prevalence of Landscape Similarity Zones within the Shoreward Visual Study Area

Landscape Similarity Zone	NLCD Classification	Total Sq. Mi. (%)	Sq. Mi. Visually Affected (%)
Inland Bays, Lakes, and Ponds		**224 (12.7)**	**173 (77.2)**
	Open Water	224	173
Forest and Forested Wetlands		**661 (37.5)**	**2.7 (0.4)**
	Deciduous Forest	29	0.03
	Evergreen Forest	114	0.04
	Mixed Forest	88	0.01
	Woody Wetlands	431	2.6
Agricultural Land		**515 (29.1)**	**13 (2.5)**
	Cultivated Crops	510	13
	Pasture/Hay	4	0.02
Developed Open Space		**106 (6.0)**	**2.1 (2.0)**
	Developed, Open Space	106	2.1
Wetlands		**91 (5.1)**	**40 (44.0)**
	Emergent Herbaceous Wetlands	91	40
Residential		**76 (4.3)**	**2.3 (3.0)**
	Developed, Low Intensity	76	2.3
Urban Fringe		**48 (2.7)**	**2.9 (6.0)**
	Developed, Medium Intensity	48	2.9
High-Density Residential/Commercial		**19 (1.1)**	**1.6 (8.4)**
	Developed, High Intensity	19	1.6
Beach		**13 (0.7)**	**7.8 (60.0)**
	Barren Land (Rock/Sand/Clay)	13	7.8
Low Vegetation		**13 (0.7)**	**0.2 (1.5)**
	Grassland/Herbaceous	5	0.1
	Shrub/Scrub	9	0.1
Grand Total		**1,766**	**245 (13.9)**

3.5 Visually Sensitive Historic Resources

R. Christopher Goodwin & Associates, Inc. (RCG&A) evaluated the potential for visual impacts from the Project on 158 previously recorded historic properties within the APE identified through a progressive program of consultation, archival research, outreach and engagement, windshield survey, field survey, and data analysis, including properties listed on the National Register of Historic Places (NRHP) and properties included in the respective state inventories of the Delaware, New Jersey, Virginia and Maryland State Historic Preservation Offices (SHPOs). The results of this review are detailed in the Historic Resources Visual Effects Analysis (HRVEA) included as COP Appendix II-I3. The HRVEA ultimately identified three historic properties that are potentially subject to visual effects from the Project (Table 3-6).

3.5.1 Recreational

Recreation has been an important part of the economy of the mid-Atlantic region beginning as early as the 1830s. The region served as a seaside retreat destination for wealthy inhabitants of regional cities, like Philadelphia, New York, and Baltimore. The area also became a destination for sport hunting of waterfowl and other coastal birds between the 1890s and 1920s. Recreational resources in this area were created for visitors to enjoy the natural landscape of nearby water bodies, including the Atlantic Ocean, the Cape May, Isle of Wight, and Rehoboth bays. An example of this resource would be beachfront hotels built with beach access and unobscured views.

3.5.2 Maritime

The maritime resources category refers to the numerous facilities along the North Atlantic coastline serving as life-saving stations or lighthouses. These facilities were part of the United States Life Saving Service, which later merged with the Lighthouse Service and the U.S Revenue Service to form the United States Coast Guard (USCG). Maritime resources, like lighthouses, were built to increase the navigational and shoreline safety of those on the Atlantic Ocean and therefore required direct and unobscured views of the ocean.

3.5.3 Residential

Residential resources within the VSA have construction dates ranging from 1792 to 1928. These buildings are typically in rural, urban, or suburban areas and include outbuildings, such as tenant houses, garages, and agricultural support buildings. They typically have driveways and landscaped lawns and vegetation and do not derive their significance from views of the ocean.

3.5.4 Defense Facilities

To protect shipping between Cape May, New Jersey, and Cape Henlopen, Delaware, from enemy fire, leading up to World War II, the Delaware region experienced an expansion in military coastal defense facilities. Typically, they cover hundreds of acres, and some consist of multiple buildings. These facilities required locations along the water and unobscured views of the Atlantic Ocean.

3.5.5 Transportation

One bridge is located within the VSA: the Ocean City Bridge. The bridge carries vehicular and pedestrian across the Sinepuxent Bay between West Ocean City and Ocean City. It uses modern building materials, like steel beams and jointed, concrete construction. As a bridge in a maritime setting, the Ocean City Bridge provides views to the ocean as visitors approach Ocean City.

3.5.6 Agricultural

Agriculture is a major part of the economy in Worcester County, Maryland. Produce has been shipped from the region to urban centers like Baltimore, Norfolk, Washington, D.C., and Philadelphia, via both steamboat service and railroad. This resource type typically does not have a maritime setting or a view of the ocean and often includes agricultural support buildings.

3.5.7 Commercial

Commercial buildings are generally within agricultural settings with no views to the ocean. Built during the twentieth century, they are typically modest rural buildings and built to serve local, rural communities.

3.5.8 Objects

Historic resource objects within the VSA are typically monuments constructed by government entities or cultural groups to memorize historic events or persons. They are located within maritime settings with views to the ocean and vary in height and material, typically made of stone with a placard. These monuments are also typically highly visible on the landscape.

3.5.9 Mixed Use

Mixed use districts are generally related to recreational tourism and have been a significant part of the Mid-Atlantic coastal region's economy. These include numerous hotels and seaside retreats, with access from major cities, such as Philadelphia, Baltimore, and New York aided by the expansion of railroads. Because mixed use districts are tied to recreational tourism directly related to the natural environment, these areas usually have unobstructed views of the Atlantic Ocean or are located very close to the coast with easy access to unobstructed views.

3.5.10 Municipal

Municipal buildings are generally within urban settings with limited views to the ocean. Built during the early twentieth century, they typically exhibit early-twentieth century architectural styles and are prominently sited along major thoroughfares.

3.5.11 Religious

Religious resources are generally located within urban, maritime settings and offer religious services to coastal communities, including the local community and tourists.

Table 3-6. Visually Sensitive Historic Resources[1]

Name	ID	State	Eligibility	Maritime Setting Narrative	Maritime Significance Narrative
Fort Miles Historic District	S06048	Delaware	NRHP	Located east and south of Lewes, Sussex County, Delaware, Fort Miles represents nationally significant trends in federal coastal defense policy, military landscape and post planning, and standardized military architecture. The buildings that support the fortifications represent significant examples of buildings constructed from standard Army plans. Fort Miles is strategically situated at the point where the Delaware Bay and Atlantic Ocean meet at Cape Henlopen, Delaware. Maritime setting and unobstructed ocean views are key to the significance of the property.	The resource is sited strategically at Cape Henlopen for views over the Atlantic Ocean and Delaware Bay. The site yields significance and integrity from its maritime setting and ocean views.
U.S. Coast Guard Tower	WO-347	Maryland	Eligible for the Purposes of the Project	The U.S. Coast Guard Tower is a five-story, braced metal observation tower erected at the south end of Ocean City. The resource was strategically sited at the Ocean City beachfront to support its use as a coast guard facility. The maritime setting and views toward the Atlantic Ocean are key to the significance of the property.	The resource is sited directly on the Ocean City coastline with largely unobstructed views of the Atlantic Ocean. The site yields significance and integrity from its maritime setting and ocean views.
Oceanside North Ocean City Survey District	Pending MIHP Number	Maryland	Recommended Eligible Pending SHPO Concurrence	The Oceanside North Ocean City Survey District is a seasonal community representative of architectural and development trends found along the coastal U.S. The maritime setting, unobstructed views, and access to the Atlantic Ocean are character defining features and key to the significance of the resource.	The resource is sited directly on the Ocean City coastline with largely unobstructed views of the Atlantic Ocean. The site yields significance and integrity from its maritime setting and ocean views.

[1] Preliminary pending completion of the findings and forms from state-level survey in Delaware, Maryland, and New Jersey conducted February-April 2023, which will be reflected in the HRVEA to be submitted by August 15, 2023.

3.6 Visually Sensitive Natural Resources

A visual resource is defined as a natural feature that contributes to the character of a place. These resources might include agriculture, preserves, wildlife management areas, state forests or parks, and national parks. These natural resource areas are likely to have higher sensitivity to visual change due to the regulatory restrictions on use and development that help to maintain the natural setting. Based on publicly available GIS data, resources that fell within the 43-mile VSA are shown in Figure 8. A count of resources that are within the Project viewshed are provided in Table 3-7.

Table 3-7. Visually Sensitive Natural Resources

Resource Type	Number Within Study Area	Number of Locations with WTG Blades Visible	Number of Locations with WTG Nacelle Visible	Number of Locations with OSSs Visible
Agricultural Easement	190	18	3	0
Conservation Easement	70	16	8	0
Educational Land	22	1	0	0
Federal Land	4	1	0	0
Municipal Land	34	9	3	0
Municipal Park	89	14	9	2
National Seashore	1	1	1	1
National Wildlife Refuge	6	5	3	0
Nature Reserve, Preserve, or Sanctuary	27	8	4	0
Other Land	11	5	0	0
Private Conserved Land	199	54	29	8
State Forest	5	1	0	0
State Land	48	13	12	2
State Park	28	15	10	3
Wildlife Management Area	15	5	4	0

3.7 Environmental Justice Areas

Based on the results of the viewshed analysis detailed in Section 4.1.1, Project visibility (based on the blade tip viewshed area) may occur in a total of 29.4 square kilometers (11.3 square miles) across 15 different mapped Environmental Justice communities (defined as being within the 50th percentile or greater for the minority index and/or the low-income index). These areas are shown in Figure 12, Environmental Justice Areas, and include areas of open water and undeveloped land. Additional information on the environmental justice assessment conducted for the Project can be found in Volume II, Section 17.4 of the Construction and Operations Plan.

4.0 Visual Impact Analysis

Visual impact of the Project was analyzed using multiple methods to determine potential visibility and impact to LSZs in general, and specific KOPs to present BOEM with information to assess visual effects. To support the assessment the visual impact of the Project, the visibility of the Project needed to be determined based on the height of the various Project components. A viewshed analysis was created, LSZs in the viewshed were considered, and sites within the viewshed were visited for photo documentation. Some of these sites (KOPs) were selected for the creation of visual simulations. This information was then used to assess the impacts within LSZs and at KOPs.

4.1 Project Visibility

A viewshed analysis, field photo documentation, and visual simulations were completed to identify potential Project visual impacts to the identified resources. The process for completing these analyses and the results of each are presented below.

To aid in assessing the visibility of the Project at different locations, Sullivan et al.'s (2012/2013) visibility rating was used as a reference, summarized below in Table 4-1. Approximate distance threshold ranges associated with each visibility category are provided, specifically pertaining to the proposed activity. Exceptions to these ranges are possible for elevated viewpoints, such as Cape May Lighthouse, which may experience higher potential visibility of WTGs even at increased distances.

Table 4-1. Visibility Ratings and Threshold Distances

Visibility Level	Visibility Rating	Distance Threshold Range
Level 1: Visible only after extended, close viewing; otherwise, invisible	An object/phenomenon that is near the extreme limit of visibility. It could not be seen by a person who was unaware of it in advance and looking for it. Even under those circumstances, the object can be seen only after looking at it closely for an extended period	25-43 miles
Level 2: Visible when scanning in general direction of project; likely to be missed by casual observer	An object/phenomenon that is very small and/or faint, but when the observer is scanning the horizon or looking more closely at an area, can be detected without extended viewing. It could sometimes be	

Visibility Level	Visibility Rating	Distance Threshold Range
	noticed by casual observers; however, most people would not notice it without some active looking.	
Level 3: Visible after brief glance in general direction of project and unlikely to be missed by casual observer	An object/phenomenon that can be easily detected after a brief look and would be visible to most casual observers, but without sufficient size or contrast to compete with major landscape/seascape elements.	15-25 miles
Level 4: Plainly visible and could not be missed by casual observer, but does not strongly attract visual attention, or dominate view, because of apparent size, for views in direction of project	An object/phenomenon that is obvious and with sufficient size or contrast to compete with other landscape/seascape elements, but with insufficient visual contrast to strongly attract visual attention and insufficient size to occupy most of an observer's visual field.	
Level 5: Strongly attracts the visual attention of views in the general direction of the study subject. Attention may be drawn by the strong contrast in form, line, color, or texture, luminance, or motion.	An object/phenomenon that is not large but contrasts with the surrounding landscape elements so strongly that it is a major focus of visual attention, drawing viewer attention immediately and tending to hold that attention. In addition to strong contrasts in form, line, color, and texture, bright light sources such as lighting and reflections! and moving objects associated with the study subject may contribute substantially to drawing viewer attention. The visual prominence of the study subject interferes noticeably with views of nearby landscape/seascape elements.	10-15 miles
Level 6: Dominates view because project fills most of visual field for views in its general direction. Strong contrasts in form, line, color, texture, luminance or motion may contribute to view dominance.	An object/phenomenon with strong visual contrasts that is so large that it occupies most of the visual field, and views of it cannot be avoided except by turning one's head more than 45 degrees from a direct view of the object. The object/phenomenon is the major focus of visual attention, and its large apparent size is a major factor in its view dominance. In addition to size, contrasts in form, line, color, and texture, bright light sources and moving objects associated with the study subject may contribute substantially to drawing viewer attention. The visual prominence of the study subject detracts noticeably from views of other landscape/seascape elements.	

4.1.1 Viewshed Analysis

The viewshed analysis was conducted over the entire VSA for both the maximum blade tip height (286 meters (938 feet) ASL) and for the top of the nacelle (165 meters (541 feet) ASL), which encompasses the FAA navigation lights, to refine the study area to include only those areas that would likely have visibility of the WTGs and to provide a geographic extent of visibility or APE. The viewshed analysis was also conducted for the maximum height of the proposed OSSs at 43 meters (144 feet) for 400MW OSSs and at 39 meters (128 feet) for the 800MW OSS. United States Army Corps of Engineers (USACE) LiDAR elevation data was used to create the Digital Surface Model and Digital Terrain Model where available (primarily in coastal areas, see Figures 6 and 7), and USGS National Elevation dataset was used in all other areas. The overall viewshed is shown in Figure 6, with a detailed view in Figure 7.

According to the results of the viewshed analysis, up to 80.1 percent of the overall VSA has potential turbine blade visibility. The majority of the total visible area (over 98%) consists of the 14,143 square kilometers (5,461 square miles) of open ocean seaward of the Atlantic coast. The remainder of the visible area is the shoreward VSA. Potential turbine blade and nacelle visibility occur in approximately 7.1 percent and 4.0 percent, respectively, of the shoreward VSA. This visibility is concentrated along the entire shoreline, but in places such as Ocean City and Bethany Beach, the first row of buildings tends to block views from locations further inland (Figure 7). The locations of the historic resources listed in Table 3-6 in relation to the Landscape Similarity Zones and potential project visibility can be found in Figure 5.

Being within the Project viewshed is not synonymous with Project visibility. This area represents the maximum possible extent of project visibility based on available data and maximum model resolution limitations. Areas identified as visible in viewshed mapping do not necessarily have clear views of the entire Project and may only provide partially obstructed views of one turbine or intermittently visible blades as they rotate. Furthermore, areas of actual visibility are anticipated to be additionally limited by screening from intervening vegetation and smaller structures not large enough to be accounted for in the viewshed analysis. Actual visibility also depends on weather and lighting conditions, which is especially prevalent when seaward objects are greater than 16 kilometers (10 miles) from the viewer.

Figure 10 displays the viewshed for the onshore substation. Most of this area is covered in vegetation, preventing a direct view of the ground-level substation components (transformers, circuit breakers, control buildings, etc.) except immediately to the south along the access road and from some parts of Indian River Bay to the northeast. The tallest substation component will be the lightning protection poles, which will be visible above existing vegetation from most directions, as shown in the viewshed map in Figures 10 and 11.

Table 4-2 breaks down the viewshed areas by distance from the WTGs, which illustrates that a significant portion of the area of potential visibility occurs beyond 20 miles from the WTGs, increasing the likelihood that intervening terrain, vegetation, or structures would obstruct views of the WTGs and decreasing the visual prominence of any WTGs that are visible.

Table 4-2. Shoreward Study Area Land Area Viewshed Results Summary

	69-kilometer (43-mile) Radius Study Area			
Distance from Project Area	**Turbine Blade Visible**	**Turbine Nacelle Visible**	**OSS Visible**	**Total Shoreward Area**
0-10 miles	N/A	N/A	N/A	N/A

	69-kilometer (43-mile) Radius Study Area			
Distance from Project Area	**Turbine Blade Visible**	**Turbine Nacelle Visible**	**OSS Visible**	**Total Shoreward Area**
10-20 miles	33% 74.1 sq. mi (192.0 sq. km)	24% 54.3 sq. mi (140.6 sq. km)	1% 2.3 sq mi (6.0 sq km)	223 sq mi (579 sq km)
20-30 miles	17% 86.4 sq. mi (223.7 sq. km)	12% 63.6 sq. mi (164.8 sq. km)	N/A	517 sq mi (1,338 sq km)
30-40 miles	9% 70.1 sq. mi (181.7 sq. km)	3% 21.9 sq. mi (0.1 sq. km)	N/A	750 sq mi (1,942 sq km)
40-43 miles	5% 14.7 sq mi (38.1 sq km)	<1% 0.1 sq mi (0.2 sq km)	N/A	276 sq mi (716 sq km)
Total 43-Mile Study Area	14% 245.4 sq. mi (635.6 sq. km)	8% 139.9 sq. mi (362.2 sq. km)	<1% 2.3 sq mi (6.0 sq km)	1,766 sq mi (4574 sq km)

4.1.2 Field Photo Documentation

During March 2016, August 2021, and March 2023, visual impact assessment experts (Gordon Perkins and Matt Robertson, formerly of ESS Group, Inc. and Scott Dehainaut, Mike Ernsting, and Tierney Latham of TRC) visited the Project study area in order to document views in the direction of the PDE. Weather conditions varied between partly cloudy and clear, with maximum practical effort made to collect photography while weather and visibility was ideal for maximum viewing distance.

A total of 26 locations were photographed during daylight using a full frame digital SLR camera with a 50mm lens to document the existing views. The camera was mounted on a tripod for stability and camera height and GPS position were recorded at each photo location. Table 4-3 lists the visual resources that were photographed at the 26 locations. Appendix B contains a Photo Log of the field photographs taken. From the locations visited, twelve locations were selected with input from BOEM as Key Observation Points (KOPs) for which visual simulations were prepared.

Table 4-3. Photo Locations Considered for Visual Simulations

Visual Resource	Location	Representative Simulation
Ocean City Pier, Atlantic Hotel	Ocean City, Maryland	Ocean City Pier, Atlantic Hotel
Assateague State Park	Assateague Island, Maryland	Assateague Island National Seashore
Assateague Island National Seashore	Assateague Island, Maryland	Assateague Island National Seashore
Mansion House NRHP and Public Landing	Snow Hill, Maryland	Mansion House NRHP and Public Landing
Public Boat Launch	Berlin, Maryland	Mansion House NRHP and Public Landing

Visual Resource	Location	Representative Simulation
Isle of Wight Lifesaving Station	Ocean City, Maryland	84th Street Beach, Ocean City
Fenwick Island State Park	Fenwick Island, Delaware	84th Street Beach, Ocean City
US Coast Guard Tower, US Life Saving Station	Ocean City, Maryland	Pier Building, Pier, Atlantic Hotel
Ocean City Harbor Entrance	Ocean City, Maryland	Pier Building, Pier, Atlantic Hotel
Atlantic Hotel	Ocean City, Maryland	Pier Building, Atlantic Hotel
Margaret Vandergrift Cottage, Lambert Ayres House	Ocean City, Maryland	Pier Building, Pier, Atlantic Hotel
Mount Vernon Hotel	Ocean City, Maryland	Pier Building, Pier, Atlantic Hotel
Ocean City Beach	Ocean City, Maryland	84th Street Beach, Ocean City
WWII Observation Tower (Ground Level)	Bethany Beach, Delaware	Bethany Beach Boardwalk and Wreck Site
Bethany Beach Boardwalk and Wreck Site	Bethany Beach, Delaware	Bethany Beach Boardwalk and Wreck Site
Ocean View Parkway Beach Entrance	Bethany Beach, Delaware	Bethany Beach Boardwalk and Wreck Site
Assawoman Bay Wildlife Area	Assawoman Bay, Delaware	Mansion House NRHP and Public Landing
Ocean City Beach, Boardwalk	Ocean City, Maryland	Pier Building, Pier, Atlantic Hotel
84th Street Beach, Ocean City	Ocean City, Maryland	84th Street Beach, Ocean City
Indian River Life Saving Station	Rehoboth Beach, Delaware	Indian River Life Saving Station
Delaware Seashore State Park	Dewey Beach, Delaware	Delaware Seashore State Park
Cape May Lighthouse	Cape May, New Jersey	Cape May Lighthouse
Fort Miles Historic District, Cape Henlopen State Park	Cape Henlopen, New Jersey	Fort Miles Historic District, Cape Henlopen State Park
Wildwood Boardwalk	Wildwood, New Jersey	Wildwood Boardwalk
Rehoboth Beach Boardwalk	Rehoboth Beach, Delaware	Rehoboth Beach Boardwalk
Toms Cove Visitor Center, Assateague Beach	Assateague Island, Virginia	Toms Cove Visitor Center, Assateague Beach

From the photo documentation collected during this field verification, twelve viewpoints were selected for the development of the Project visual simulations. The viewpoints chosen for the visual simulations were as follows (see Figure 9 for photo and simulation locations):

- KOP 18: Ocean City Pier, Atlantic Hotel, Ocean City Beach, Maryland (Ocean City Boardwalk)
- KOP 3: Assateague Island National Seashore, Assateague Island, Maryland
- KOP 15: Bethany Beach Boardwalk and Wreck Site, Bethany Beach, Delaware

- KOP 6: 84th Street Beach, Ocean City, Maryland
- KOP 25: Assateague Island, Toms Cove Visitor Center, Chincoteague, Virginia
- KOP 21: Cape May Lighthouse, Cape May, New Jersey
- KOP 20: Delaware Seashore State Park, Dewey Beach, Delaware
- KOP 22: Fort Miles Historic District, Cape Henlopen State Park, New Jersey
- KOP 19: Indian River Life Saving Station, Rehoboth Beach, Delaware
- KOP 4: Mansion House NRHP and Public Landing, Snow Hill, Maryland
- KOP 24: Rehoboth Beach Boardwalk, Rehoboth Beach, Delaware
- KOP 23: Wildwood Boardwalk, Wildwood, New Jersey

These viewpoints were selected to provide representative views of the Project from viewpoints ranging the entire coastal area adjacent to the Project. Simulations in Delaware and Maryland represent views in which the Project is visible while simulations in New Jersey and Virginia represent views at the farthest reaches of the viewshed.

4.1.3 Visual Simulations

In order to produce the visual simulations, a to-scale model of the proposed WTG was created in a 3D photorealistic modeling software, 3D Studio Max. The 121 identical WTG models were then placed in a 3D modeled environment at the proposed locations within the Lease area. The WTGs were modeled at the 121 proposed turbine locations as well as at the four proposed OSS locations. A virtual camera was also created in the virtual environment to match the exact specifications of the Nikon D810 camera, as well as the field recorded location. The camera bearing in the model was set to match the field recorded bearing line. Next, the field recorded photograph was set as the virtual camera background and the modeled horizon was matched to the actual horizon. For simulations at times of day other than the actual time of photography, representative lighting conditions were simulated using supplemental representative photographs of the sky at the simulation time taken from a nearby simulation location. The virtual camera was aligned to the baseline photograph using georeferenced flags placed in the field and recreated in the modeled environment. A virtual environment was created to match the sun and weather conditions observed in the field. The appropriate elevation for each WTG was set so that it appeared in the correct location beyond the horizon by using an earth curvature model developed by TRC in consultation with Dr. Jackson Cothren of the University of Arkansas. The curvature model is based on viewing distance and accounts for conservative atmospheric light refraction, which, under optimal viewing conditions, extends viewing distance by accounting for light "bending" around the earth's surface. The refraction coefficient (*k*) is 0.143, based on a standard refraction factor (*a*) of 7/6 (ESS Group 2014). The WTGs were oriented toward the prevailing wind direction as well as facing the shore for maximum visibility in a separate set of simulations. Turbine blade rotational positions were randomized to replicate realistic viewing conditions. The view was then rendered, composited, and post-processed to integrate the rendered model into the photograph.

Nighttime conditions were considered to address the potential for nighttime impacts associated with the aviation safety lighting described in Section 2.2. Nighttime simulations were produced by modelling the dimensions and output for LED L-864 and L-810 FAA beacons and placing them on the appropriate positions on the WTGs. In order to verify the intensity, actual field observations of similar fixtures were included in the light model and resulting simulation. The resulting rendering of the FAA lights was then overlaid on nighttime photograph and integrated into a composite simulation. The nighttime simulations previously submitted to BOEM have been included in Appendix A.

The previously submitted visual simulations are presented in Appendix A. Daytime simulations are provided as both panoramas and single frame details, based on the photography captured. The single frame detail was created to represent the view from the field of view of a camera. Although this may show greater detail of the surrounding landscape and Project components, it is viewing the Project in a reduced field of view as compared to a standard panorama. Panoramas are more representative of what a viewer would see standing at the selected viewpoints (discussed in Section 4.2) and is a more accurate depiction of the visual impact of the Project.

Additional visual simulations have been added in Appendix A. Each new simulation consists of a figure set which includes the simulation context depicting the view angle and context maps depicting the view angle and the visible WTGs and OSSs from each KOP, a set of context photographs showing the area surrounding each KOP, a panorama showing the existing visual conditions from each KOP, a panorama simulation showing the Project visibility during the same time of day as the existing conditions panorama at each KOP, and single frame visual simulations showing the Project visibility during two other times of the day at each KOP.

4.1.4 Video Simulation

While simulation figures can provide a sense for relative size and overall visual context, figures cannot represent the dynamic impacts that would be experienced at that location over time. To better understand the visual impacts in that context, a video simulation has been developed that combines on-site photography for an entire day with simulated renders of the proposed Project layout. The photos used in the simulation were taken at 5-minute intervals, which provides a highly detailed and realistic representation of visual impacts to the landscape from two important perspectives: changing light over time and changing use over time. The simulation shows that the impact of light on how users see the landscape comes not only from the sun's movement across the sky but also from the sun's frequent interference by cloud cover and buildings. A bustling public beach in summer, along with the equally busy waterway immediately adjacent, represents a constantly changing, active setting for human recreational and commercial activity where size, color, and motion compete for prominence in the visual landscape. This simulation shows those factors and provides an important context for understanding the visual impact of the turbine layout within a dynamic landscape, where changing light and changing use is constant.

The video simulation can be viewed at https://www.youtube.com/watch?v=8KggG7Tgky4.

4.1.4.1 Video Simulation Timeframe and Location

The video represents the 84th Street Beach in Ocean City, Maryland, on July 22, 2021. Individual photos were taken at 5-minute intervals beginning at 4:45 AM and concluding at 9:00 PM, allowing for the capture of the full range of lighting conditions from nighttime through sunrise at 5:54 AM to sunset at 8:19 PM and nighttime again after that. 84th Street Beach is part of a string of popular Atlantic-facing coastal beaches that stretch north from downtown Ocean City. The weather on July 22 was clear and pleasant with calm winds and a temperature that warmed to the upper 80s, conditions conducive to the full range of beach and near-shore recreational activities one would expect on a nice summer day.

4.1.4.2 Field Photography Methodology

The field crew arrived at 84th Street Beach the day before the intended shoot and selected a photography location that was at the foot of the barrier dunes but above the sloping portion of the beach, thus reducing the potential for interference and placing most beach activity in the foreground of each photo. The processes for determining and recording the camera placement and view configuration were identical to that used for panorama and single-frame simulations, and the crew took extra care to mark the correct tripod and camera configurations ahead of time since early-morning setup the next day would take place in total darkness. A Canon EOS 5D Mark IV with a fixed 50mm lens was used to capture each image, and an electronic intervalometer was used to automatically take exposures at 5-minute intervals. Shooting began at 4:45 AM and the last photo was taken at 9:00 PM. Over the course of the day the field crew would frequently override the intervalometer and manually shoot additional exposures to capture distinctive events taking place in the foreground and to provide options for poor photos due to bad timing. In total more than 275 photos were taken to support development of the final video production.

4.1.4.3 Simulation and Video Production

A digital model of the 84th Street Beach location and the Project layout was developed in 3DS Max software with a virtual camera configured to duplicate the location, altitude, viewing direction, and camera lens used in the photography. A render was produced from that virtual camera for each 5-minute timeframe showing the turbine layout and the lighting impacts for that time of day. Each render consisted of two files; one showing the Project (WTGs and OSSs) with the associated lighting and a second representing the impacts of distance and atmospheric conditions. These two files were combined and the resulting series of composite images added as a track to a video production that also included a track for the field photography associated with each render. The two tracks were registered to one another, and the rendered turbine track masked to remove portions where the view would be blocked by something in the foreground (i.e., a vessel). Once additional tracks were created for supporting information (Timelapse Details, Time Frame, Contextual Map, etc.), the entire production was rendered to a high-resolution video file.

4.2 Visual Impacts at Landscape Similarity Zones

Visual impacts at Landscape Similarity Zones may vary within each LSZ and between distinct LSZs of the same type, depending on the magnitude of impact and on the variation in sensitivity between LSZs. Ranges of magnitude and sensitivity for each LSZ within the VSA are provided in Table 4-4, along with the resulting impact ranges obtained by using BOEM's visual impact matrix. The rationale for the ranges of magnitude, sensitivity, and impact for each LSZ is further described below. Landscape Similarity Zones would only be impacted by the Project if it is visible over the horizon. Therefore, the results in Table 4-4 represent a worse-case scenario.

4.2.1 Atlantic Ocean

The magnitude of visual impacts within the Atlantic Ocean LSZ are generally greater than in any other LSZ due to proximity and unobstructed views of the Project area. The WTGs and OSSs will be located within this character area and will therefore affect the scenic value of the LSZ itself, which is currently characterized by expansive panoramic views and uniform, mostly horizontal visual elements. This is the only landscape type that affords "close-up" views of the project, within 10 miles. The magnitude of visual impacts outside the immediate project area will decrease with distance but remain "large" considering the size and contrast of the new structures. Given the high sensitivity rating described in Section 3.4, there will be major visual impacts to the LSZ. User groups in the Atlantic Ocean LSZ would include maritime industry users and recreational boaters.

4.2.2 Inland Bays, Lakes, and Ponds

The magnitude of visual impact to the inland bays, lakes, and ponds within the VSA will be lower than in the Atlantic Ocean since the views are necessarily from a greater distance and are partially obstructed by the barrier islands and other terrain separating them from the project area. However, competing visual elements are still limited and a large magnitude of change is possible throughout these inland waterbodies, contributing to a potential major visual impact. User groups in the inland bays, lakes, and ponds LSZ would include location residents, maritime industry users, and recreational boaters.

4.2.3 Forest and Forested Wetlands

Forest and forested wetlands, though areas of high sensitivity, are likely to experience some of the lowest magnitudes of visual change of any landscape unit in the VSA. In addition to the inland location of these areas, tall vegetation only affords very limited views of the ocean and panoramic views are not possible from vantage points within this character area. Therefore, the visual impacts to forest and forested wetlands will be moderate. User groups in forests and forested wetlands would include recreationists, agricultural workers, business employees, and local residents.

4.2.4 Agricultural Land

The magnitude of visual impact to agricultural land will be medium at most given the inland location of these areas. Almost no agricultural land is present along the shoreline, so the extent of project views will be limited by distance and by intervening objects and terrain. As noted above, sensitivity in these areas ranges from low to medium given the uses and contribution of ocean views to the scenic value of agricultural areas; therefore, overall visual impact will range from minor to moderate. The user groups in the LSZ include agricultural workers, local residents, and business employees.

4.2.5 Developed Open Space

Developed open spaces are a highly varied LSZ in terms of sensitivity. Scenic value is generally medium to high, but users may have different susceptibility depending on activities (for example, low for golfers vs. high for landscape photographers). The magnitude of visual impacts will be similarly varied. Many developed open space areas have clear ocean views while others, such as golf courses, are often surrounded by more obstructive landscape units like forests.

Accordingly, overall visual impacts will range from minor to major. User groups in the LSZ would include commuters and through-travelers, recreationists, business employees, and local residents.

4.2.6 Wetlands

Wetland areas throughout the VSA will experience medium to large magnitudes of visual change as a result of the project. Given the low elevations and variable heights of vegetation within this character area, views of the project area can be limited, but any visible WTGs will strongly contrast with the existing visual elements and the placement of many wetlands adjacent to other waterbodies may afford ocean views. Scenic value is high and susceptibility to change can be medium to high as noted above, resulting in a potential major visual impact in some wetland areas. User groups in wetlands would include recreationists, local residents, and possibly maritime industry users.

4.2.7 Rural Residential Development

The magnitude of visual impacts for rural residential development areas will generally be large along the immediate Atlantic shoreline and bayfront locations within the VSA, decreasing with distance inland. The magnitude of impact will be smallest for those residential areas with views of the WTGs partially screened by intervening structures (some of which may not have visibility of the ocean itself but will be able to observe the WTGs over other structures of vegetation). As discussed in Section 3.4, shorefront locations will have high sensitivity to change, while the majority of inland rural residential areas will have medium sensitivity, resulting in a range of overall visual impacts from minor to major. User groups would include residents, business employees, agricultural workers, and recreationists.

4.2.8 Urban Fringe

Urban fringe areas will similarly have a range of impact magnitude, ranging from large along the shoreline at key ocean viewpoints with panoramic views to small at inland areas of urban fringe with a high degree of visual clutter and obstructions, like shopping centers. These character areas are less commonly located along the immediate shoreline, but ocean views toward the project are possible. Sensitivity is medium throughout many of these areas, but can be high, particularly in historically sensitive areas. Visual impact will be major to minor, correspondingly. User groups in the urban fringe LSZ would include business employees, local residents, and occasionally recreationists.

4.2.9 Commercial and Industrial Centers

The sensitivity of commercial and industrial centers is more variable than in the other developed LSZs as a result of the variation in user activities and ocean-based scenic value. The commercial and industrial centers with high visual sensitivity within the VSA are also likely to have the highest magnitude of visual change since they are often located immediately on the shoreline and include elevated vantage points with clear views of the project area. These areas could experience major visual impacts, while inland commercial and industrial areas will have among the lowest magnitude of impact and lowered sensitivity due to heavily built environments and obstructed ocean views. User groups would include residents, workers, and recreationists.

4.2.10 Beaches

The magnitude of visual impact at beach locations across the VSA will be high when the project is close enough to the beach location to actually be visible over the horizon. These areas are generally the nearest onshore locations to the project area, with unobstructed views resulting in large geographic extent and high contrast to existing views. The ocean view is a key component of the high scenic value at any beach and will contribute to a major overall visual impact, provided that the project is actually visible over the horizon at the beach location. User groups include local residents and recreationists.

4.2.11 Low Vegetation

Visual impacts will have a variable magnitude in these character areas, as they are widely distributed across the VSA. Those close to the shoreline may have clear ocean views with limited visual screening or competition for visual attention, resulting in potential large magnitudes of impact. Combined with a medium to high sensitivity to change caused by the natural setting and limited development, the overall impacts of the project will range from minor to major. User groups include recreationists, local residents, and possibly agricultural workers.

Table 4-4. SLVIA Impact Level Matrix for Landscape Similarity Zones

LSZ Name[1]	SLVIA Magnitude Rating (large, medium, small)	SLVIA Sensitivity Rating (low, medium, high)	SLVIA Overall Impact Level (major, moderate, minor, negligible)	Rationale
Atlantic Ocean	Large	High	Major	Large geographic extent and large size/scale; medium to high susceptibility and high value
Inland Bays, Lakes, and Ponds	Medium to Large	High	Major	Medium geographic extent and medium to large size/scale; medium to high susceptibility and high value
Forest and Forested Wetlands	Small	High	Moderate	Small geographic extent and small to medium size/scale; medium to high susceptibility and high value
Agricultural Land	Medium	Low to Medium	Minor to Moderate	Small to medium geographic extent and medium size/scale; low to medium susceptibility and low to medium value
Developed Open Space	Medium to Large	Low to High	Minor to Major	Medium to large geographic extent and medium to large size/scale; low to high susceptibility and medium to high value
Wetlands	Medium to Large	High	Major	Medium to large geographic extent and medium to large size/scale; medium to high susceptibility and high value
Developed Residential	Small to Large	Medium to High	Minor to Major	Small to large geographic extent and medium to large size/scale; medium to high susceptibility and medium to high value

LSZ Name[1]	SLVIA Magnitude Rating (large, medium, small)	SLVIA Sensitivity Rating (low, medium, high)	SLVIA Overall Impact Level (major, moderate, minor, negligible)	Rationale
Developed Urban Fringe	Small to Large	Medium to High	Minor to Major	Small to large geographic extent and medium to large size/scale; low to high susceptibility and medium to high value
High-Density Residential/ Commercial	Small to Large	Low to High	Minor to Major	Small to large geographic extent and medium to large size/scale; low to high susceptibility and low to high value
Beaches	Large	High	Major	Large geographic extent and medium to large size/scale; medium to high susceptibility and high value (when the project is close enough to be visible over the horizon)
Low Vegetation	Small to Large	Medium to High	Minor to Major	Small to large geographic extent and small to large size/scale; medium to high susceptibility and medium to high value

[1] The classification of landscape and seascape areas (or LSZ) has been modified based BOEM guidance (BOEM 2021b).

4.3 Visual Impacts at Selected Viewpoints

Impact ratings reflect some or all the following factors that may contribute to the different sensitivity and visual impact ratings of the proposed Project at different locations:

- Project Magnitude (Distance, Scale, Geographic Extent): the perceived vertical scale and horizontal extent of the visual change at each KOP is directly related to the distance between the viewer and the new visual elements added by the Project and affects the magnitude of all visual impacts. Section 4.1 and Table 4-1 give approximate distance thresholds at which the proposed visual changes may be considered more or less significant, though viewer elevation is an important factor. The physical layout of the project is consistent for all KOPs, but curvature of earth reduces the perceived geographic extent in practice as WTGs and OSSs may drop out of sight beyond the horizon.

- Scenic/Recreational Value: the scenic value or quality of the existing visual resource, which may be indicated by designation as a scenic area, conservation area, state park, national seashore, or other protected resource area. Many areas that do not carry official designations also have elevated scenic or recreational value due to their popularity as tourist or recreationist destinations. These areas tend to have fewer artificial visual elements and less visual clutter to draw the viewer’s attention and are therefore more susceptible to visual impact.

- Viewer Susceptibility: a function of the attention a viewer or user at a KOP gives to the seascape and landscape views. This factor is a primary driver of sensitivity to change for a specific KOP and depends on both the activities of users at a KOP and their particular connection to the setting. Susceptibility was evaluated considering the potential impacts within LSZs in Section 4.2.

- Visual Composition: the composition of visual elements in the existing view at the KOP, including natural landforms, vegetation, and artificial structures in the direction of view and in the viewer's periphery. The consistency of new visual elements with the particular form, line, color, and texture of existing elements is a primary driver of the visual impact of an action.

- Viewing Angle: The angle of view contributes to the lighting direction and whether visual elements are front- back- or side-lit at a given time. This also includes the relative location of new visual elements to the most likely angle of view at a KOP, if a primary view angle exists (for example, most beachfront locations would have a primary view angle towards the ocean rather than up and down the shoreline).

- Motion/Lighting: New visual elements that include motion or luminance, such as turbine blade motion or aircraft safety lighting, can attract significant visual attention. The degree to which these factors contribute to overall change varies with distance and with proximity to other sources of motion or light.

- Atmospheric Conditions and Season: Weather conditions have a varying degree of impact to the visual impact of new elements like WTGs. During certain conditions, all WTGs will be completely obscured from view at distant KOPs, while the WTGs may still be visible under the same conditions at a closer KOP. Seasonality of visitation at many KOPs is a main driver of sensitivity to visual change. During the off-season (winter) at beach KOPs, there are fewer users to experience visual change, or in some cases KOPs (e.g., Cape May Lighthouse) may not be publicly accessible at all for parts of the year. On the other hand, less off-season activity at popular summer destinations (like 84th Street Beach) would reduce visual clutter for users who are present in winter months and could make them more sensitive to new visual change.

- Duration of View: The amount of time during which the Project can be observed at a given user at a particular KOP. Since WTGs are stationary, this is a factor driven by the user's activity while observing the project as well as by the apparent geographic extent of the project. A user sunbathing at an Ocean City beach location, facing the ocean, may be more sensitive to change, as they can observe the WTGs over long periods, as compared to a user at a Virginia beach location, who is only able to see the WTGs while walking north up the beach. A user boating next to the Project will observe WTGs over a longer duration than a passenger in a car driving on a coastal road.

The Project would be comprised of up to 121 WTGs, up to 4 OSSs, and a Met Tower, of which the WTGs and at most two OSSs would be visible from the shoreline. Although the Project is relatively small compared to the open ocean area, the introduction of man-made moving structures can, depending on distance and meteorological conditions, create a visual contrast to the expanse of the ocean and sky. Difference in color and contrast between the WTGs and OSSs, the sky, and the ocean along with movement of the WTG blades are the main sources of visual prominence. Motion of the WTGs is important to consider but becomes much less disruptive to the existing view with increasing distance to the viewer. The vertical scale of the turbines and horizontal extent and arrangement of the overall Project Area also differentiates impacts at different locations.

The proposed WTGs would be the tallest visible elements on the horizon, although at a far distance. From most foreground and mid-ground vantage points (from vessels on the ocean), the WTGs would be perceived as the main visual element. When viewed from far background vantage points on land, the WTGs' perceived scale and presence would be considerably reduced. For example, the PDE maximum WTG height of 286 m (938 ft), when viewed from shore at 21 kilometers (13 miles), is equivalent in vertical scale to an object 1.4 meters (4.5 ft) tall viewed from 100 meters (328 ft) away, or a 1.4-centimeter-high (0.5-inch-high) object viewed at 1 meter (3 ft) (approximately arm's length). From an earth curvature standpoint, the turbine blades are technically visible in clear conditions from sea level at just over 69 kilometers (43 miles) but would have greatly diminished visibility beyond the point at which the nacelles and towers drop below the horizon at a viewing distance of approximately 54 kilometers (33.5 miles).

FAA aviation obstruction lights would be visible from coastal locations where daytime views of the WTG nacelles and OSSs occur. Inland views are typically screened by dunes, low hills, and existing vegetation or buildings. When visible from inland locations, views would typically include existing coastal light sources that include commercial and residential building sources, streetlights, vehicle headlights, and lights from passing vessels. The FAA lights in the night sky would be noticeable from beach areas and coastal areas, where visible above the horizon. Viewer attention would be drawn by the slow flashing of the red lights and would be most noticeable from beachfront areas. Recreational beaches are primarily visited during daytime hours minimizing the number of affected viewers. The impact of FAA lighting is substantially limited by the distance of the Project from any vantage points. The WTG lights would be visible low on the horizon and would appear to vary in intensity due to the slow flash rate, intermittent shadowing as rotating blades pass in front of the light source, and atmospheric conditions. Use of ADLS as described in Section 2.5 would significantly reduce the amount of time FAA obstruction lights would be lit (see Appendix E).

As stated in Section 2.5, the lighting and marking described in this assessment is proposed and subject to approval by BOEM, the Federal Aviation Administration (FAA), the U.S. Coast Guard (USCG), and other relevant agencies.

Review of the visual simulation images, along with photos of the existing view, allowed for comparison of the aesthetic character of each view with and without the PDE.

4.3.1 Onshore Coastal Viewpoints

Table 4-5 below describes the existing views at each of the KOPs and summarizes the visual change resulting from the proposed Project.

Due to the coastal nature of many of these KOPs, several share visual and landscape/seascape characteristics. All beach locations provide a vantage point from which the viewer can enjoy views of the beach, ocean, recreational users, surf, and sunrises/sunsets. With similar compositions, the major distinguishing factors between the visual impacts experienced at these KOPs are the distance to the Project area, the viewing angle, and the ability to perceive motion and lighting.

KOPs nearer the Project area experience an objectively greater visual change, with more WTGs visible over a greater horizontal extent. The WTGs will appear taller, are less obscured by the horizon, and are oriented closer to a typical seaward view angle than KOPs farther to the north and south.

Several KOPs, particularly near Ocean City, Maryland, Rehoboth, Delaware, and Wildwood, New Jersey, are at popular recreation areas and tourist destinations that receive high visitation throughout the days and evenings during the summer and fall seasons. Recreationists and tourists can be lounging on the beach, swimming or surfing in the water, boating in the nearshore area (i.e., kayaking, jet skiing), or fishing along the shoreline. In several views from KOPs, there is an increased visual presence of artificial structures such as piers, jetties, and shorefront buildings. These KOPs can have a decreased sensitivity to change as compared to less developed KOP locations that are also frequently used for recreation, such as Assateague Island National Seashore or Delaware Seashore State Park, where the natural landscape/seascape and ocean view is the primary visual element.

When visible over the horizon, the somewhat regular vertical form of the tubular WTG towers would contrast with the horizontal form of the water/sky horizon. The color of the turbine tower, nacelle and blades would be viewed against the background sky. When the WTGs are backlit (side facing viewer is in shade) the degree of visual contrast is heightened and thus somewhat less compatible with the background sky than if viewed in a more illuminated front- or side-lit condition. Front- or side-lit conditions would cause the turbines to stand out more against a bluer sky, primarily occurring in clear conditions. The sun path for the majority of the viewpoints along the eastern shores of Delaware and Maryland is from behind the turbines in the morning (backlit condition) to behind the viewer, in front of the turbines in the evening (front-lit), with a shift to the south during the winter months that creates a side-lit condition for viewers facing east. Viewers in northern vantage points in Delaware and very small parts of New Jersey would experience more backlit condition in the winter months when the sun is in the southern sky. Color contrast decreases as distance increases and would diminish or disappear completely during periods of haze, fog or precipitation. Visibility due to meteorological conditions is addressed in COP Volume I Section 2.7 and in Appendix D. The meteorological analysis shows that these weather conditions occur for greater than 50% of daylight hours approximately 103 days per year. On an hourly basis, clear conditions occur an average of 67% of daylight hours over the course of the year.

Lighting of the OSSs is the same as the WTGs, resulting in similar changes to visibility based on change in distance and weather conditions (i.e., haze, fog, or precipitation). The OSSs are less than 60.6 m (199 ft) in height, appearing as small dark boxes against the water/sky horizon when visible.

Table 4-5. Existing and Proposed Views for Onshore Viewpoints

Key Observation Point Name	Existing View	KOP Sensitivity Rating	View with Proposed Project	Visibility Impact Rating
KOP 23: Wildwood Boardwalk	Boardwalk/beach location in Wildwood, NJ. Approx. 58.5 km (36.3 mi) north of nearest WTG location. This beach view is near the northern extent of the Project's limit of visibility. Visual elements include a large sandy beach extending from the foreground to the midground (over 1,000 feet to the water), a strip of ocean and waves in the midground, and the distant ocean, horizon and sky in the background. Medium sensitivity to visual change due to lack of competing focal points, but less dominant ocean view given the distance from the water. User groups: Local residents, recreationists, and business employees.	Medium	The existing view will be altered in a 12.6° horizontal extent with the addition of 62 WTGs to the south. No OSS or nacelles will be visible above the horizon. A maximum of 37% of the nearest WTG height will be visible.	1
KOP 21: Cape May Lighthouse (elevated)	Observation deck of Cape May Lighthouse, NJ. Approx. 54.0 km (33.6 miles) north of nearest WTG location. This elevated view is available to tourists who climb the lighthouse during operating hours. Visual elements include the lighthouse safety railings in the immediate foreground, ground-level houses, roads, parking lots, and beachfront in the midground, and the ocean, sky, and horizon in the background. High sensitivity to visual change due to tourism significance, very expansive views, and lack of competing focal points in the ocean. User groups: Recreationists.	High	The existing view from the observation deck will be altered in a 14.6° horizontal extent with the addition of 121 WTGs to the south. No OSS will be visible above the horizon. Nacelles of 87 WTGs will be visible. A maximum of 79% of the nearest WTG height will be visible.	3
KOP 21: Cape May Lighthouse (ground level)	Beach access walkway at Cape May State Park, NJ. Approx. 53.9 km (33.5 mi) north of nearest WTG location. Visual elements include beach and dunes in the foreground, waves and ocean in the midground, and distant ocean, horizon, and sky in the background. High sensitivity to visual change due to expansive views and lack of competing focal points.	High	The existing view will be altered in a 13.5° horizontal extent with the addition of 92 WTGs to the south. No OSS will be visible above the horizon. Nacelles of 12 WTGs will be visible. A maximum of 53% of the nearest WTG height will be visible. Given the 360°	2

Key Observation Point Name	Existing View	KOP Sensitivity Rating	View with Proposed Project	Visibility Impact Rating
	User groups: Recreationists.		views available from the lighthouse observation deck	
KOP 22: Fort Miles Historic District, Cape Henlopen	Historic military site at Cape Henlopen State Park, NJ. Approx. 40.1 km (24.9 mi) northwest of nearest WTG location. Visual elements include walkways and railings in the foreground; grassy areas, vegetation, and fort buildings in the midground, and distant ocean, horizon, and sky in the background. Medium sensitivity to visual change due to historic significance but more visual clutter and competing visual elements besides the ocean. User groups: Local residents and recreationists.	Medium	The existing view will be altered in a 16.1° horizontal extent with the addition of 121 WTGs to the southeast. No OSS will be visible above the horizon. Nacelles of 86 WTGs will be visible. A maximum of 81% of the nearest WTG height will be visible.	2
KOP 24: Rehoboth Beach Boardwalk	Beach location in Rehoboth, DE Approx. 35.2 km (21.9 mi) northwest of the nearest WTG location. Visual elements include beach and dunes in the foreground, waves and ocean in the midground, and distant ocean, horizon, and sky in the background. Medium sensitivity to visual change due to expansive views, but with competing focal points. User groups: Local residents, recreationists, and business employees.	Medium	The existing view will be altered in a 18.0° horizontal extent with the addition of 121 WTGs to the southeast. No OSS will be visible above the horizon. Nacelles of 93 WTGs will be visible. A maximum of 83% of the nearest WTG height will be visible.	2
KOP 20: Delaware Seashore State Park	Beach location from a state park in DE. Approx. 31.4 km (19.5 mi) northwest of the nearest proposed WTG location. Visual elements include beach and dunes in the foreground, waves and ocean in the midground, and distant ocean, horizon, and sky in the background. High sensitivity to visual change due to conservation significance, expansive views, and lack of competing focal points. User groups: Local residents, recreationists, and maritime users.	High	The existing view will be altered in a 20.7° horizontal extent with the addition of 121 WTGs to the southeast. No OSS will be visible above the horizon. Nacelles of 109 WTGs will be visible. A maximum of 87% of the nearest WTG height will be visible.	3
KOP 19:	Beach location and historic site. Approx. 27 km (17 mi) northwest of the nearest WTG location. The viewpoint is near a National Register Historic Site. Visual elements include	High	The existing view will be altered in a 22.4° horizontal extent with the addition of 121 WTGs to the southeast. No OSS will be	3

Key Observation Point Name	Existing View	KOP Sensitivity Rating	View with Proposed Project	Visibility Impact Rating
Indian River Life Saving Station	beach and dunes in the foreground, waves and ocean in the midground, and distant ocean, horizon, and sky in the background. High sensitivity to visual change due to historic significance, expansive views, and lack of competing focal points. User groups: Local residents and recreationists.		visible above the horizon. Nacelles of 117 WTGs will be visible. A maximum of 90% of the nearest WTG height will be visible.	
KOP 15: Bethany Beach Boardwalk & Wreck Site	Beach location in DE. Approx. 19.9 km (12.4 mi) northwest of the nearest proposed WTG location. The foreground of this view to the southeast is comprised of beach front. Visual elements include beach and dunes in the foreground, waves and ocean in the midground, and distant ocean, horizon, and sky in the background. High sensitivity to visual change due to expansive views and lack of competing focal points. User groups: Local residents, recreationists, and business employees.	High	The existing view will be altered in a 31.8° horizontal extent with the addition of 121 WTGs to the southeast. All 121 nacelles and 2 OSS will be visible. A maximum of 97% of the nearest WTG height will be visible.	5
KOP 6: 84th Street Beach, Ocean City	Beach location in Ocean City, MD. Approx. 17.4 km (10.8 mi) west of nearest WTG location. Visual elements include beach and beachgoers in the foreground, waves and ocean in the midground, and distant ocean, horizon, and sky in the background. KOP has expansive views and low activity in early morning hours with an increasing amount of recreational activity and related visual clutter during the day, so viewer sensitivity to change is variable. User groups: Local residents, recreationists, and business employees.	Medium	The existing view will be altered in a 50.9° horizontal extent with the addition of 121 WTGs directly east. All 121 nacelles and 3 OSS will be visible. A maximum of 98% of the nearest WTG height will be visible. This KOP has the lowest distance to the nearest WTGs and the most directly seaward view of the Project area, resulting in a significant change to the seascape.	5
KOP 18: Ocean City Pier, Atlantic Hotel	Pier and boardwalk location at Ocean City Beach. Approx. 21 km (13 mi) west of the nearest proposed WTG location. Visual elements include the beach and pier in the foreground, waves and ocean in the midground, and distant ocean, horizon, and sky in the background. The high amount of recreational activity (both onshore and offshore), visual	Medium	The existing view will be altered in a 51.2° horizontal extent with the addition of 121 WTGs directly east. All 121 nacelles and 3 OSS will be visible. A maximum of 97% of the nearest WTG height will be visible. The visual change introduced by the WTGs at	5

Key Observation Point Name	Existing View	KOP Sensitivity Rating	View with Proposed Project	Visibility Impact Rating
	clutter, motion, and lighting elements at this KOP reduce the sensitivity to visual change somewhat compared to less developed KOPs. User groups: Local residents, recreationists, and business employees.		this KOP will be one of the largest in magnitude of the KOPs studied given the higher horizontal extent of the new visual elements.	
KOP 3: Assateague Island National Seashore	National Seashore in Maryland. Approx. 6.4 km (16.4 mi) southwest of the nearest proposed WTG location. Visual elements include beach and dunes in the foreground, waves and ocean in the midground, and distant ocean, horizon, and sky in the background. High sensitivity to visual change due to conservation significance, expansive views, and lack of competing focal points. User groups: Local residents and recreationists.	High	The existing view will be altered in a 39.5° horizontal extent with the addition of 121 WTGs to the northeast. All 121 nacelles and 1 OSS will be visible. A maximum of 90% of the nearest WTG height will be visible.	4
KOP 4: Mansion House	Public wharf location on inland bay. Approx 42.3 km (26.3 mi) southwest of the nearest WTG location. The KOP is adjacent to a National Register Historic Site located on the Chesapeake Bay, with views of the Atlantic Ocean and the Project Area partially obstructed by Assateague Island. The foreground of this view is the waters of the Chesapeake Bay, with less wave activity than would be observed in the Atlantic Ocean but otherwise similar uses including boating and fishing. The midground consists of the waters of the bay, and the background includes the horizon, barrier islands, and ocean beyond. Low sensitivity to proposed changes on the other side of the barrier islands, given the intervening visual clutter, including many vertical elements such as trees, houses, and other structures. User groups: Local residents, recreationists, and maritime users.	Low	The existing view will be altered in a 30.7° horizontal extent with the addition of 121 WTGs to the northeast, many of which may be screened from view by Assateague Island. No OSS will be visible above the horizon. Nacelles of 76 WTGs are theoretically visible above the horizon, but only approximately 40 nacelles will be visible when accounting for screening by intervening landforms and vegetation. A maximum of 67% of the nearest WTG height will be visible.	2

Key Observation Point Name	Existing View	KOP Sensitivity Rating	View with Proposed Project	Visibility Impact Rating
KOP 25: Assateague Beach, Toms Cove Visitor Center	Beach site in national seashore area. Approx. 64.0 km (39.7 miles) southwest of the nearest WTG location, near the limit of visibility of the Project due to curvature of the earth. Visual elements include beach and dunes in the foreground, waves and ocean in the midground, and distant ocean, horizon, and sky in the background. High sensitivity to visual change due to conservation significance, expansive views, and lack of competing focal points. User groups: Recreationists.	High	The existing view will be altered in a 19.7° horizontal extent with the addition of 58 WTGs to the northeast. No OSS or turbine nacelles will be visible. A maximum of 24% of the nearest WTG height will be visible. This location will experience one of the lowest levels of visual change due to the distance from the Project area (and resulting earth curvature effect) and the relatively small vertical scale and horizontal extent of the WTGs. The angle at which the WTGs can be seen is also farther north than the primary seaward view angle at this beach location.	1

Table 4.6 provides additional details regarding each KOP.

Table 4-6. KOP Details

Key Observation Point Name	Representative Character Area[1]	Viewing Direction	Elevation (Feet)	Lighting Angle of Simulation	Visibility Threshold	Distance to Nearest Turbine (miles/nautical miles)	Horizontal Extent of Visible WTGs
KOP 23: Wildwood Boardwalk	Beach, High-Density Commercial	South	11.5	Morning: Side-lit Midday: Backlit Evening: Side-lit	Low (25-43 miles)	36.4/31.6	12.6°
KOP 21: Cape May Lighthouse (elevated)	Residential, Historic (Maritime)	South	153.3	Morning: Side-lit Midday: Backlit Evening: Side-lit	Medium (25-43 miles, elevated)	33.6/29.2	14.6°
KOP 21: Cape May Lighthouse (ground level)	Beach	South	21.1	Morning: Side-lit Midday: Backlit Evening: Side-lit	Low (25-43 miles)	33.5/29.1	13.5°
KOP 22: Fort Miles Historic District, Cape Henlopen	Developed Open Space, Historic (Defense Facility)	Southeast	36.4	Morning: Backlit Midday: Side-lit Evening: Front-lit	Medium (15-25 miles)	24.9/21.6	16.1°
KOP 24: Rehoboth Beach Boardwalk	Beach, High-Density Commercial	Southeast	18.2	Morning: Backlit Midday: Side-lit Evening: Front-lit	Medium (15-25 miles)	21.8/18.9	18.0°
KOP 20: Delaware Seashore State Park	Beach	Southeast	17.3	Morning: Backlit Midday: Side-lit Evening: Front-lit	Medium (15-25 miles)	19.5/16.9	20.7°
KOP 19: Indian River Life Saving Station	Beach	Southeast	12.5	Morning: Backlit Midday: Side-lit Evening: Front-lit	Medium (15-25 miles)	17.0/14.8	22.4°
KOP 15: Bethany Beach Boardwalk & Wreck Site	Beach, Residential	Southeast	11.5	Morning: Backlit Midday: Side-lit Evening: Front-lit	High (10-15 miles)	12.4/10.8	31.8°

Key Observation Point Name	Representative Character Area[1]	Viewing Direction	Elevation (Feet)	Lighting Angle of Simulation	Visibility Threshold	Distance to Nearest Turbine (miles/nautical miles)	Horizontal Extent of Visible WTGs
KOP 6: 84th Street Beach, Ocean City	Beach, Urban Fringe	East	14.6	Morning: Backlit Midday: Side-lit Evening: Front-lit	High (10-15 miles)	10.8/9.4	50.9°
KOP 18: Ocean City Pier, Atlantic Hotel	Beach, High-Density Commercial	East	19.6	Morning: Backlit Midday: Side-lit Evening: Front-lit	High (10-15 miles)	12.5/10.9	51.2°
KOP 3: Assateague Island National Seashore	Beach	Northeast	21.4	Morning: Side-lit Midday: Front-lit Evening: Side-lit	Medium (15-25 miles)	18.6/16.2	39.5°
KOP 4: Mansion House	Inland Bays, Lakes, and Ponds, Historic (Agricultural)	Northeast	5.1	Morning: Side-lit Midday: Front-lit Evening: Side-lit	Low (25-43 miles)	26.2/22.8	30.7°
KOP 25: Assateague Beach, Toms Cove Visitor Center	Beach	Northeast	13.6	Morning: Side-lit Midday: Front-lit Evening: Side-lit	Low (25-43 miles)	39.8/34.6	19.7°

[1] The classification of landscape and seascape areas (or LSZ) has been modified based BOEM guidance (BOEM 2021b).

BOEM's "Assessment of Seascape, Landscape, and Visual Impacts of Offshore Wind Energy Developments on the Outer Continental Shelf of the United States, April 2021" describes the methodology for seascape, landscape, and visual impact assessment (SLVIA) that BOEM uses to identify the potential impacts of offshore wind energy developments in Federal waters on the OCS of the United States. Although this VIA was submitted prior to the issuance of the SLVIA guidance, at the request of BOEM some of the elements of the SLVIA guidance and methodology have been incorporated into this VIA.

According to the SLVIA guidance, the sensitivity of a seascape/landscape impact receptor is dependent on its susceptibility to change and its perceived value to society. The susceptibility of a seascape/landscape receptor to change is its ability to accommodate the impacts of the proposed project without substantial change to the basic existing characteristics of the seascape/landscape. This applies to the overall character of a particular seascape/landscape area, or an individual element and/or feature, or a particular aesthetic, experiential, and perceptual aspect that contributes to the character of the area. Seascapes, landscapes, and their features/elements have values associated with them by society, and these values are identified as part of the seascape and landscape assessments. In general, areas of seascape/landscape are likely to be highly valued when their character is judged to be distinctive and where scenic quality, wildness or tranquility, and natural or cultural heritage features make a particular contribution to the seascape or landscape.

The judgements about the susceptibility and value of a receptor is recorded on an ordinal scale of high, medium, or low but the finding should be documented clearly and should be based on and consistent with the information provided.

Table 4-7 provides the susceptibility, value and sensitivity ratings for each KOP along with the rationale for each rating.

Table 4-7. Susceptibility, Value, and Sensitivity Matrix for Onshore Viewpoints

Key Observation Point Name	Susceptibility Rating (high, medium, low)	Susceptibility Rationale	Value Rating (high, medium, low)	Value Rationale	SLVIA Sensitivity Rating (high, medium, low)	Sensitivity Rationale
KOP 23: Wildwood Boardwalk	Medium	Located within Beach and High Density Commercial. This consists of a mostly natural beach environment with clear evidence of newer development (i.e., boardwalk, high-rise buildings) and several vertical structures.	Medium	Popular tourism destination, typical developed beach location	Medium	Medium susceptibility, medium value
KOP 21: Cape May Lighthouse (elevated)	Medium	Located within Residential and Historic (Maritime). There is clear evidence of older development (i.e., residential, boardwalk) and undisturbed ocean.	High	Significant maritime historic site, heavily visited and valued primarily for ocean views	High	Medium susceptibility, high value
KOP 21: Cape May Lighthouse (ground level)	High	Located in Beach. This consists of mostly a natural beach/dune environment with minor evidence of development and some vertical elements (i.e., walkway, signage).	Medium	Typical undeveloped beach location, within state park	High	High susceptibility, medium value
KOP 22: Fort Miles Historic District, Cape Henlopen	Low	Located in Developed Open Space and Historic (Defense Facility). There is clear evidence of older or rustic development (i.e., walkways, railings, fort buildings).	High	Significant military historic site	Medium	Low susceptibility, high value

Key Observation Point Name	Susceptibility Rating (high, medium, low)	Susceptibility Rationale	Value Rating (high, medium, low)	Value Rationale	SLVIA Sensitivity Rating (high, medium, low)	Sensitivity Rationale
KOP 24: Rehoboth Beach Boardwalk	Medium	Located in Beach, High-Density Commercial. This consists of a natural beach/dune environment with clear evidence of newer development (i.e., boardwalk, commercial buildings, lampposts).	Medium	Popular tourism destination, typical developed beach location	Medium	Medium susceptibility, medium value
KOP 20: Delaware Seashore State Park	High	Located in Beach. This consists of a pristine natural beach environment with almost no development.	Medium	Typical undeveloped beach location, within state park	High	High susceptibility, medium value
KOP 19: Indian River Life Saving Station	High	Located in Beach. This consists of a natural beach environment with some evidence of older development (i.e., lifesaving station, fenceposts).	High	Typical undeveloped beach location, historic significance	High	High susceptibility, high value
KOP 15: Bethany Beach Boardwalk & Wreck Site	Medium	Located in Beach and Residential. There are multiple signs of development (i.e., residences, boardwalks) visible adjacent to beach.	Medium	Typical developed beach location,	Medium	Medium susceptibility, medium value

Key Observation Point Name	Susceptibility Rating (high, medium, low)	Susceptibility Rationale	Value Rating (high, medium, low)	Value Rationale	SLVIA Sensitivity Rating (high, medium, low)	Sensitivity Rationale
KOP 6: 84th Street Beach, Ocean City	Medium	Located within Beach and Urban Fringe There is clear evidence of newer development (i.e., high-rise residential, commercial structures).	Medium	Popular tourism destination, typical developed beach location	Medium	Medium susceptibility, medium value
KOP 18: Ocean City Pier, Atlantic Hotel	Medium	Located in Beach and High Density Commercial. There is clear evidence of newer development (i.e., pier, high-rise residential, commercial), which includes vertical and moving elements.	Medium	Popular tourism destination, typical developed beach location, unique pier attraction	Medium	Medium susceptibility, medium value
KOP 3: Assateague Island National Seashore	High	Located in Beach. There is almost no development. This consists of a pristine natural beach environment.	High	Typical undeveloped beach location, within National Seashore conservation area	High	High susceptibility, high value
KOP 4: Mansion House	Low	Located in Inland Bays, Lakes, and Ponds and Historic (Agricultural). There is clear evidence of older development (i.e., piers, residences).	High	Typical inland bay location, historical significance	Medium	Low susceptibility, high value
KOP 25: Assateague Beach, Toms Cove Visitor Center	High	Located in Beach. There is almost no development. This consists of a pristine natural beach environment.	High	Typical undeveloped beach location, within National Seashore conservation area	High	High susceptibility, high value

The magnitude of an impact on a seascape or landscape depends on the size or scale of the change associated with the proposed project, the geographic extent of the change, and the duration and reversibility of the change.

The SLVIA guidance recommends that the size or scale of change from loss, addition, or alteration of character, features, elements, or aesthetic, experiential, or perceptual aspects of the seascape/landscape likely to occur from the impact under consideration be described and assessed as to whether the degree of change is large, medium, or small. Size or scale does not refer to the size or scale of the of the project, rather it refers to the size or scale of the change from existing conditions.

For seascape/landscape impacts from offshore wind projects, the geographic extent over which the impact will be experienced, which ultimately is associated with the visibility of the project, is related to the project viewshed. The judgement about the geographic extent of a particular impact is recorded on an ordinal scale of large, medium, or small and is documented and justified by the information provided.

The duration and reversibility of a particular impact is the length of time over which the impact is likely to occur and the degree to which the currently existing conditions are restored after the impact ceases. Duration is recorded on an ordinal scale of short term (less than 5 years), long term (5-30 years), or considered permanent (more than 30 years). The judgment regarding duration should take into consideration any residual impacts remaining after decommissioning. Reversibility is recorded on a verbal scale of nonreversible, partially reversible, or fully reversible. In the assessment of impact level, duration and reversibility are considered together and recorded on a verbal scale of good, fair and poor, with good combining short duration with full reversibility, and poor combining considered permanent with nonreversible.

Table 4-8 provides the size or scale, geographic extent and duration/reversibility ratings for each KOP along with the rationale for each rating.

Table 4-8. Size/Scale, Geographic Extent, and Duration/Reversibility Matrix for Onshore Viewpoints

Key Observation Point Name	Size or Scale Rating (large, medium, small)	Size or Scale Rationale	Geographic Extent Rating (large, medium, small)	Geographic Extent Rationale	Duration/ Reversibility Rating (good, fair, poor)	Duration/ Reversibility Rationale
KOP 23: Wildwood Boardwalk	Small	Significant distance, high curvature screening effect	Small	Low horizontal extent (10% of FOV)	Fair	Long term/ Reversible
KOP 21: Cape May Lighthouse (elevated)	Medium	Significant distance, some curvature screening effect due to elevation	Small	Low horizontal extent (12% of FOV)	Fair	Long term/ Reversible
KOP 21: Cape May Lighthouse (ground level)	Small	Significant distance, high curvature screening effect	Small	Small horizontal extent (11% of FOV)	Fair	Long Term/ Reversible
KOP 22: Fort Miles Historic District, Cape Henlopen	Medium	Moderate distance, other competing visual elements	Small	Small horizontal extent (13% of FOV)	Fair	Long Term/ Reversible
KOP 24: Rehoboth Beach Boardwalk	Medium	Moderate distance, other competing visual elements	Small	Small horizontal extent (15% of FOV)	Fair	Long Term/ Reversible
KOP 20: Delaware Seashore State Park	Large	Moderate distance, few competing visual elements	Small	Small horizontal extent (17% of FOV)	Fair	Long Term/ Reversible
KOP 19: Indian River Life Saving Station	Large	Moderate distance, some competing visual elements	Small	Small horizontal extent (18% of FOV)	Fair	Long Term/ Reversible
KOP 15: Bethany Beach Boardwalk & Wreck Site	Medium	Moderate distance, few competing visual elements	Medium	Medium horizontal extent (26% of FOV)	Fair	Long Term/ Reversible
KOP 6: 84th Street Beach, Ocean City	Large	Low distance, little curvature screening, some competing visual elements,	Large	Large horizontal extent (41% of FOV)	Fair	Long Term/ Reversible
KOP 18: Ocean City Pier, Atlantic Hotel	Large	Low distance, little curvature screening, some competing visual elements	Large	Large horizontal extent (41% of FOV)	Fair	Long Term/ Reversible
KOP 3: Assateague Island National Seashore	Medium	Moderate distance, few competing visual elements	Medium	Medium horizontal extent (34% of FOV)	Fair	Long Term/ Reversible

Key Observation Point Name	Size or Scale Rating (large, medium, small)	Size or Scale Rationale	Geographic Extent Rating (large, medium, small)	Geographic Extent Rationale	Duration/ Reversibility Rating (good, fair, poor)	Duration/ Reversibility Rationale
KOP 4: Mansion House	Small	Significant distance, high terrain screening, many competing visual elements	Medium	Medium horizontal extent (25% of FOV)	Fair	Long Term/ Reversible
KOP 25: Assateague Beach, Toms Cove Visitor Center	Small	Significant distance, high curvature screening effect	Small	Small horizontal extent (16% of FOV)	Fair	Long Term/ Reversible

Once the components for receptor sensitivity (susceptibility and value) and impact magnitude (size and scale, geographic extent, and duration and reversibility) are rated, the components are combined into the magnitude and sensitivity factor values, as detailed in the SLVIA guidance. For example, if both the susceptibility and value ratings are high, then the sensitivity rating is high.

Once the sensitivity and magnitude factors have been determined, they are combined into an overall finding of major, moderate, minor, or negligible overall impact. For example, if the sensitivity rating is low and the magnitude rating is small, the impact level is considered minor. The SLVIA guidance notes that determination of overall impact is subject to change, however, when considering individual project circumstances.

Table 4-9 provides the SLVIA magnitude and overall impact level ratings for each KOP along with the rationale for each rating.

Table 4-9. SLVIA Magnitude and Overall Impact Level Matrix for Onshore Viewpoints

Key Observation Point Name	SLVIA Magnitude Rating (large, medium, small)	SLVIA Magnitude Rationale	SLVIA Overall Impact Level (major, moderate, minor, negligible)	SLVIA Overall Impact Level Rationale
KOP 23: Wildwood Boardwalk	Small	Small size/scale, small geographic extent, fair duration/reversibility	Minor	Small magnitude, medium sensitivity
KOP 21: Cape May Lighthouse (elevated)	Small	Medium size/scale, small geographic extent, fair duration/reversibility	Minor	Small magnitude, high sensitivity, low visibility due to distance
KOP 21: Cape May Lighthouse (ground level)	Small	Small size/scale, small geographic extent, fair duration/reversibility	Minor	Small magnitude, high sensitivity, low visibility due to distance
KOP 22: Fort Miles Historic District, Cape Henlopen	Small	Medium size/scale, small geographic extent, fair duration/reversibility	Minor	Small magnitude, medium sensitivity
KOP 24: Rehoboth Beach Boardwalk	Small	Medium size/scale, small geographic extent, fair duration/reversibility	Minor	Small magnitude, medium sensitivity
KOP 20: Delaware Seashore State Park	Medium	Large size/scale, small geographic extent, fair duration/reversibility	Moderate	Medium magnitude, high sensitivity
KOP 19: Indian River Life Saving Station	Medium	Large size/scale, small geographic extent, fair duration/reversibility	Moderate	Medium magnitude, high sensitivity
KOP 15: Bethany Beach Boardwalk & Wreck Site	Medium	Medium size/scale, medium geographic extent, fair duration/reversibility	Moderate	Medium magnitude, medium sensitivity
KOP 6: 84th Street Beach, Ocean City	Large	Large size/scale, large geographic extent, fair duration/reversibility	Major	Large magnitude, medium sensitivity

Key Observation Point Name	SLVIA Magnitude Rating (large, medium, small)	SLVIA Magnitude Rationale	SLVIA Overall Impact Level (major, moderate, minor, negligible)	SLVIA Overall Impact Level Rationale
KOP 18: Ocean City Pier, Atlantic Hotel	Large	Large size/scale, large geographic extent, fair duration/reversibility	Major	Large magnitude, medium sensitivity
KOP 3: Assateague Island National Seashore	Medium	Medium size/scale, medium geographic extent, fair duration/reversibility	Moderate	Medium magnitude, high sensitivity
KOP 4: Mansion House	Small	Small size/scale, medium geographic extent, fair duration/reversibility	Minor	Small magnitude, low sensitivity
KOP 25: Assateague Beach, Toms Cove Visitor Center	Small	Small size/scale, small geographic extent, fair duration/reversibility	Minor	Small magnitude, high sensitivity, low visibility due to distance

4.3.2 Offshore and Nearshore Viewpoints

Offshore viewers on vessels within the Atlantic Ocean are likely to experience the greatest visual impacts due to the presence of the WTGs and OSSs. In the direction of the Lease area from an offshore viewer, there are limited visual elements competing for visual dominance. As proximity increases, the visual extent and scale of the WTGs increases dramatically. The nearest areas of concentrated vessel traffic are the outbound and inbound traffic lanes from Delaware Bay, which pass by the northeast side of the Lease area (see Figure 4-2). The traffic lanes are used most frequently by commercial shipping vessels, mainly large container ships, which are visible in the video simulation.

The Cape May-Lewes Ferry is a passenger and vehicle ferry with year-round service between Lewes, Delaware to Cape May, New Jersey. Passengers on the ferry would experience views of the Project similar to KOP 22 (Fort Miles Historic District, Cape Henlopen, Delaware) and KOP 21 (Cape May Lighthouse, Cape May, New Jersey) at either end of the journey.

Recreational uses in the Project area consist of recreational fishing and boating. Many of these vessels are visible in the video simulation, consisting of personal vessels (including small motorboats and sailing vessels) used either for transportation between ports or to access offshore recreational areas (i.e., fishing areas, scuba sites). Recreational fishing vessels typically use the Project area to reach fishing grounds further offshore, as none are located within the Lease area (see Figure 13, Offshore Recreational Uses for additional information).

Additional commercial uses of the nearshore Project area include digital advertising on nearshore vessels (https://theseaboard.com/), small vessels used for nearshore water tours of the area, parasailing, and slow-moving aircraft flying at low altitude with advertising banners. Some of these uses can be seen in the video simulation.

4.3.3 Onshore Upland Viewpoints

Upland viewpoints, which includes LSZs and character areas not directly represented by simulations (i.e., beaches, inland bays, public open space), are likely to experience minor to moderate visual impact. As described in section 3.4, many LSZs have limited views of the Project area due to vegetation and artificial structures. Developed areas beyond the immediate coastline with high sensitivity to visual change, such as the historic sites described in Section 3.5, may experience moderate visual impact if WTGs are visible. Other developed areas may be less sensitive to change and will only experience minor impacts. Those limited areas of forest and forested wetland, agricultural land, wetlands, and low vegetation that do have visibility of the Project, will experience minor to moderate visual impact due to distance and partial obstruction of the WTGs.

4.3.4 Impacts from Onshore Structures

The new US Wind substations would be located on private property and not open to the public and, therefore, fully unobstructed public views of the Project substations would not be possible. Ground-level components that are shorter than the surrounding vegetation, such as transformers, circuit breakers, and supporting structures, would potentially be visible only partially from limited areas of Indian River and Indian River Bay to the northeast. Views of the Project substations from the power plant access road directly south of the substation would be limited to workers of the power plant, as the access road is not open to the public. The lightning protection poles, which are tall but narrow cylindrical structures with grounding wires, would be the only portion of the substations potentially visible to viewers in most of the mapped viewshed area, as all other Project structures would be screened by trees. A visual simulation from a public vantage point is provided as Figure 11.

The O&M Facility is proposed in a commercial maritime harbor in West Ocean City, Maryland. Based on the surrounding area, proposed Project structures would be found in previously commercially developed areas and match the existing visual character of the area. Additional information regarding the proposed buildout on potential properties, including digital renderings of the potential layout on the maximum property footprint, is included in Section 2.6.2

Impacts to the landscape from onshore Project elements are expected to be minor to moderate. Export cables and transition vaults will be buried underground and not visible. The onshore substation is adjacent to the existing Indian River 230 kV substation and in close proximity to NRG's Indian River Power Station. The only structure that is expected to be visible from nearby publicly accessible property is the lightning rod (Figure 11). This structure will be consistent with the existing substation visual character and appearance in terms of components and height. Sensitivity in the viewshed of the onshore project components is likely to be lower due to the existing electric generating facilities and related industrial structures in the immediate vicinity.

4.3.5 Nighttime Impacts

WTGs, when unlit, are unlikely to be visible from shore. When nacelle- and tower-mounted FAA lights are active, the visual change may have a moderate to major visual impact at KOPs from which the lights are visible, particularly when no nearby artificial light source is present. However, an ADLS Efficacy Analysis, completed by Capitol Airspace Group, concluded the use of an ADLS-controlled lighting system would result in a more than 99% decrease in the length of time FAA obstruction lights would be lit compared to obstruction lighting illuminated during all nighttime hours (see Appendix E). Based on an evalution of historical flight data in the vicinity of the Lease area, lights would have been activitated for a total of 5 hours 46 minutes and 22 seconds in a year.

4.3.6 Summary

Overall visual impact on scenic quality at selected viewpoints is likely to be variable between sites considering the broad geographic area impacted but is generally expected to be moderate due to the level of visual contrast and extent of the WTGs in the context of the overall oceanfront landscape. The simulations are conservative in that they present what may be visible on a clear day. Haze, rain, snow, fog, cloudy or overcast skies or sea spray that typically occurs in this location would decrease the overall visibility. The installation and decommissioning of the export cable and the WTGs would cause additional temporary impacts to visually sensitive resources in the area, but the only visible elements during operation would be the WTGs. The dominant visual element remains the sky and ocean view.

5.0 Mitigation Options

Mitigation options for reducing the visual impact of the WTGs are limited by the dimensions of the WTGs, the dimensions of the Lease area, and BOEM and FAA requirements for nighttime lighting.

US Wind has incorporated many of these mitigation options into the Project design, including the location of the WTGs within the Lease area, which has been designed to maximize the distance between the shoreline and the turbine array.

The following design-level mitigation measures are recommended to reduce or mitigate visual impact of the Project.

- Arrange WTG structures in a uniform grid pattern and maintain consistency in dimensions, color, design, and movement.
- Use an FAA-recommended paint color that is not pure white (RAL 90) for any WTG components visible from shore (see Section 2.5). The WTG paint color will be determined in consultation with BOEM, FAA, and USCG.
- Utilize FAA warning lights with the longest off cycle permitted by the FAA, and incorporate radar activated aviation obstruction lights (such as ADLS) to minimize the amount of time the lights are on, if permitted by overseeing agencies.

Based on the anticipated level of visual impact and limitations to mitigation options due to federal requirements, no further mitigation is recommended for this Project.

6.0 Conclusions

Visual impacts are dependent on the distance between the viewer and the Project (and resulting obstruction by the curvature of the earth itself), the atmospheric conditions that could screen some or all the foundation, and portions of the WTG tower, nacelle, and rotor, and any other natural or constructed obstructions located between the viewer and the Project. As shown in the visual simulations (Appendix A), the widest portion of the WTGs (foundation and deck) would be below the visual horizon and would not be visible for most of the WTGs from the assessed viewpoints. The visual impact of the WTGs would be primarily caused by the wind turbine towers, nacelles, moving turbine blades, and FAA lights, where visible.

The WTGs would be clearly visible from many offshore and onshore locations under optimal visibility conditions (a clear, low humidity day) and hard to see in haze, rain, snow, cloudy or overcast skies, sea spray or fog that typically occurs in these locations.

Visibility would rarely occur beyond the eastern shore beaches and the first row of buildings or houses, except for Assateague Island and the inland shores west of Assateague Island. The viewshed analysis suggests that 7.1 percent of the shoreward VSA may have visibility of the WTGs, while 4.0 percent may have visibility of the WTG nacelles and associated FAA lights. Much of the visible area (81.4 percent) occurs over open water in the eastern portion of the VSA.

The visual simulations demonstrate that visibility of the proposed WTGs is present in most coastal areas within the VSA and the proposed WTGs would likely be distinguishable to the average viewer under clear conditions. Similarly, the FAA lights at night would most likely be visible from the shore under clear weather conditions. When the FAA obstruction lights are activated, these lights would likely be visible on clear nights from the shoreline. Therefore, the presence of a flashing light or lights on the WTGs and OSSs at night would be visible from the shore (BOEM 2007). However, the use of ADLS would greatly reduce the impacts of lighting, with lights only on and visible when aircraft are present in the area. Weather conditions such as fog, haze, clouds, or precipitation would greatly limit the visibility of the WTGs and lighting from the shore both during daytime and nighttime.

Overall, visual impacts to onshore viewers of the WTGs in clear daytime or nighttime conditions is expected to be minor to major in the areas from which WTGs can be seen (see Table 4-4). For areas with unobstructed views toward the Project within 15 miles of the Project (e.g., 84th Street Beach), WTGs will be noticeable and may draw significant attention under clear visibility conditions. As distance between the viewer and Project Area increases, the WTGs become less noticeable and occupy a smaller fraction of the visible seascape/landscape. For those KOPs at the limits of Project visibility (e.g., Toms Cove Visitor Center at Assateague Beach, Wildwood Boardwalk), visual change will be minor.

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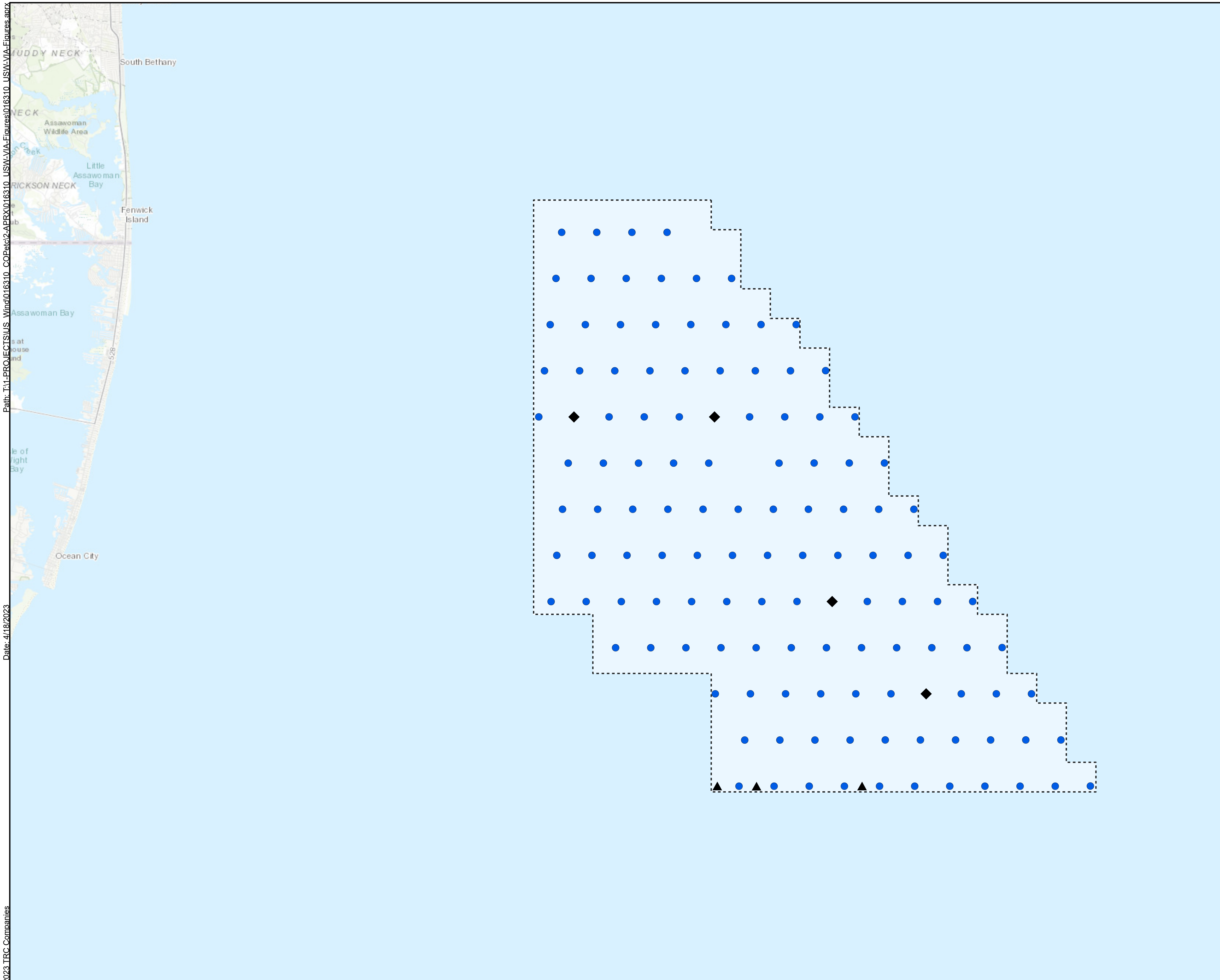
Attached Figures



Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 1
Wind Turbine Generator Layout

Legend

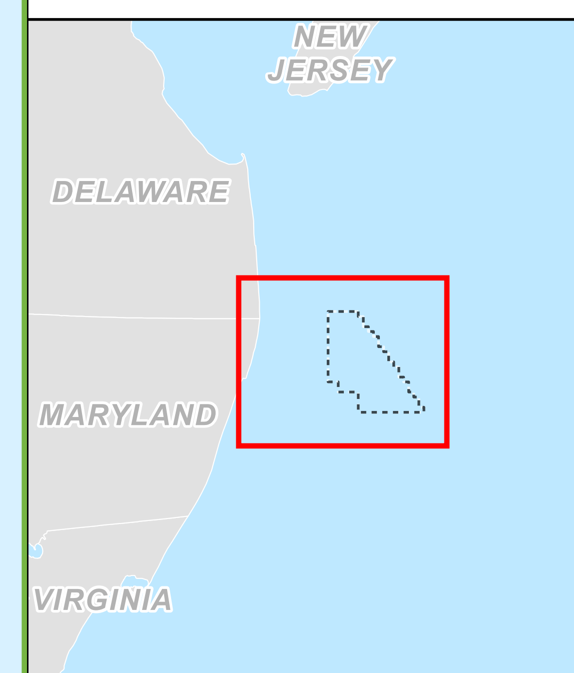
- Wind Turbine Generator (121)
- Potential Met Tower Locations (USW, 2021)
- Offshore Substation (4) (USW, 2021)
- US Wind Lease Area

0 2 4 8
Kilometers

1:150,000
Inset: 1:1,800,000

Source: 1) ESRI, Ocean Basemap, 2022
2) US Wind, Turbine Layout, July 2021

Datum: NAD 1983 UTM Zone 18N



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TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

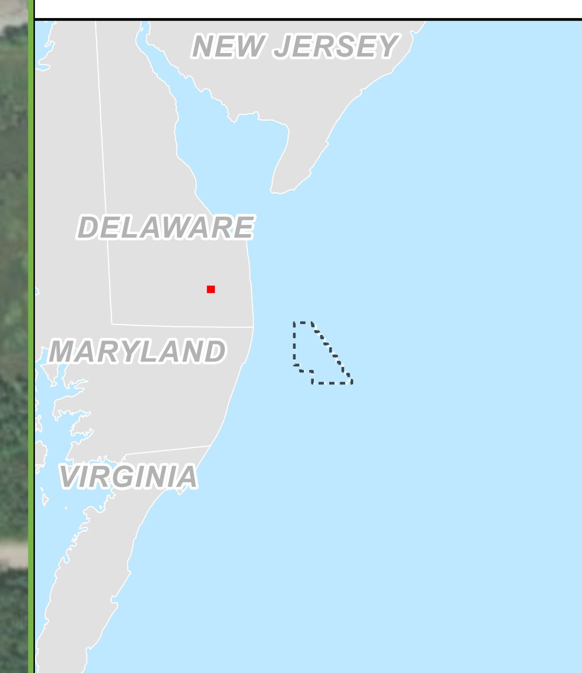
Figure 2
Interconnection Location

Legend
Proposed US Wind Substation
Proposed Substation Expansion

0 0.02 0.04 0.09 Miles
0 40 80 160 Meters

Source: 1) ESRI, World Imagery, 2018
2) US Wind, Interconnection Layout, 2019

Datum: NAD 1983 UTM Zone 18N



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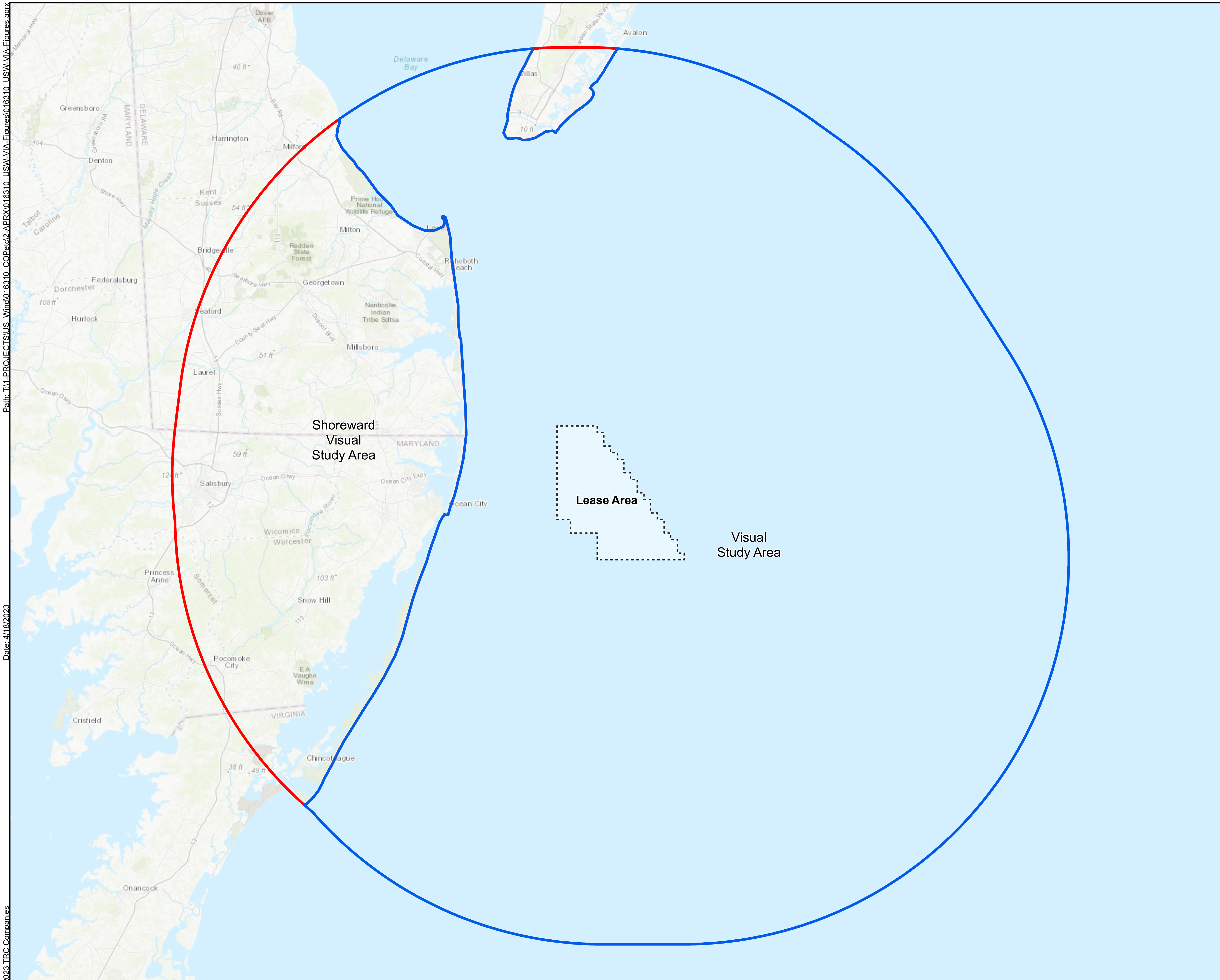


Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 3

Visual Study Area

Legend

US Wind Lease Area

43-Mile Visual Study Area *

Visual Study Area

Shoreward Visual Study Area

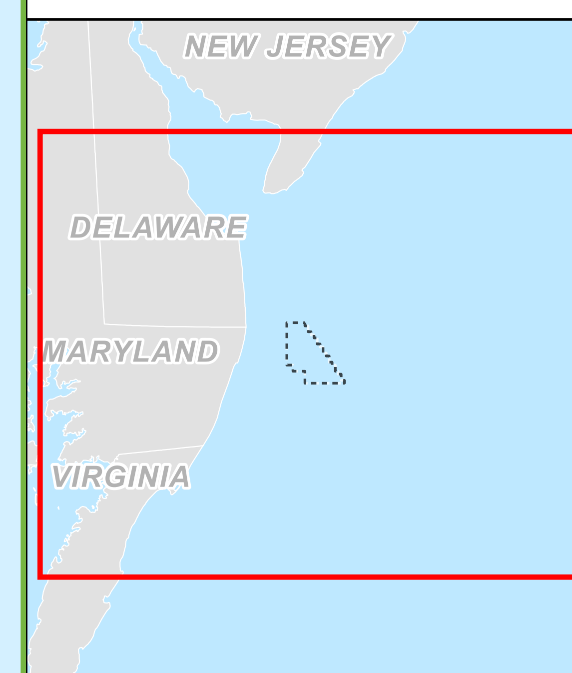
* The VSA is based on a 43-mile radius around each WTG location.

0 4.75 9.5 19 Miles

0 5 10 20 Kilometers

Source: 1) ESRI, World Topo Basemap, 2022
2) BOEM, Lease Area, 2018

Datum: NAD 1983 UTM Zone 18N



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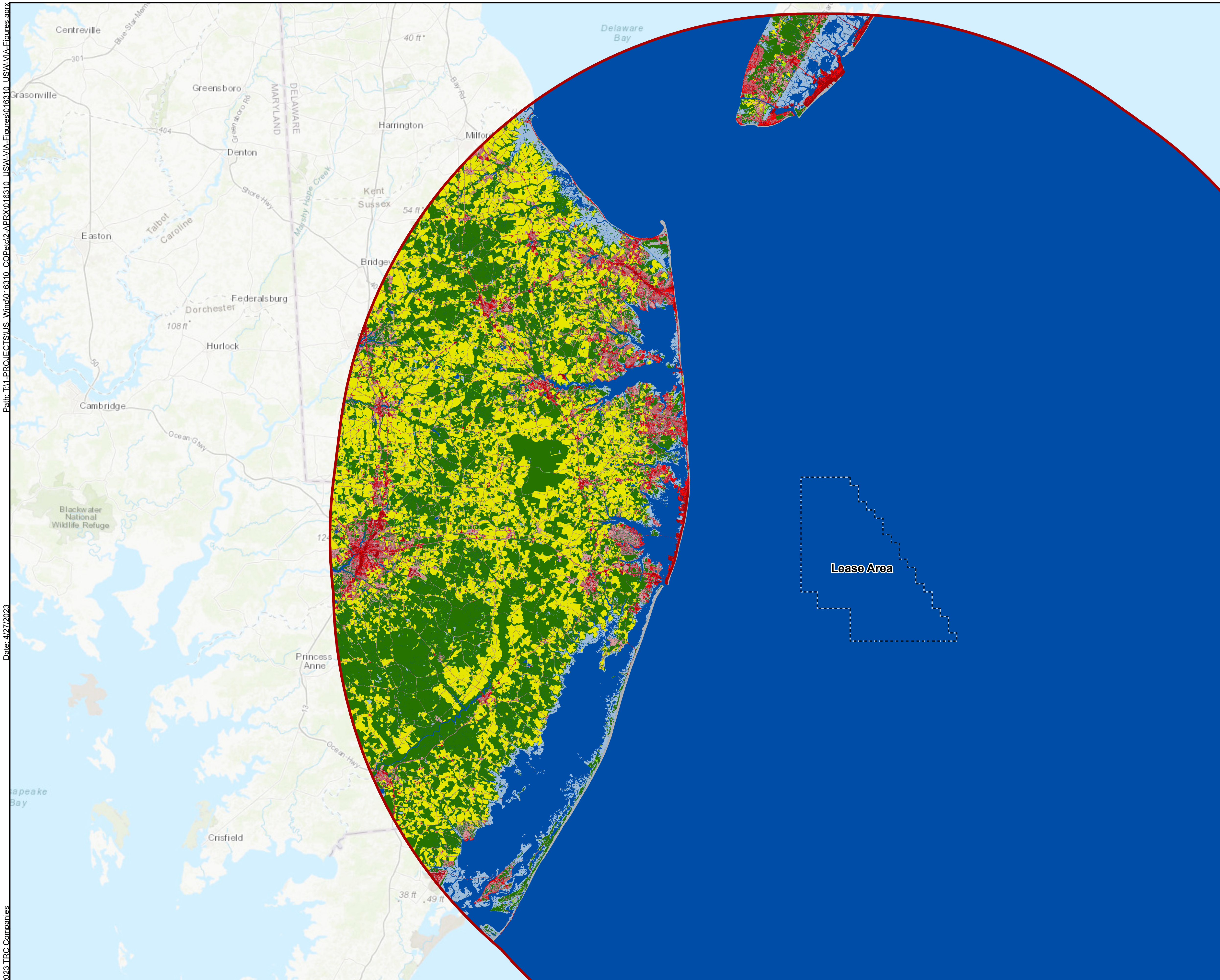


TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 4
Overview of Landscape Similarity Zones

Legend

- US Wind Lease Area
- 43-Mile Visual Study Area *

LSZ

- Open Water
- Forest and Forested Wetlands
- Agriculture
- Developed, Open Space
- Wetlands
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Beach
- Shrub/Scrub and Grasslands

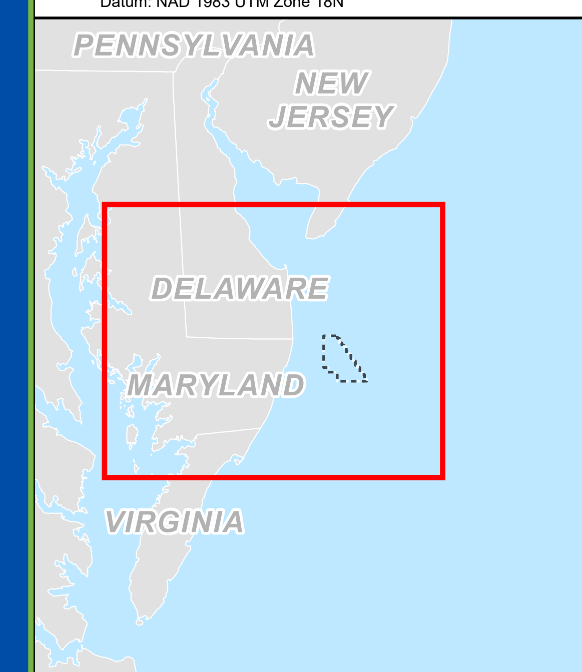
* The VSA is based on a 43-mile radius around each WTG location.

0 4 8 16 Miles

0 5 10 20 Kilometers

Source: 1) ESRI, World Topo Basemap, 2022
2) BOEM, Lease Area, 2019
3) NLCD, 2016 Land Cover, 2019

Datum: NAD 1983 UTM Zone 18N



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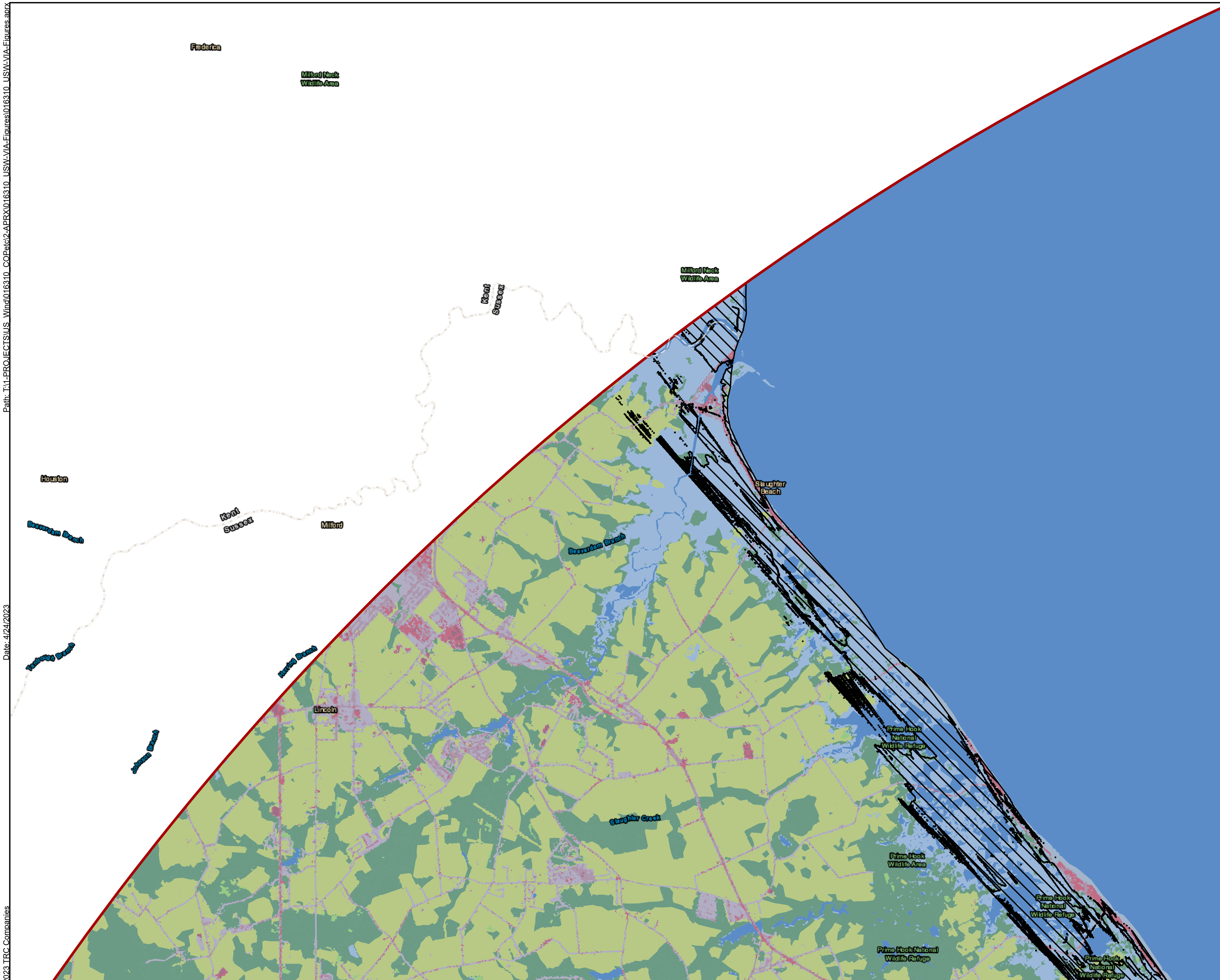


Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 5
Sheet 1 of 12

Landscape Similarity Zones

Legend

- Selected Simulation Location
- Potential Turbine Blade Visibility (43 mi)

LSZ

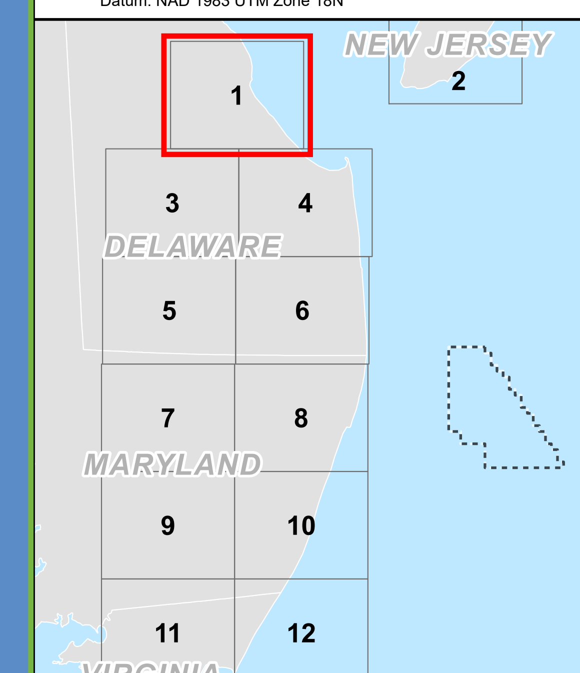
- Open Water
- Forest and Forested Wetlands
- Agriculture
- Developed, Open Space
- Wetlands
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Beach
- Shrub/Scrub and Grasslands

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) BOEM, Lease Area, 2013
2) TNC, Secured Lands, 2015
3) DE Dept. of Agriculture, State Forests, 2021
4) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

Datum: NAD 1983 UTM Zone 18N



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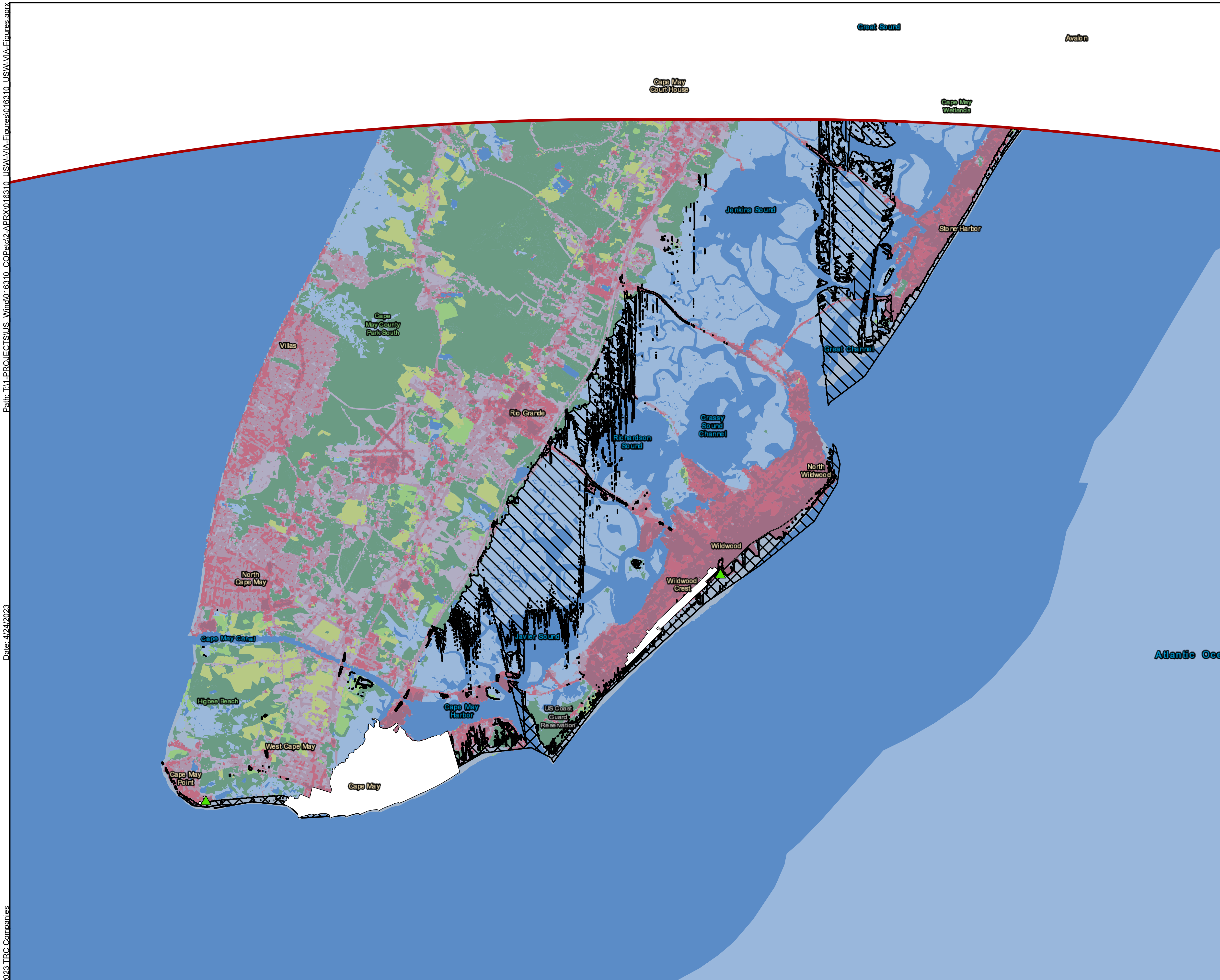

Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 5

Sheet 2 of 12

Landscape Similarity Zones

Legend

- Selected Simulation Location
- Historic Resources (area)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

LSZ

- Open Water
- Forest and Forested Wetlands
- Agriculture
- Developed, Open Space
- Wetlands
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Beach
- Shrub/Scrub and Grasslands

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) BOEM, Lease Area, 2013
2) TNC, Secured Lands, 2015
3) DE Dept. of Agriculture, State Forests, 2021
4) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

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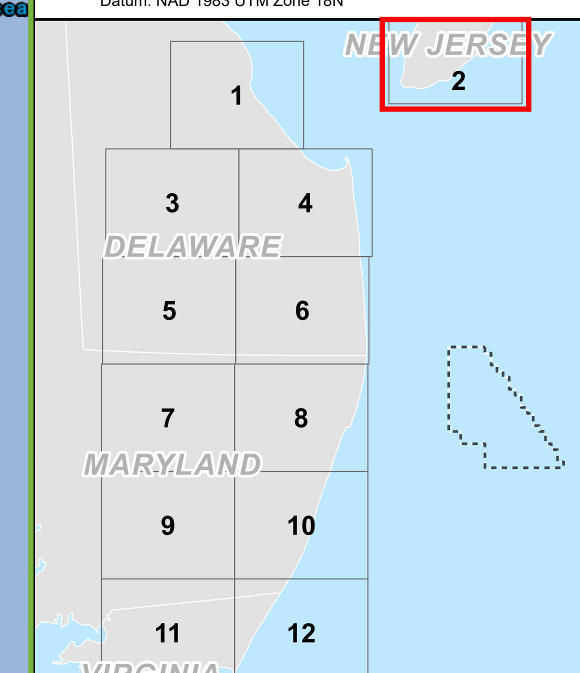

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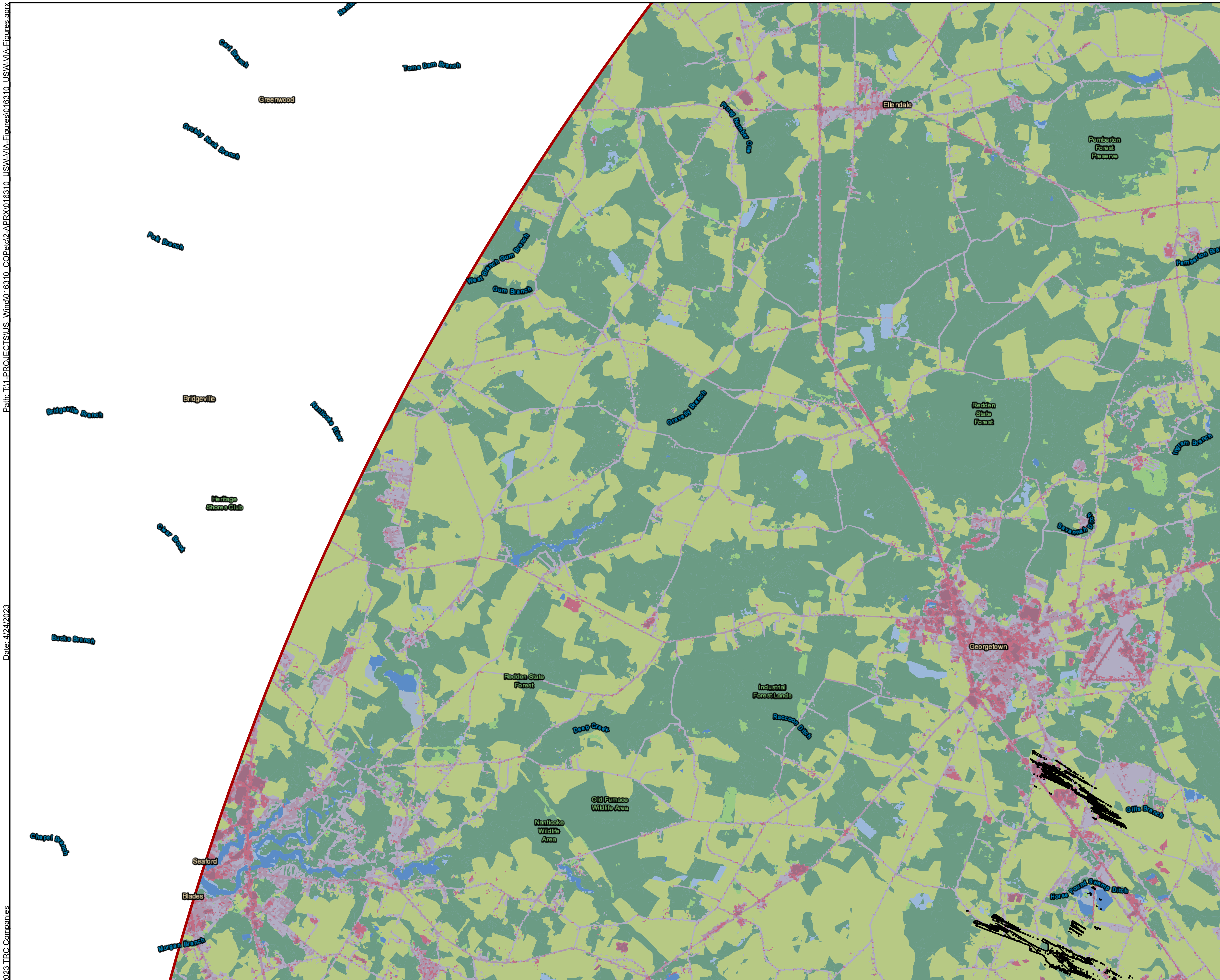


TRC

Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 5

Sheet 3 of 12

Landscape Similarity Zones

Legend

- Selected Simulation Location
- Potential Turbine Blade Visibility (43 mi)

LSZ

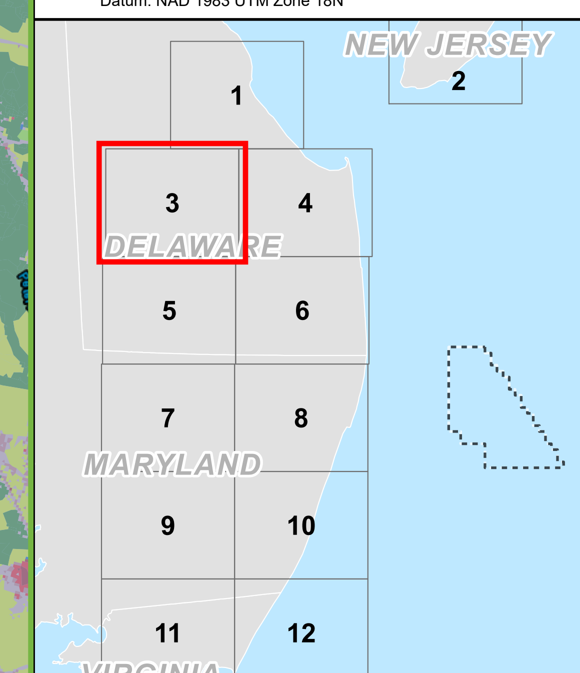
- Open Water
- Forest and Forested Wetlands
- Agriculture
- Developed, Open Space
- Wetlands
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Beach
- Shrub/Scrub and Grasslands

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) BOEM, Lease Area, 2013
2) TNC, Secured Lands, 2015
3) DE Dept. of Agriculture, State Forests, 2021
4) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

Datum: NAD 1983 UTM Zone 18N



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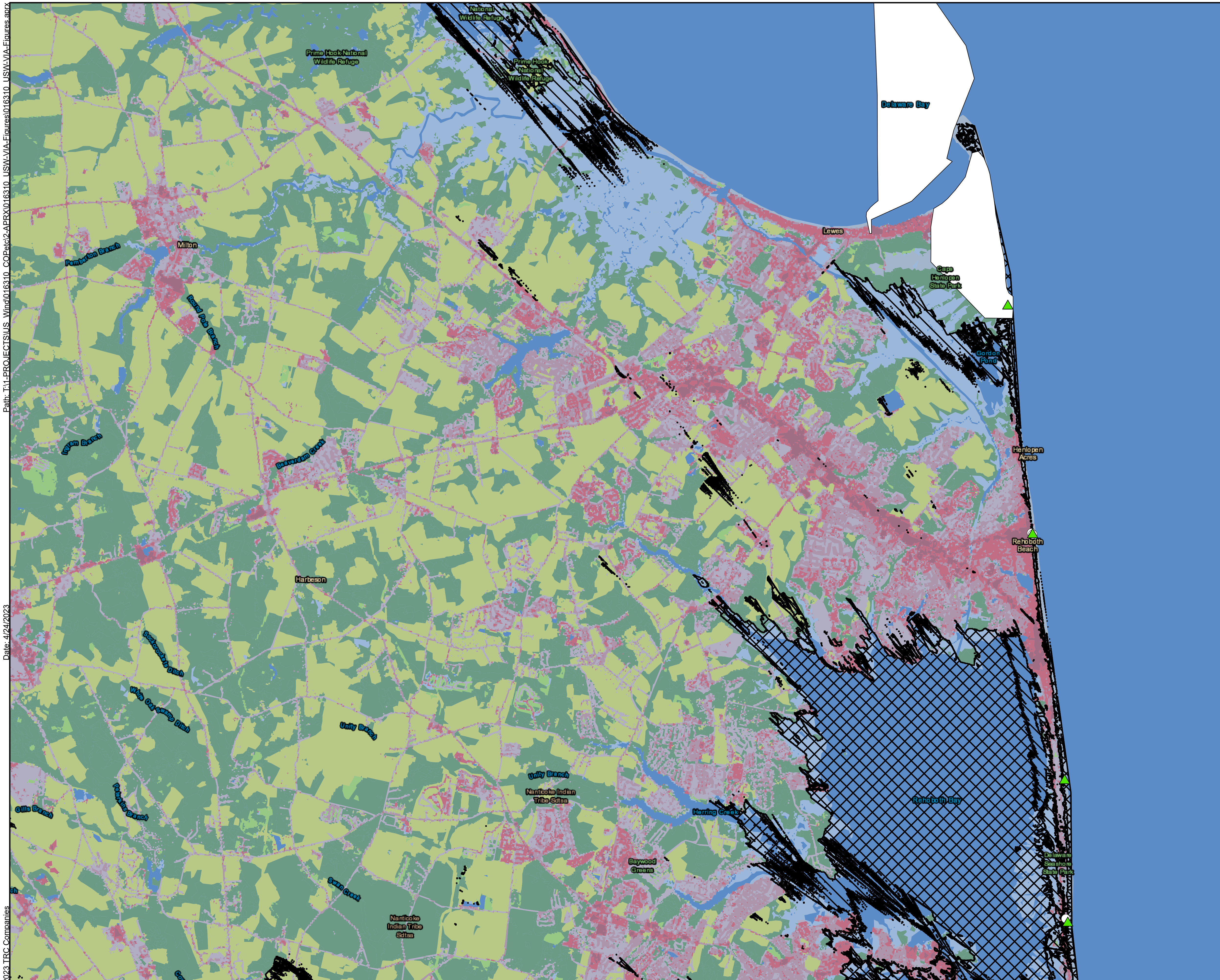


TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 5

Sheet 4 of 12

Landscape Similarity Zones

Legend

- Selected Simulation Location
- Historic Resources (point)
- Historic Resources (area)
- Potential Offshore Substation Visibility (43 mi)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

LSZ

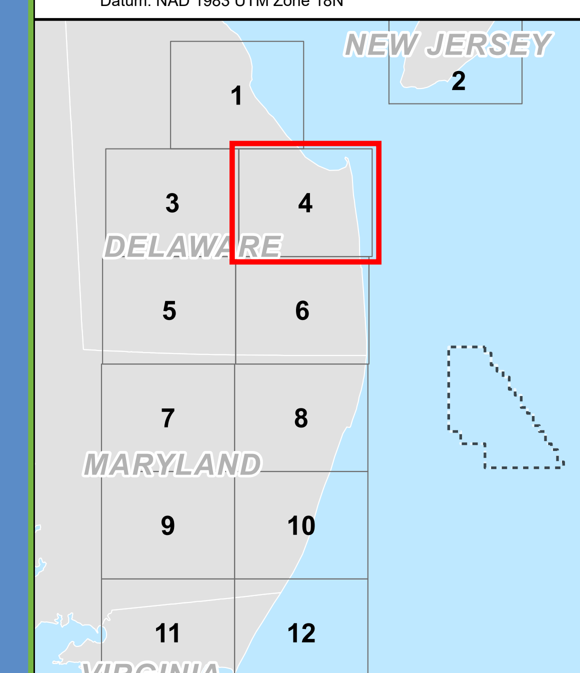
- Open Water
- Forest and Forested Wetlands
- Agriculture
- Developed, Open Space
- Wetlands
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Beach
- Shrub/Scrub and Grasslands

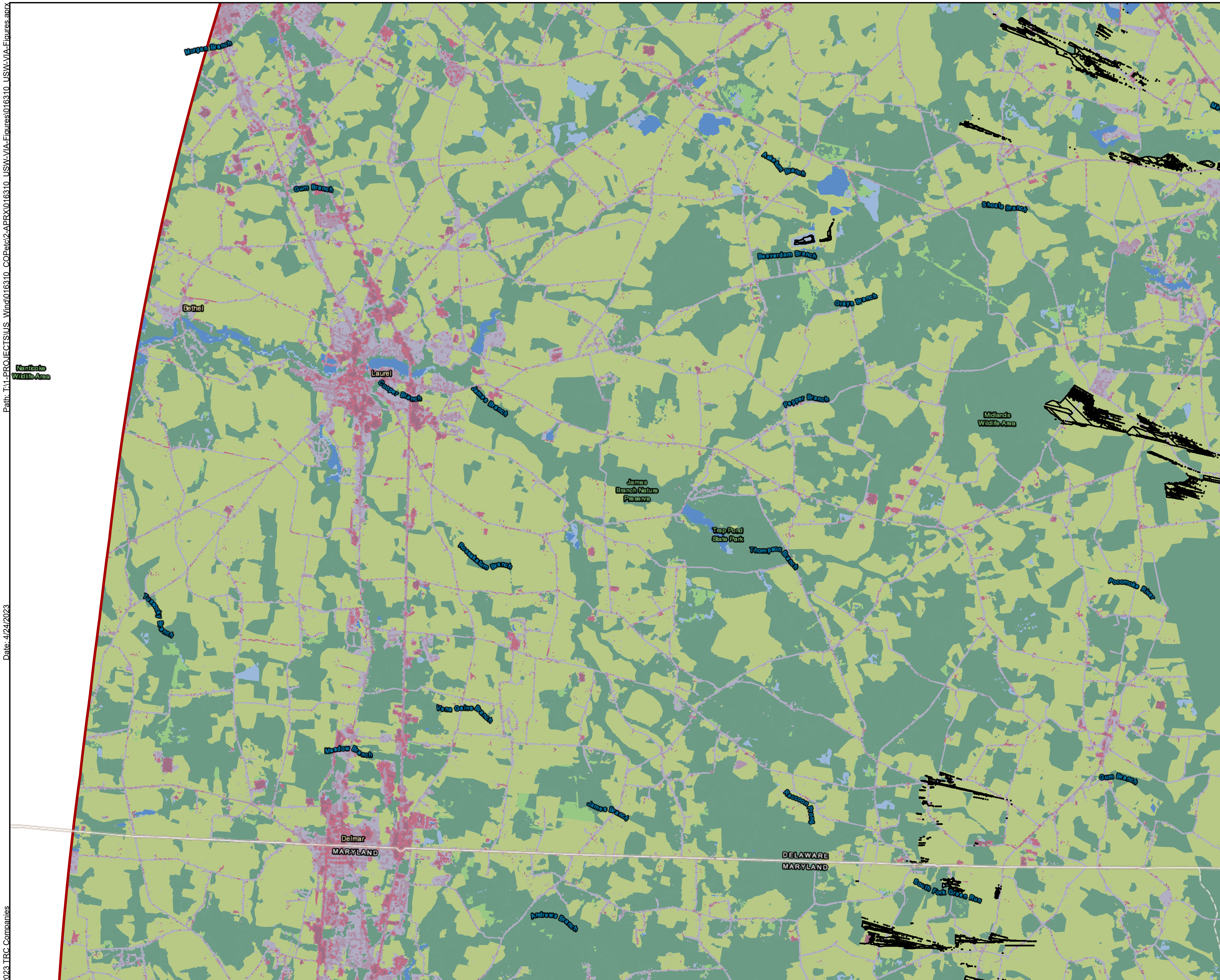
0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) BOEM, Lease Area, 2013
2) TNC, Secured Lands, 2015
3) DE Dept. of Agriculture, State Forests, 2021
4) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

Datum: NAD 1983 UTM Zone 18N





Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 5

Sheet 5 of 12

Landscape Similarity Zones

Legend

- Selected Simulation Location
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

LSZ

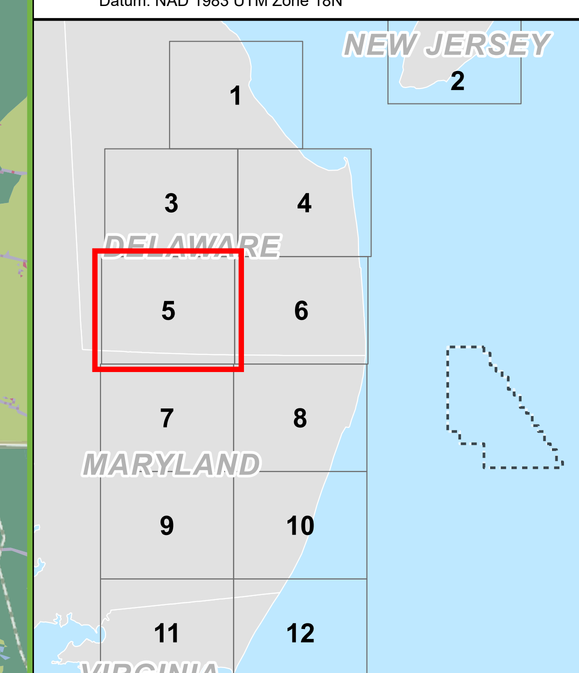
- Open Water
- Forest and Forested Wetlands
- Agriculture
- Developed, Open Space
- Wetlands
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Beach
- Shrub/Scrub and Grasslands

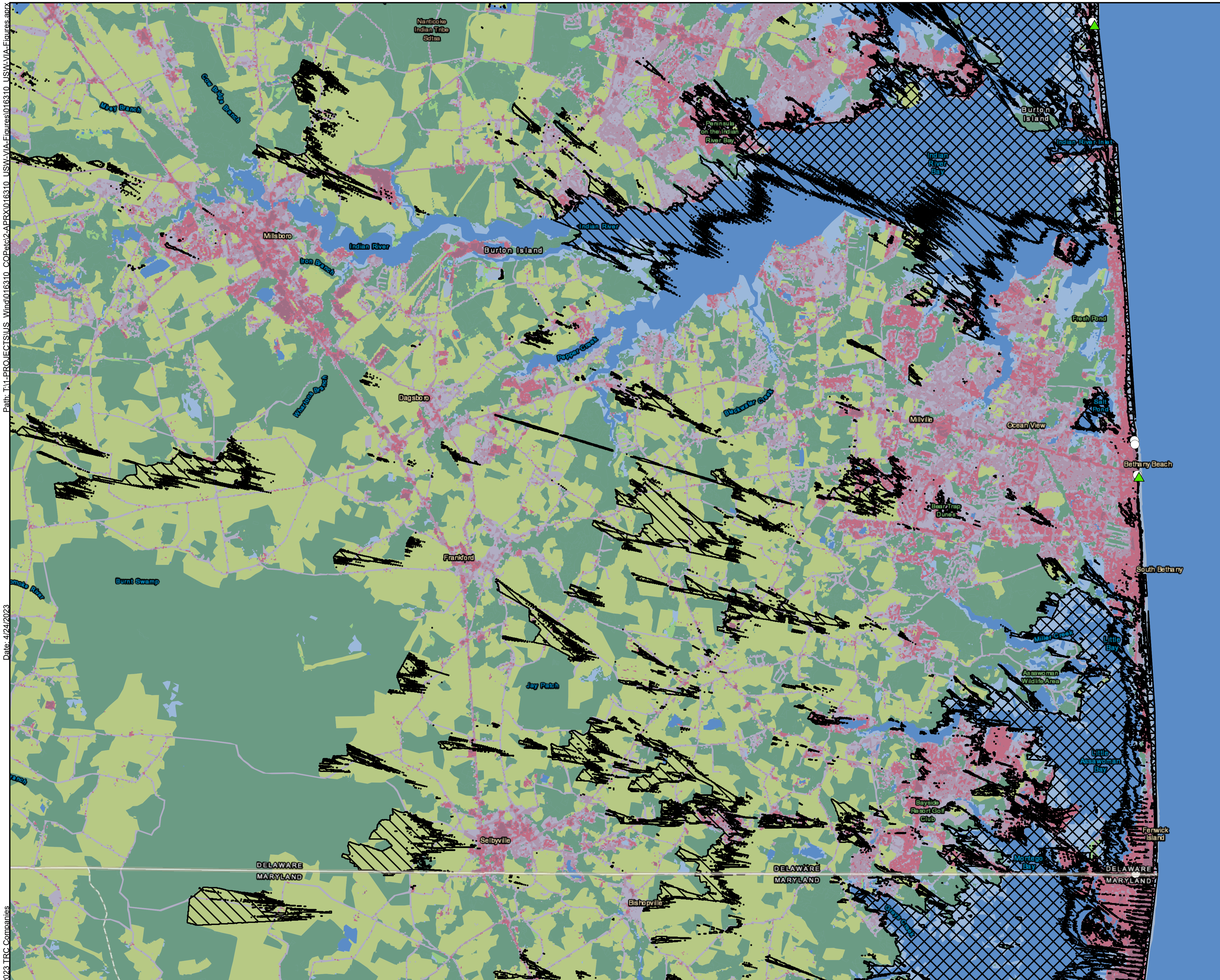
0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) BOEM, Lease Area, 2013
2) TNC, Secured Lands, 2015
3) DE Dept. of Agriculture, State Forests, 2021
4) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

Datum: NAD 1983 UTM Zone 18N





Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 5

Sheet 6 of 12

Landscape Similarity Zones

Legend

- Selected Simulation Location
- Historic Resources (point)
- Potential Offshore Substation Visibility (43 mi)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

LSZ

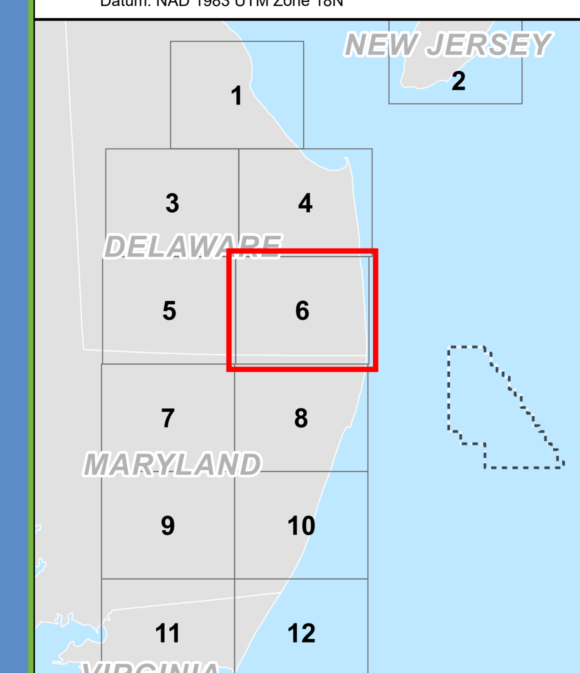
- Open Water
- Forest and Forested Wetlands
- Agriculture
- Developed, Open Space
- Wetlands
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Beach
- Shrub/Scrub and Grasslands

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) BOEM, Lease Area, 2013
2) TNC, Secured Lands, 2015
3) DE Dept. of Agriculture, State Forests, 2021
4) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

Datum: NAD 1983 UTM Zone 18N



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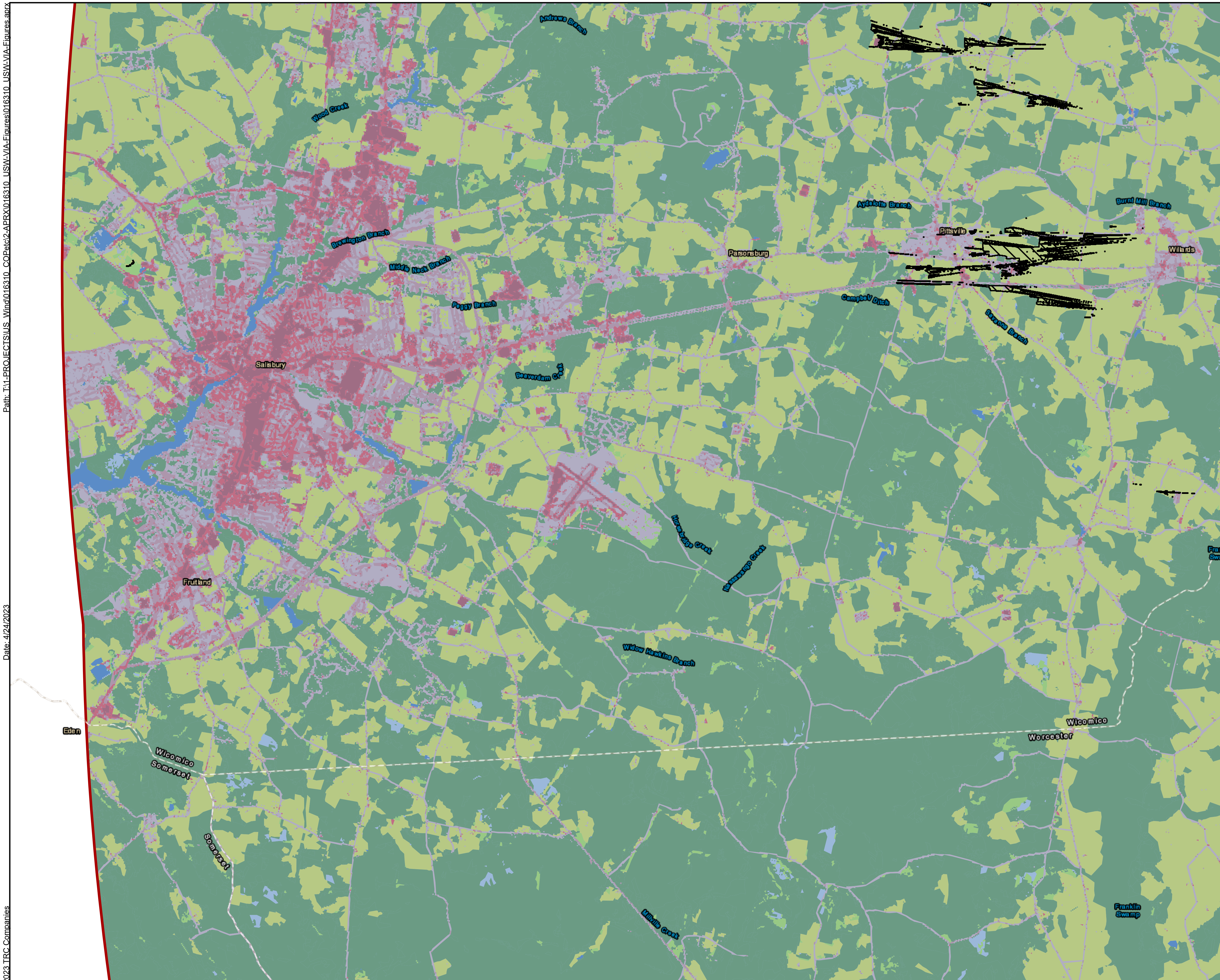


Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 5

Sheet 7 of 12

Landscape Similarity Zones

Legend

- Selected Simulation Location
- Potential Turbine Blade Visibility (43 mi)

LSZ

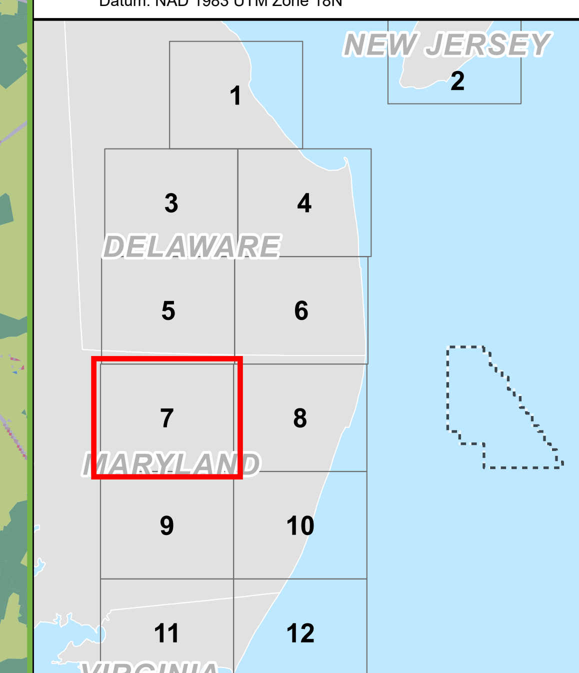
- Open Water
- Forest and Forested Wetlands
- Agriculture
- Developed, Open Space
- Wetlands
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Beach
- Shrub/Scrub and Grasslands

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) BOEM, Lease Area, 2013
2) TNC, Secured Lands, 2015
3) DE Dept. of Agriculture, State Forests, 2021
4) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

Datum: NAD 1983 UTM Zone 18N



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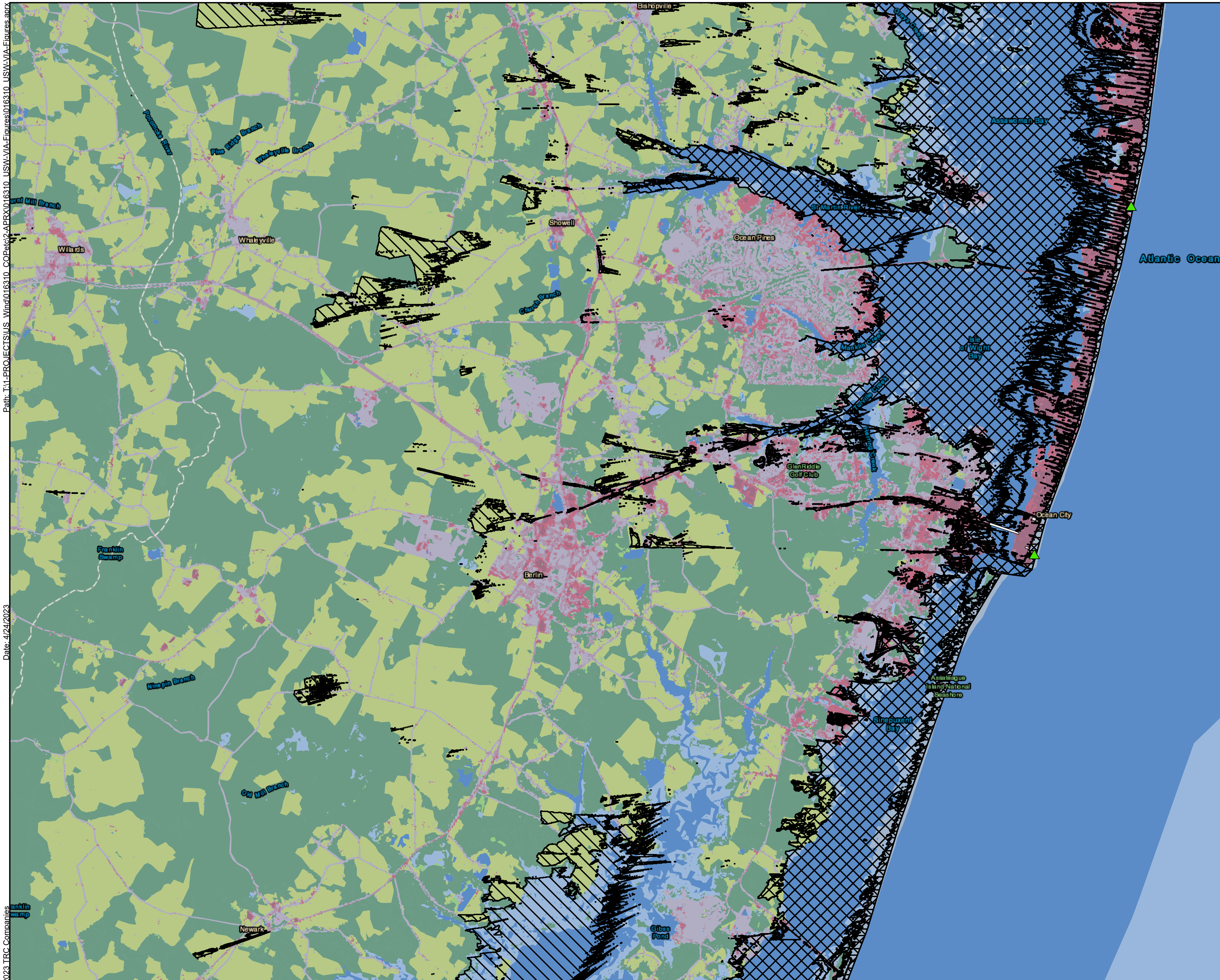

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Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 5
Sheet 8 of 12

Landscape Similarity Zones

Legend

- Selected Simulation Location
- Historic Resources (area)
- Potential Offshore Substation Visibility (43 mi)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

LSZ

- Open Water
- Forest and Forested Wetlands
- Agriculture
- Developed, Open Space
- Wetlands
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Beach
- Shrub/Scrub and Grasslands

0 0.5 1 2 Miles
0 1 2 4 Kilometers

Source: 1) BOEM, Lease Area, 2013
2) TNC, Secured Lands, 2015
3) DE Dept. of Agriculture, State Forests, 2021
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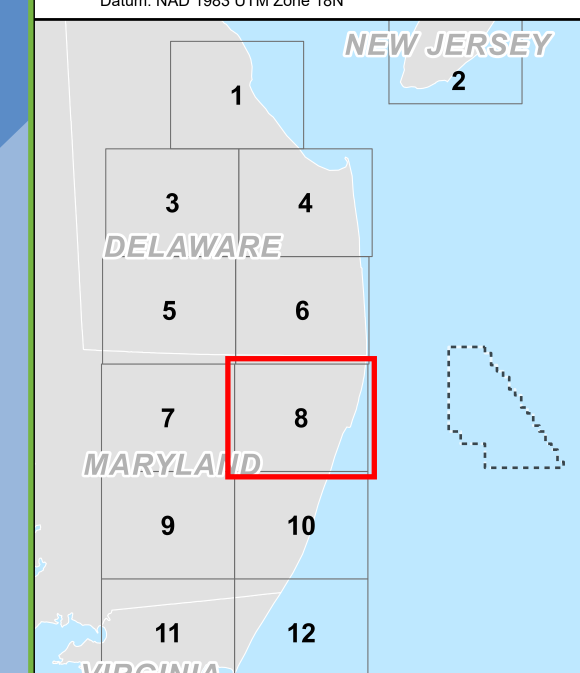

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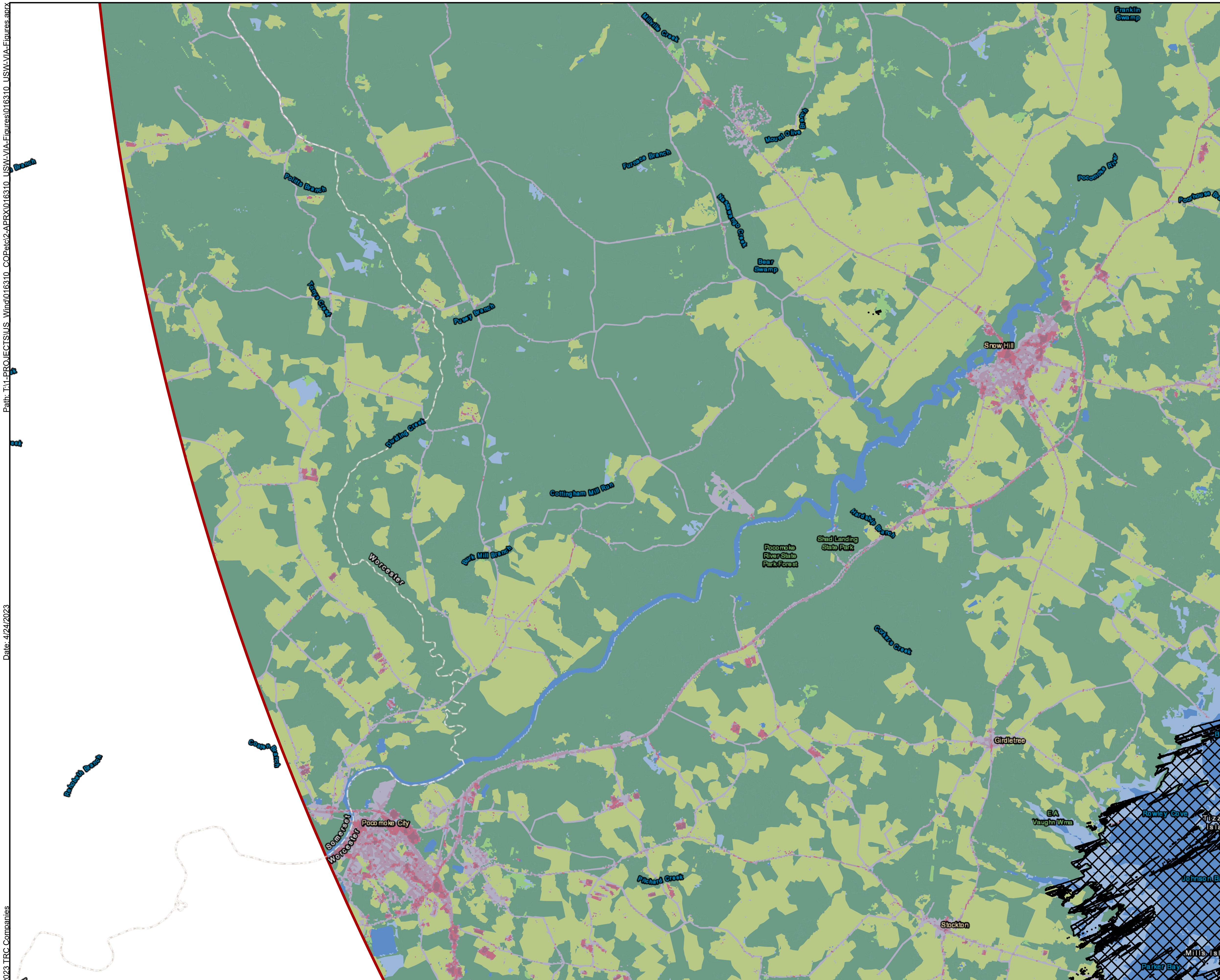

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 5
Sheet 9 of 12

Landscape Similarity Zones

Legend

- Selected Simulation Location
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

LSZ

- Open Water
- Forest and Forested Wetlands
- Agriculture
- Developed, Open Space
- Wetlands
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Beach
- Shrub/Scrub and Grasslands

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) BOEM, Lease Area, 2013
2) TNC, Secured Lands, 2015
3) DE Dept. of Agriculture, State Forests, 2021
4) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

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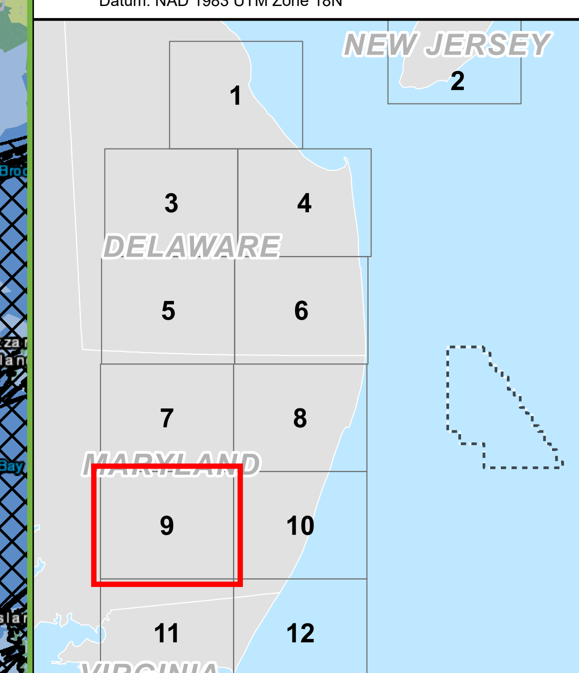
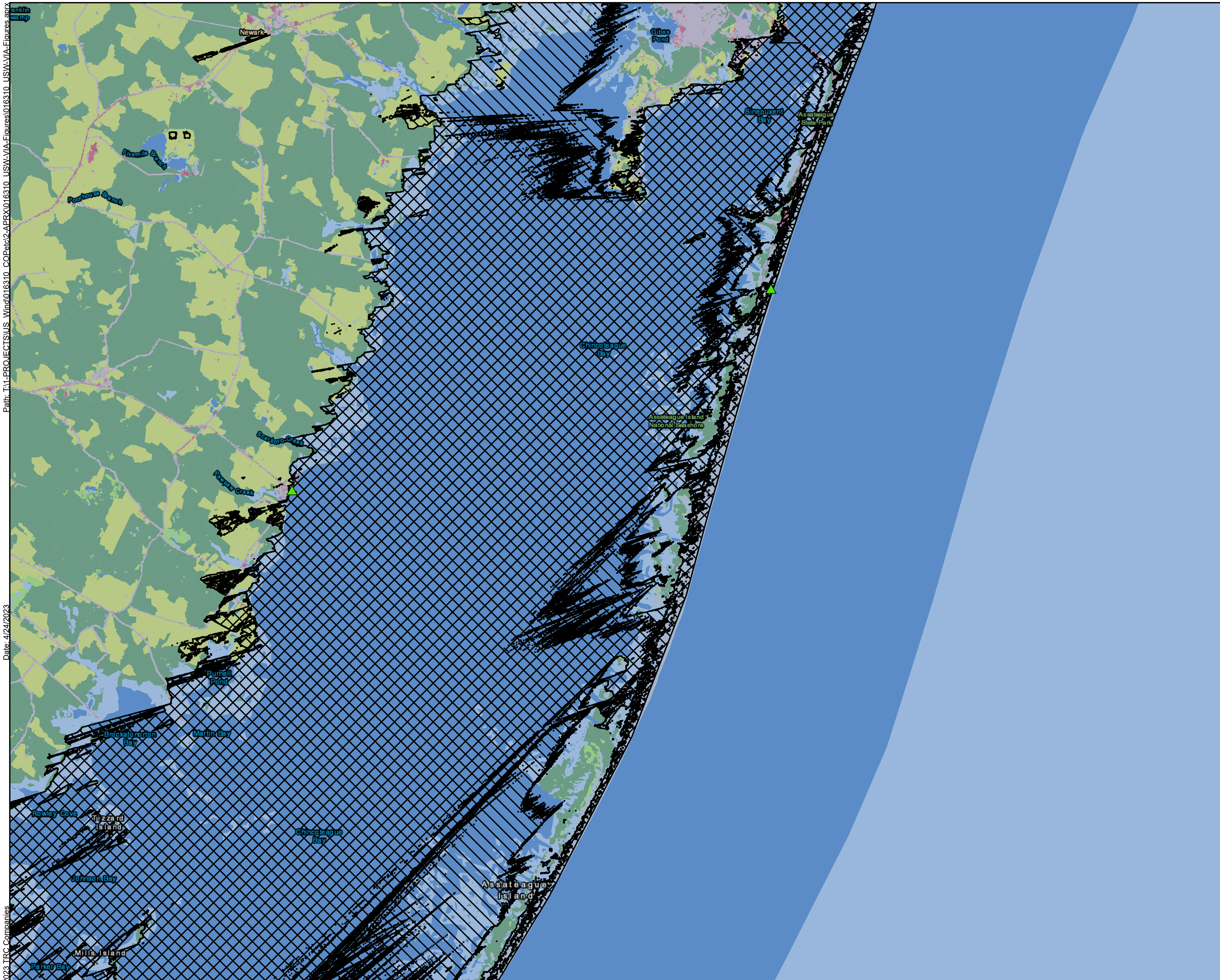




TRC

Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 5

Sheet 10 of 12

Landscape Similarity Zones

Legend

- Selected Simulation Location
- Potential Offshore Substation Visibility (43 mi)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

LSZ

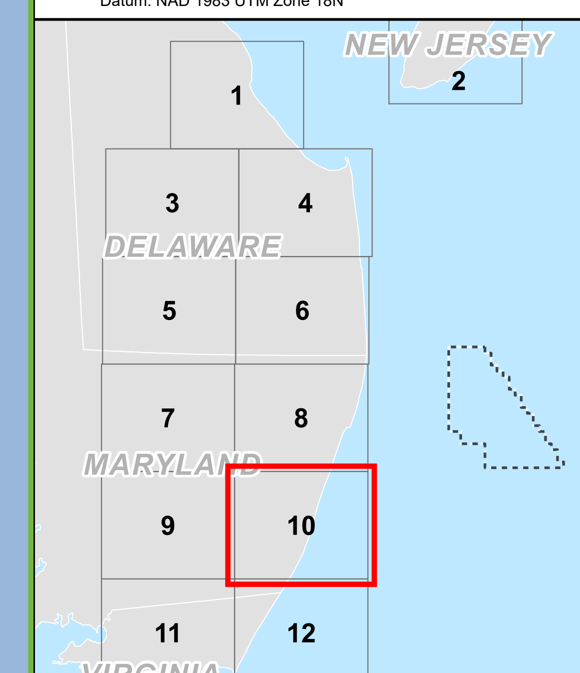
- Open Water
- Forest and Forested Wetlands
- Agriculture
- Developed, Open Space
- Wetlands
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Beach
- Shrub/Scrub and Grasslands

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) BOEM, Lease Area, 2013
2) TNC, Secured Lands, 2015
3) DE Dept. of Agriculture, State Forests, 2021
4) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

Datum: NAD 1983 UTM Zone 18N



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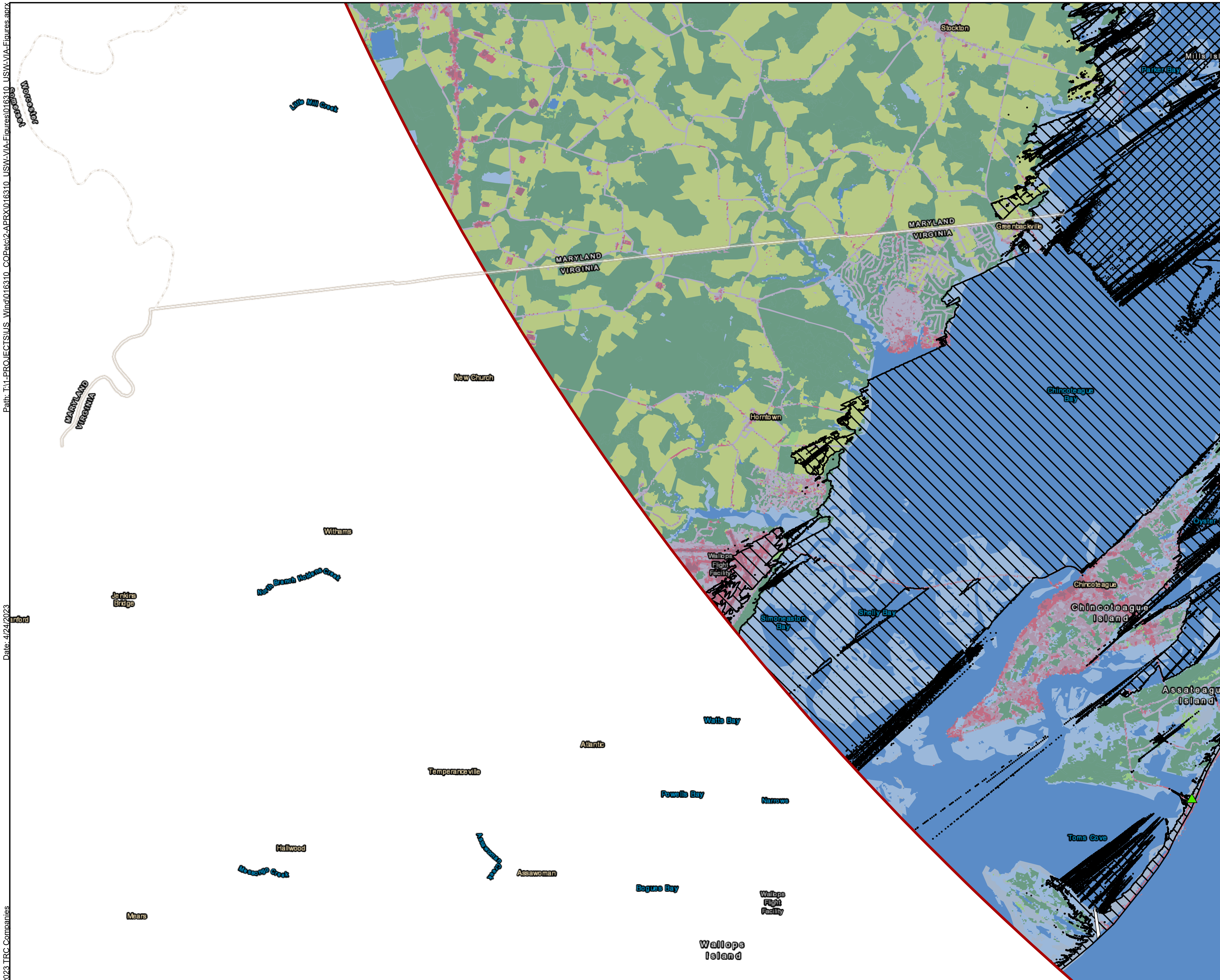


Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 5
Sheet 11 of 12

Landscape Similarity Zones

Legend

- Selected Simulation Location
- Historic Resources (area)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

LSZ

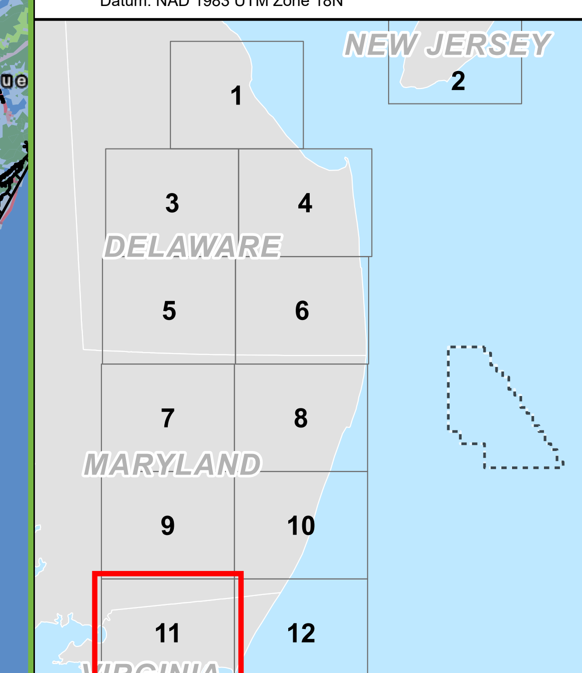
- Open Water
- Forest and Forested Wetlands
- Agriculture
- Developed, Open Space
- Wetlands
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Beach
- Shrub/Scrub and Grasslands

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) BOEM, Lease Area, 2013
2) TNC, Secured Lands, 2015
3) DE Dept. of Agriculture, State Forests, 2021
4) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

Datum: NAD 1983 UTM Zone 18N



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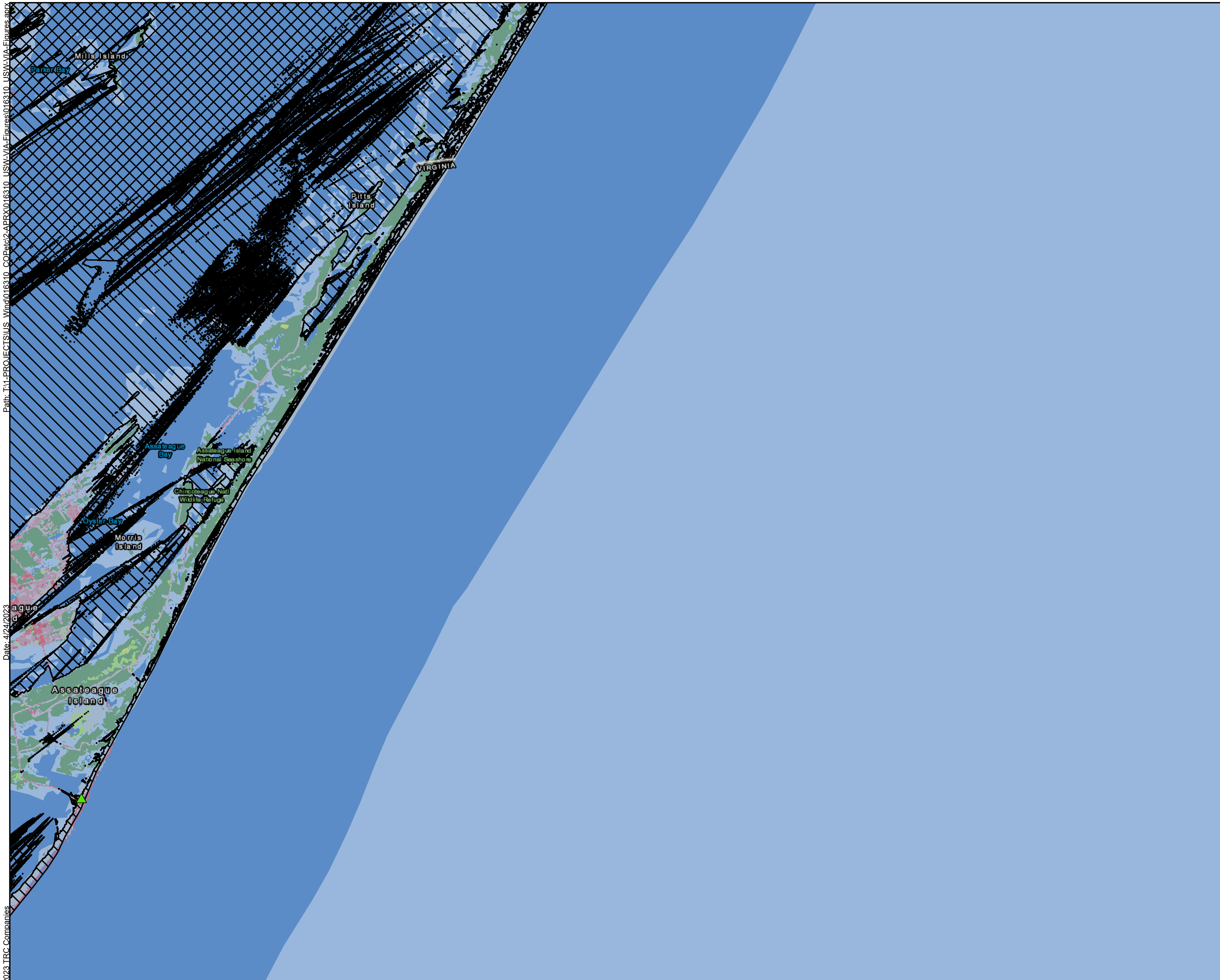

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 5
Sheet 12 of 12

Landscape Similarity Zones

Legend

- Selected Simulation Location
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

LSZ

- Open Water
- Forest and Forested Wetlands
- Agriculture
- Developed, Open Space
- Wetlands
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed High Intensity
- Beach
- Shrub/Scrub and Grasslands

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) BOEM, Lease Area, 2013
2) TNC, Secured Lands, 2015
3) DE Dept. of Agriculture, State Forests, 2021
4) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

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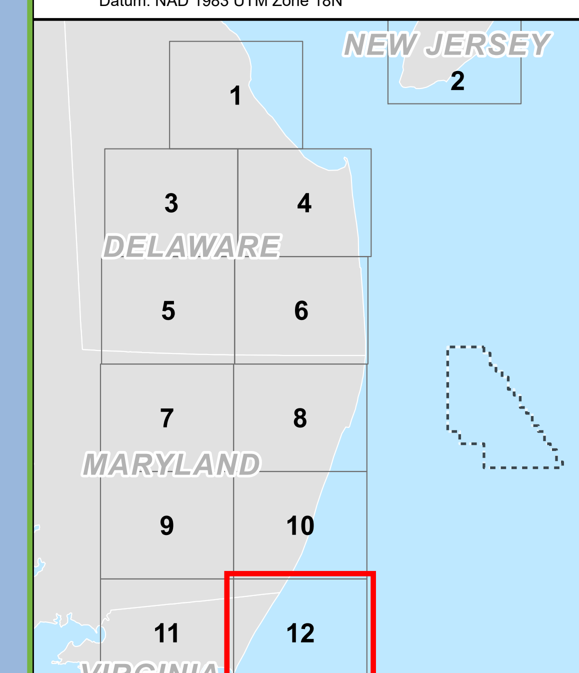

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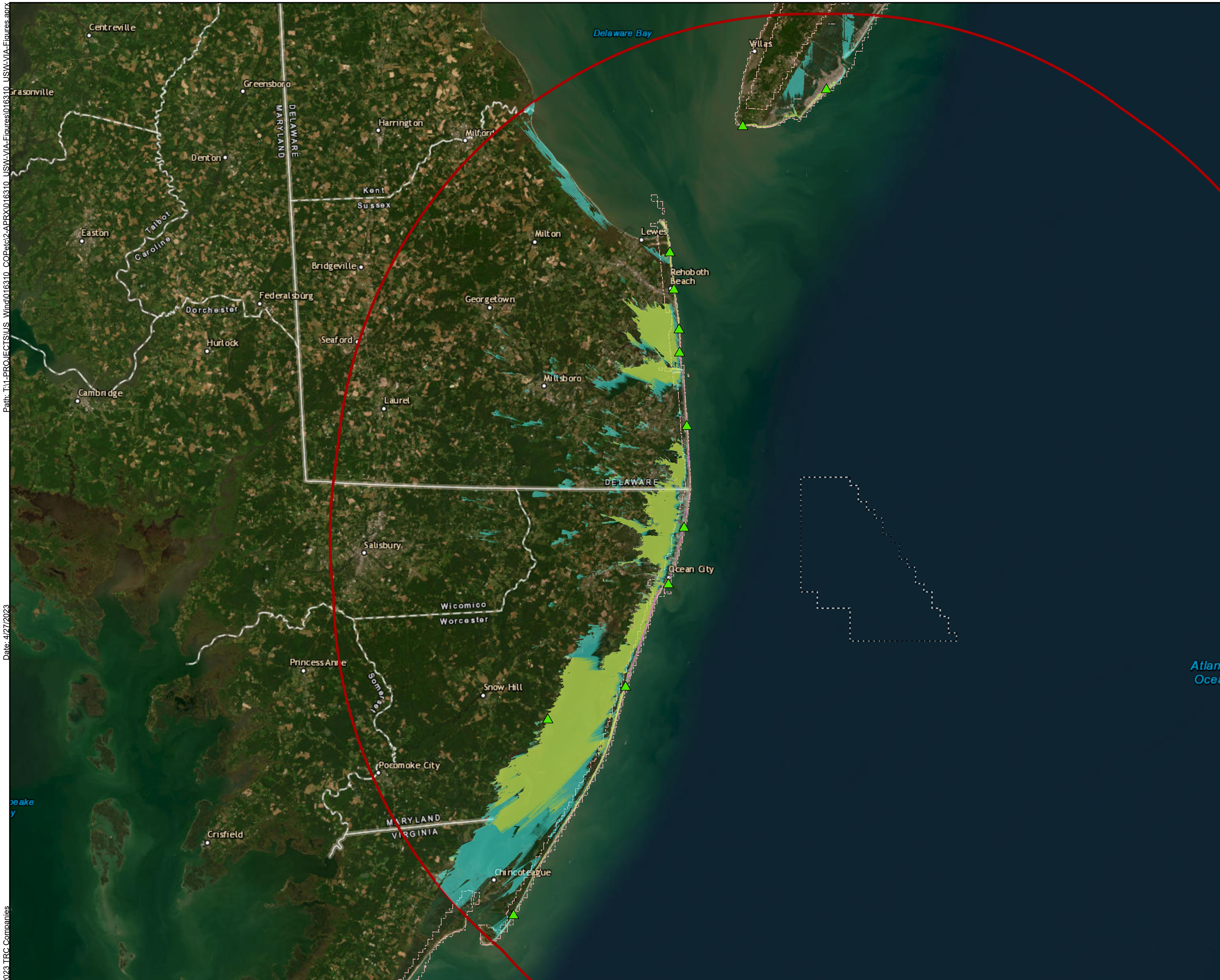


Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 6

Overall Project Viewshed

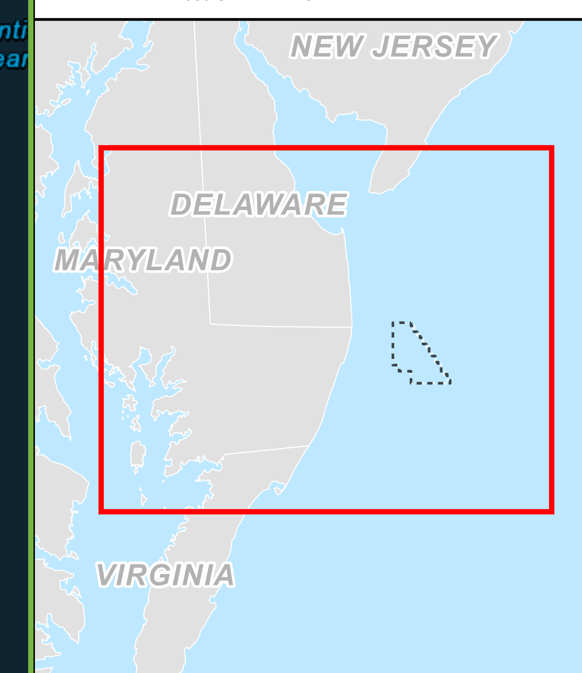
Legend

- US Wind Lease Area
- Selected Simulation Location
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)
- Potential Offshore Substation Visibility (43 mi)
- USACE NCMP Topobathy Lidar

0 2.5 5 10 Miles
0 3.5 7 14 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) USACE NCMP Topobathy Lidar- East Coast, 2017

Datum: NAD 1983 UTM Zone 18N



Date: 4/27/2023

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 7

Sheet 1 of 12

Project Viewshed

Legend

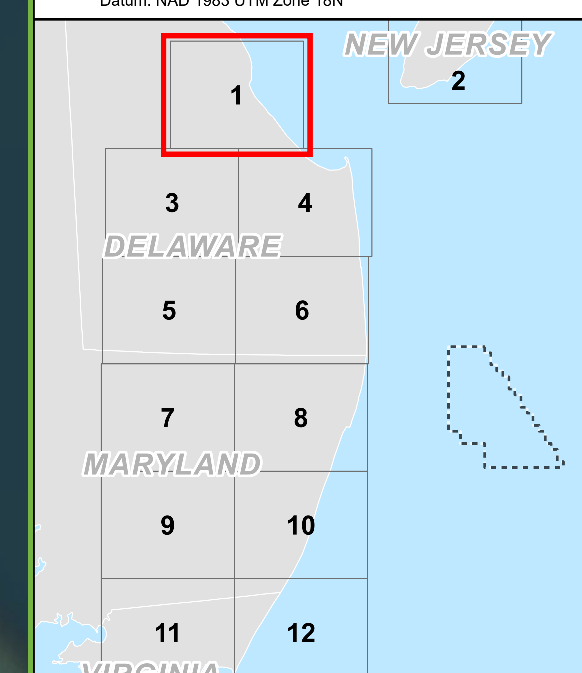
- 43-Mile Visual Study Area
- Potential Turbine Blade Visibility (43 mi)

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates

Datum: NAD 1983 UTM Zone 18N



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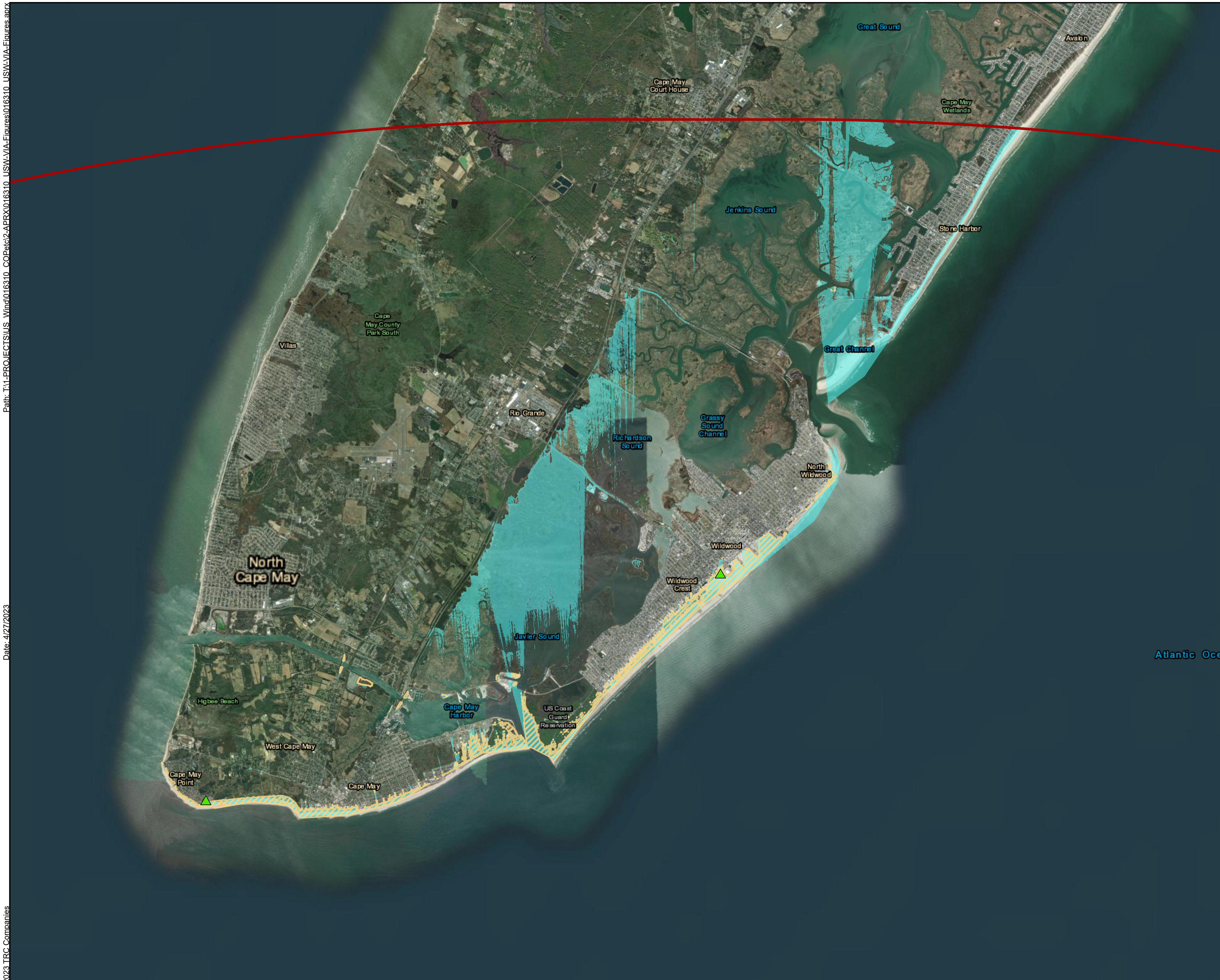


Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 7
Sheet 2 of 12

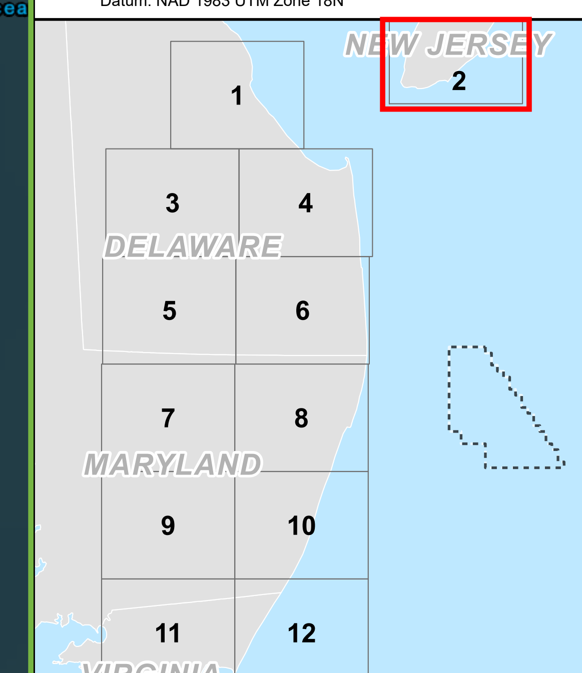
Project Viewshed

Legend

- 43-Mile Visual Study Area
- Selected Simulation Location
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

0 0.5 1 2 Miles
0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates
Datum: NAD 1983 UTM Zone 18N



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Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 7
Sheet 3 of 12

Project Viewshed

Legend

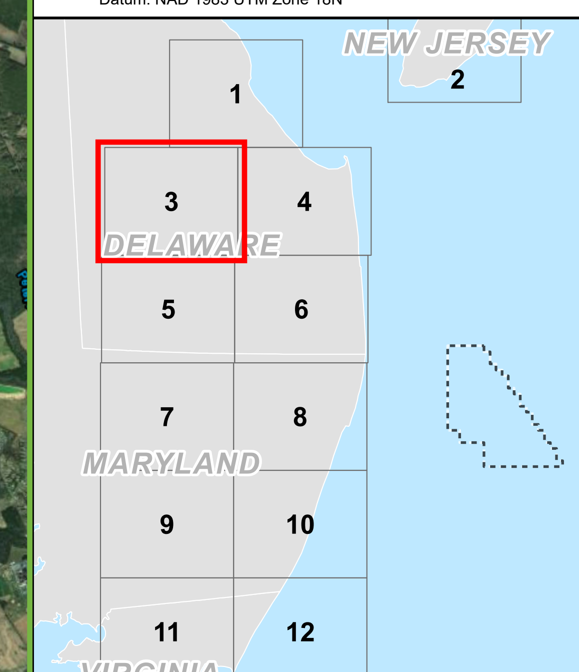
- 43-Mile Visual Study Area
- Potential Turbine Blade Visibility (43 mi)

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates

Datum: NAD 1983 UTM Zone 18N



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Date: 4/27/2023

Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 7

Sheet 4 of 12

Project Viewshed

Legend

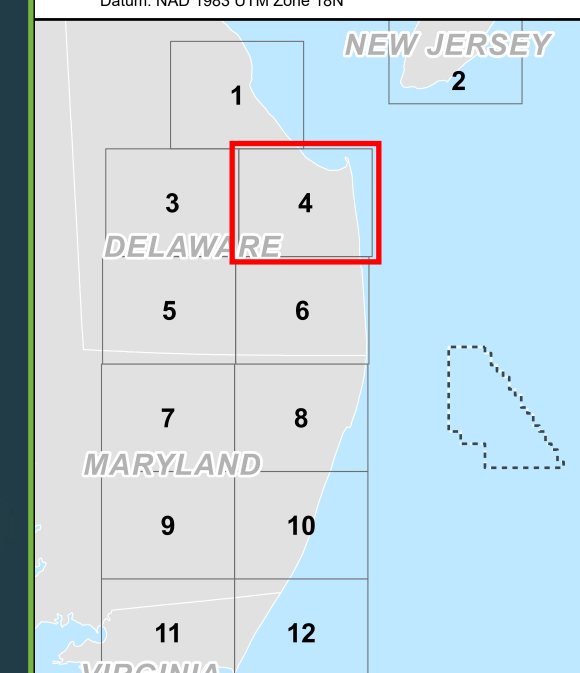
- 43-Mile Visual Study Area
- Selected Simulation Location
- Potential Offshore Substation Visibility (43 mi)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates

Datum: NAD 1983 UTM Zone 18N



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Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 7

Sheet 5 of 12

Project Viewshed

Legend

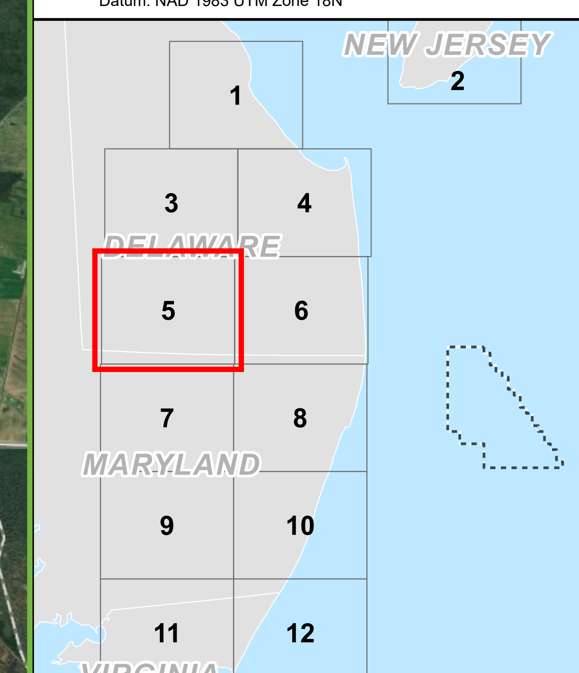
- 43-Mile Visual Study Area
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates

Datum: NAD 1983 UTM Zone 18N



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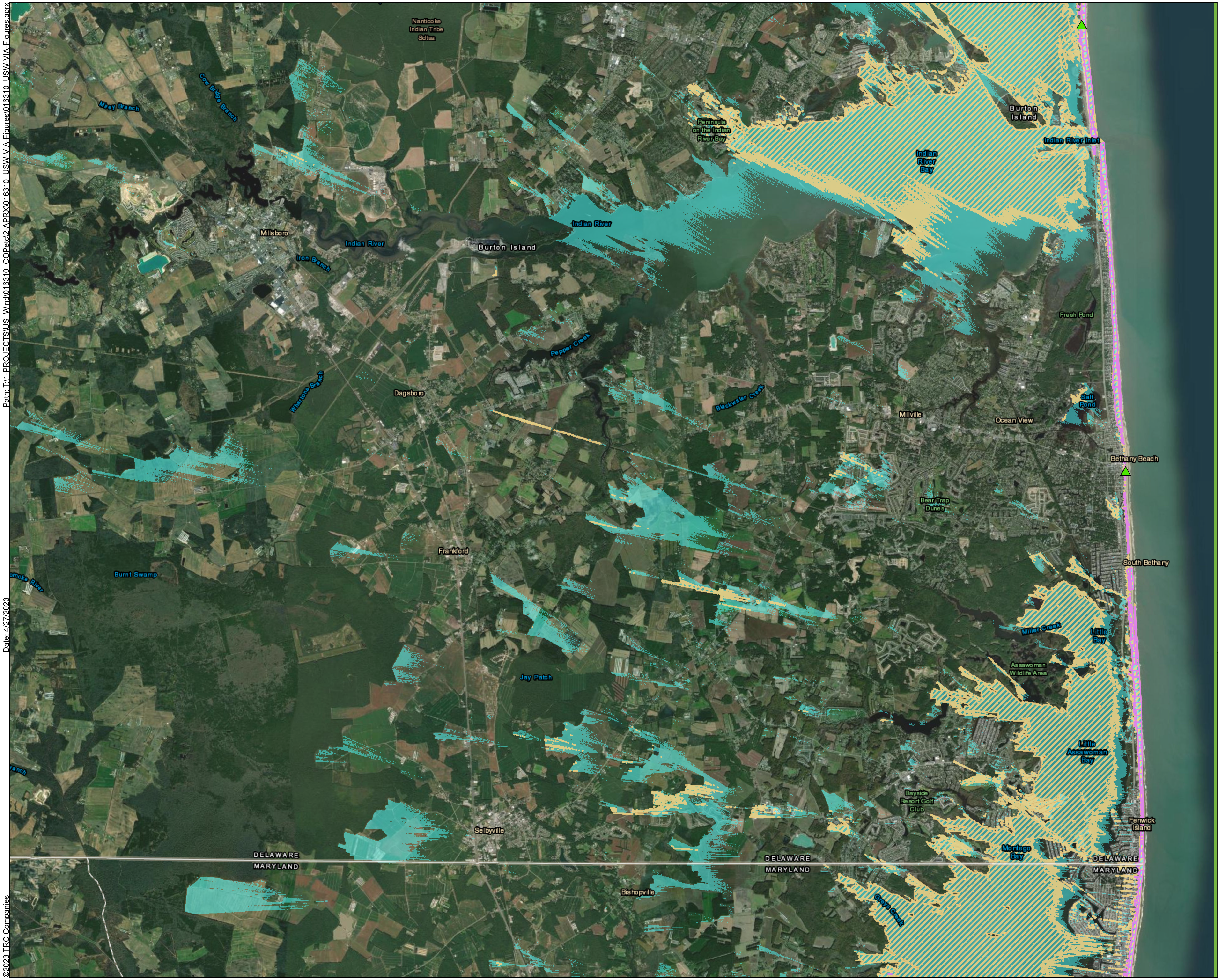


TRC

Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 7

Sheet 6 of 12

Project Viewshed

Legend

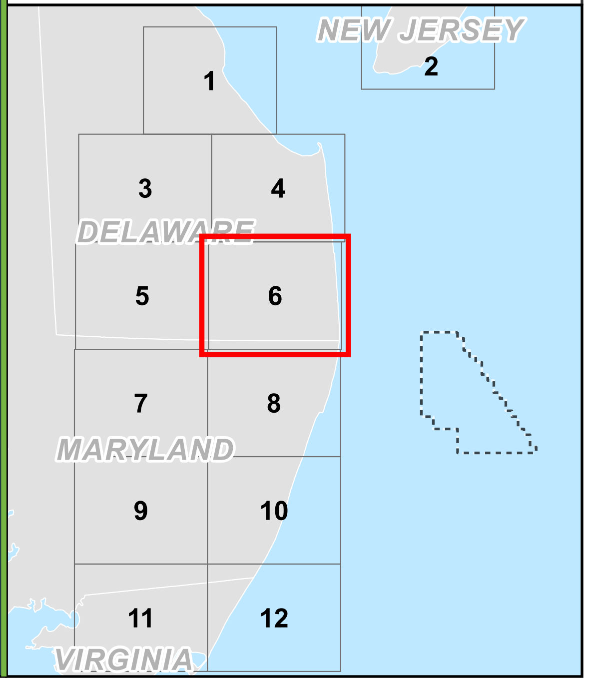
- 43-Mile Visual Study Area
- Selected Simulation Location
- Potential Offshore Substation Visibility (43 mi)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

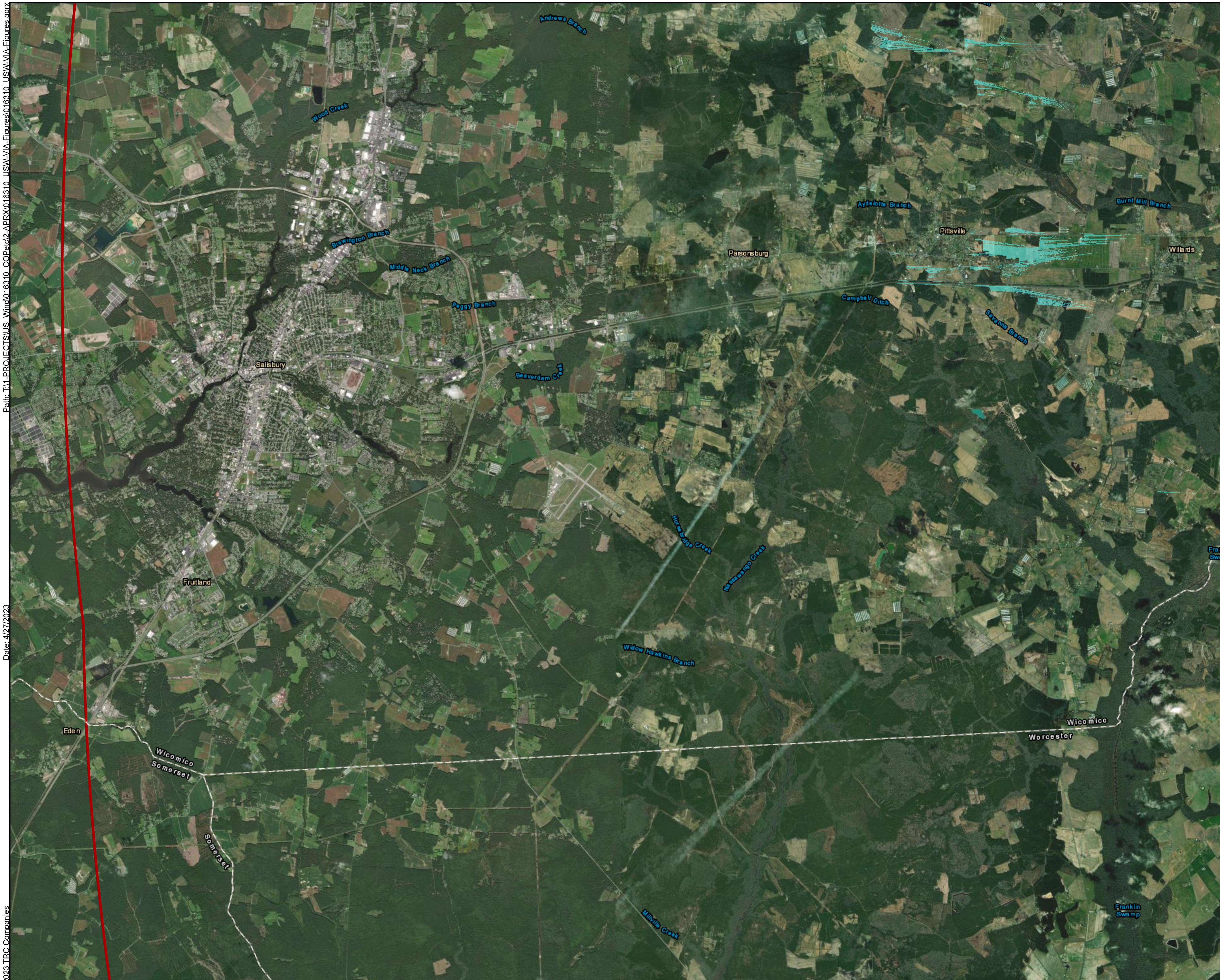
0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates

Datum: NAD 1983 UTM Zone 18N





Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 7
Sheet 7 of 12

Project Viewshed

Legend

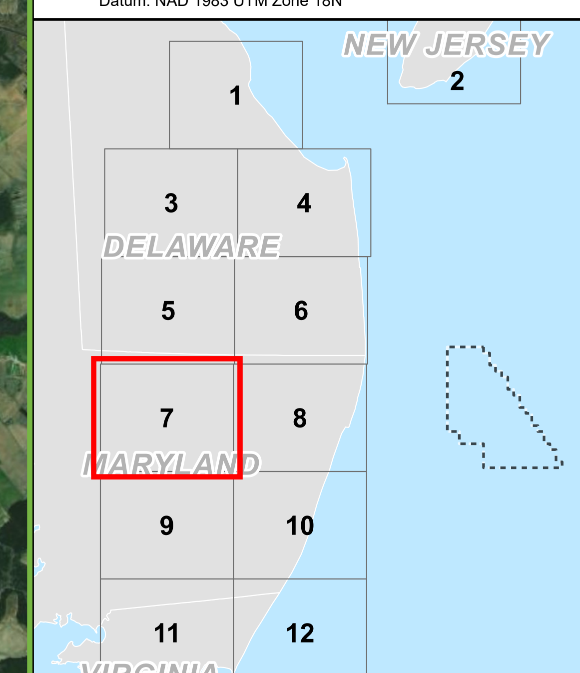
- 43-Mile Visual Study Area
- Potential Turbine Blade Visibility (43 mi)

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates

Datum: NAD 1983 UTM Zone 18N



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Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 7
Sheet 8 of 12

Project Viewshed

Legend

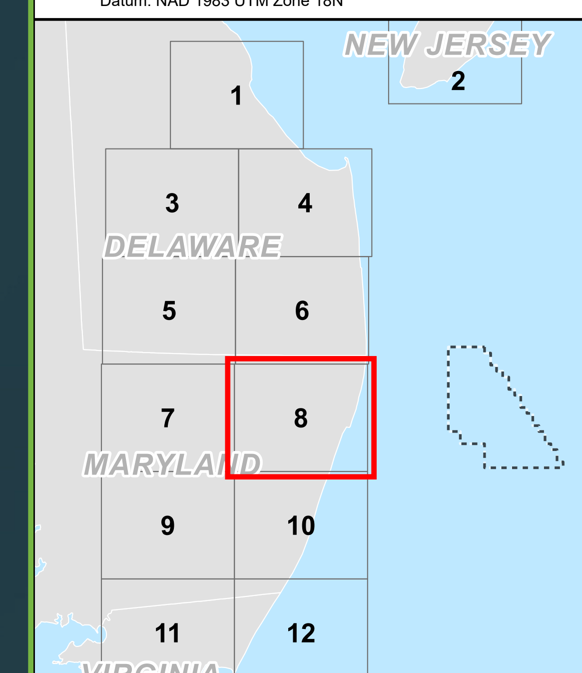
- 43-Mile Visual Study Area
- Selected Simulation Location
- Potential Offshore Substation Visibility (43 mi)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates

Datum: NAD 1983 UTM Zone 18N



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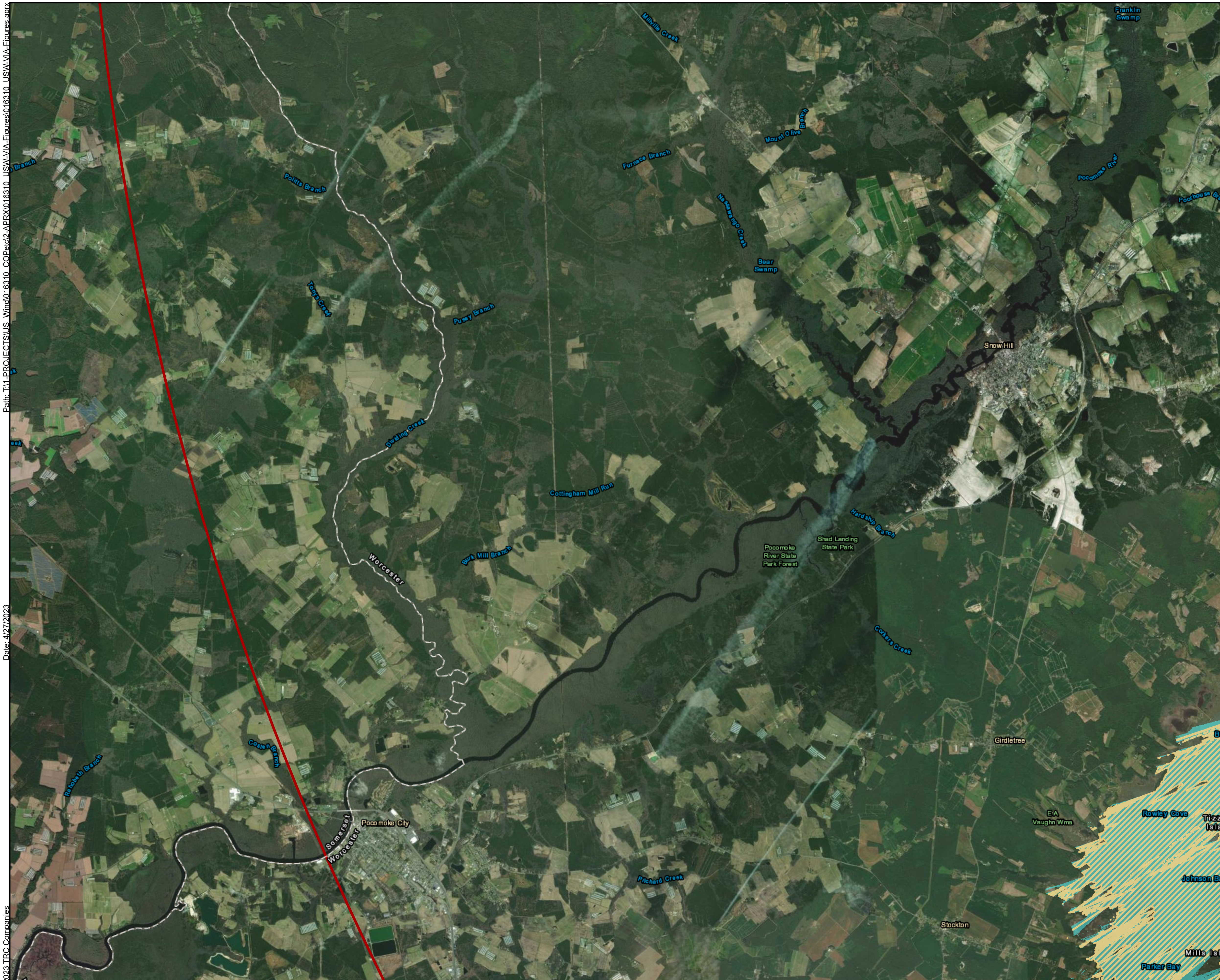


Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 7
Sheet 9 of 12

Project Viewshed

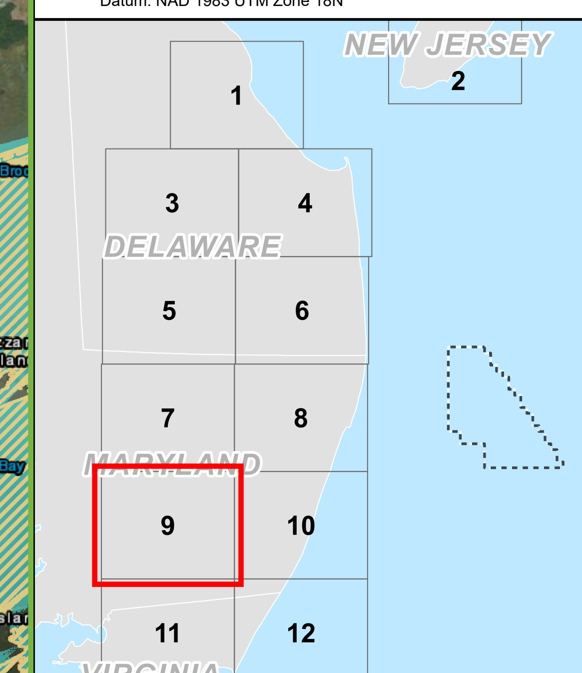
Legend

- 43-Mile Visual Study Area
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

0 0.5 1 2 Miles
0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates

Datum: NAD 1983 UTM Zone 18N



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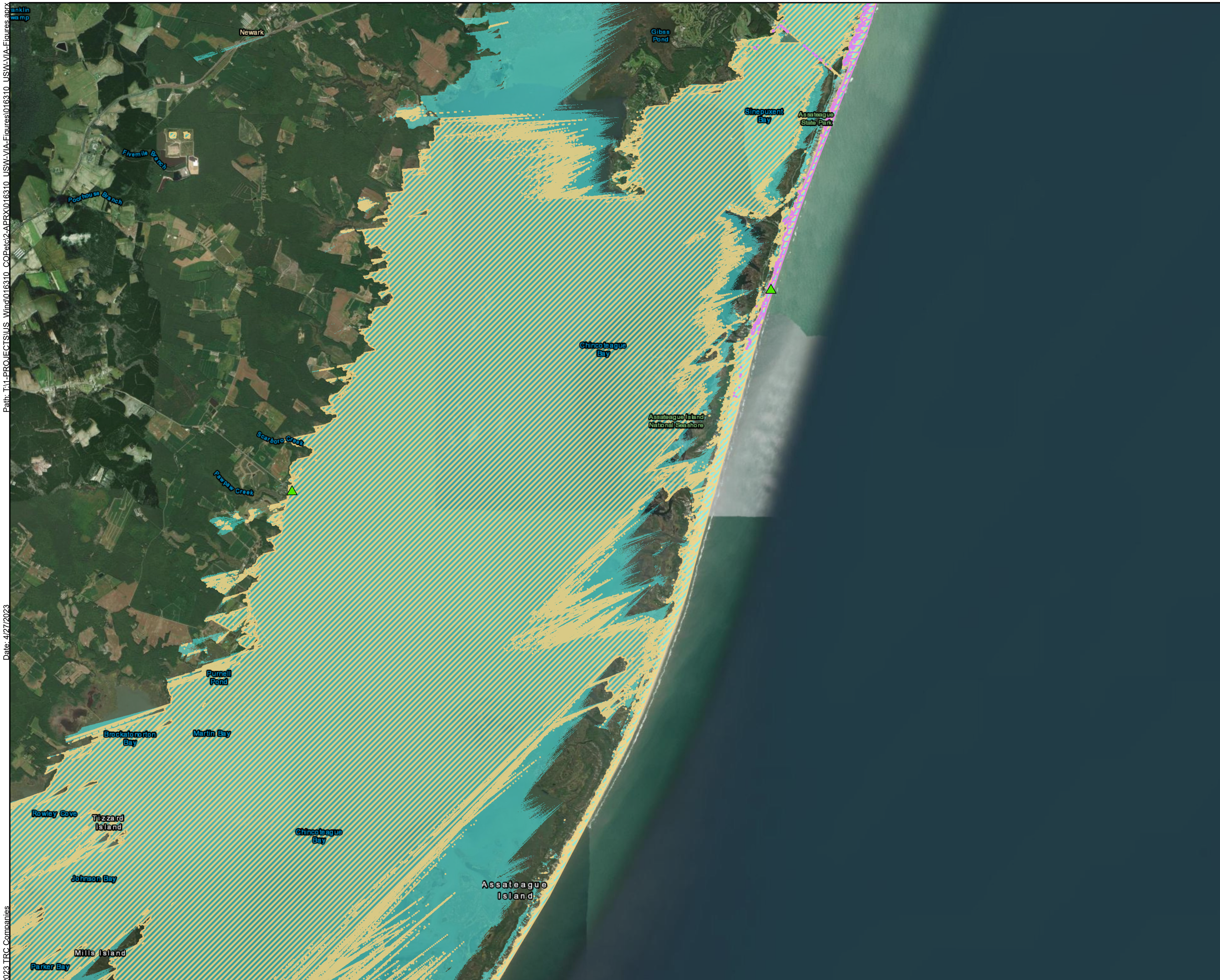


Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 7
Sheet 10 of 12

Project Viewshed

Legend

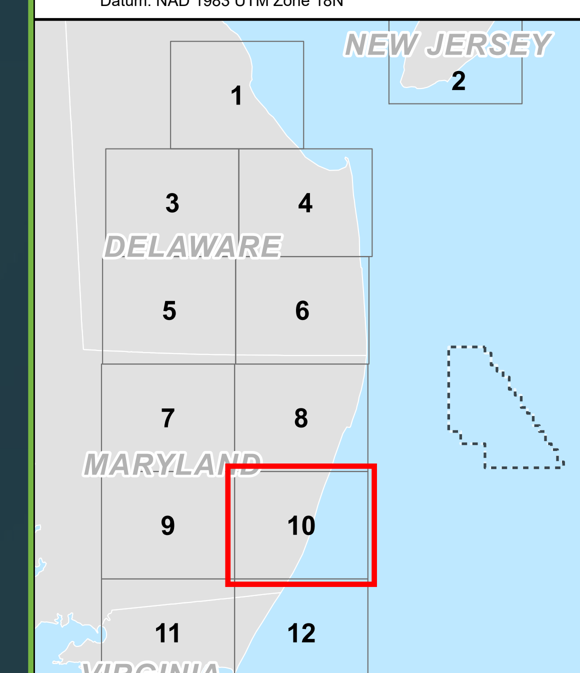
- 43-Mile Visual Study Area
- Selected Simulation Location
- Potential Offshore Substation Visibility (43 mi)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates

Datum: NAD 1983 UTM Zone 18N



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Date: 4/27/2023

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 7
Sheet 11 of 12

Project Viewshed

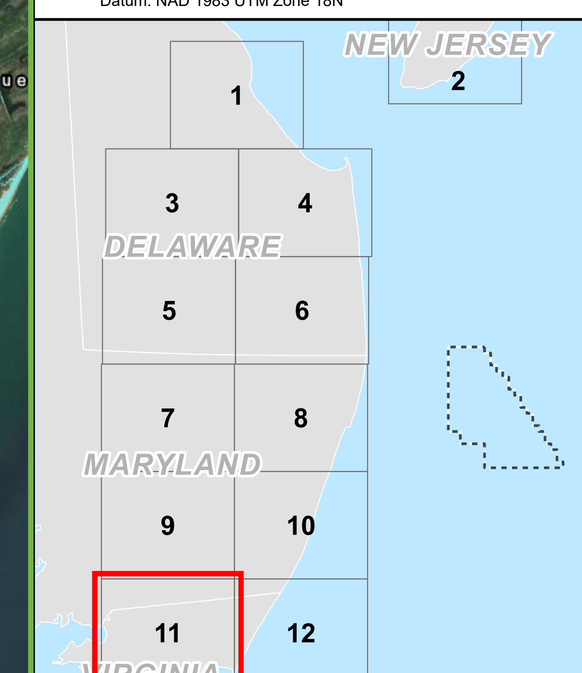
Legend

- 43-Mile Visual Study Area
- Selected Simulation Location
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

0 0.5 1 2 Miles
0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates

Datum: NAD 1983 UTM Zone 18N



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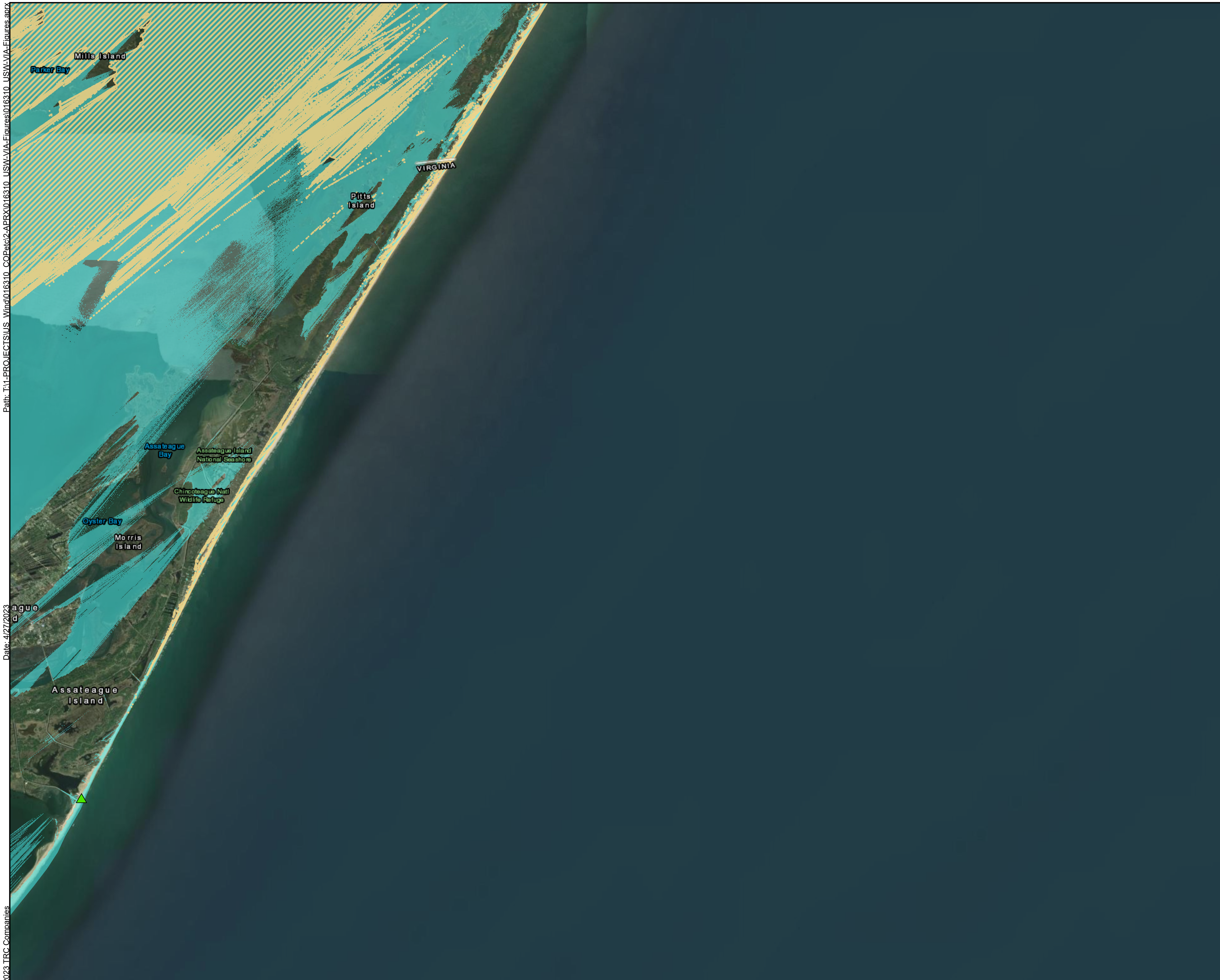


TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 7
Sheet 12 of 12

Project Viewshed

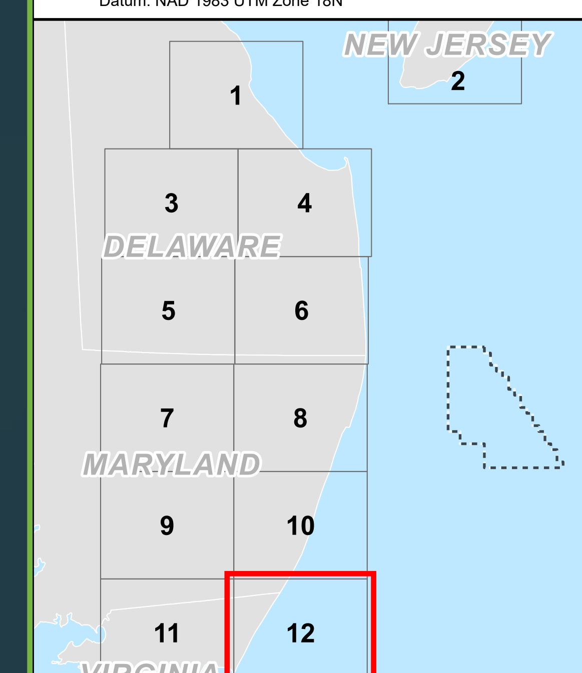
Legend

- 43-Mile Visual Study Area
- Selected Simulation Location
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)

0 0.5 1 2 Miles
0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates

Datum: NAD 1983 UTM Zone 18N



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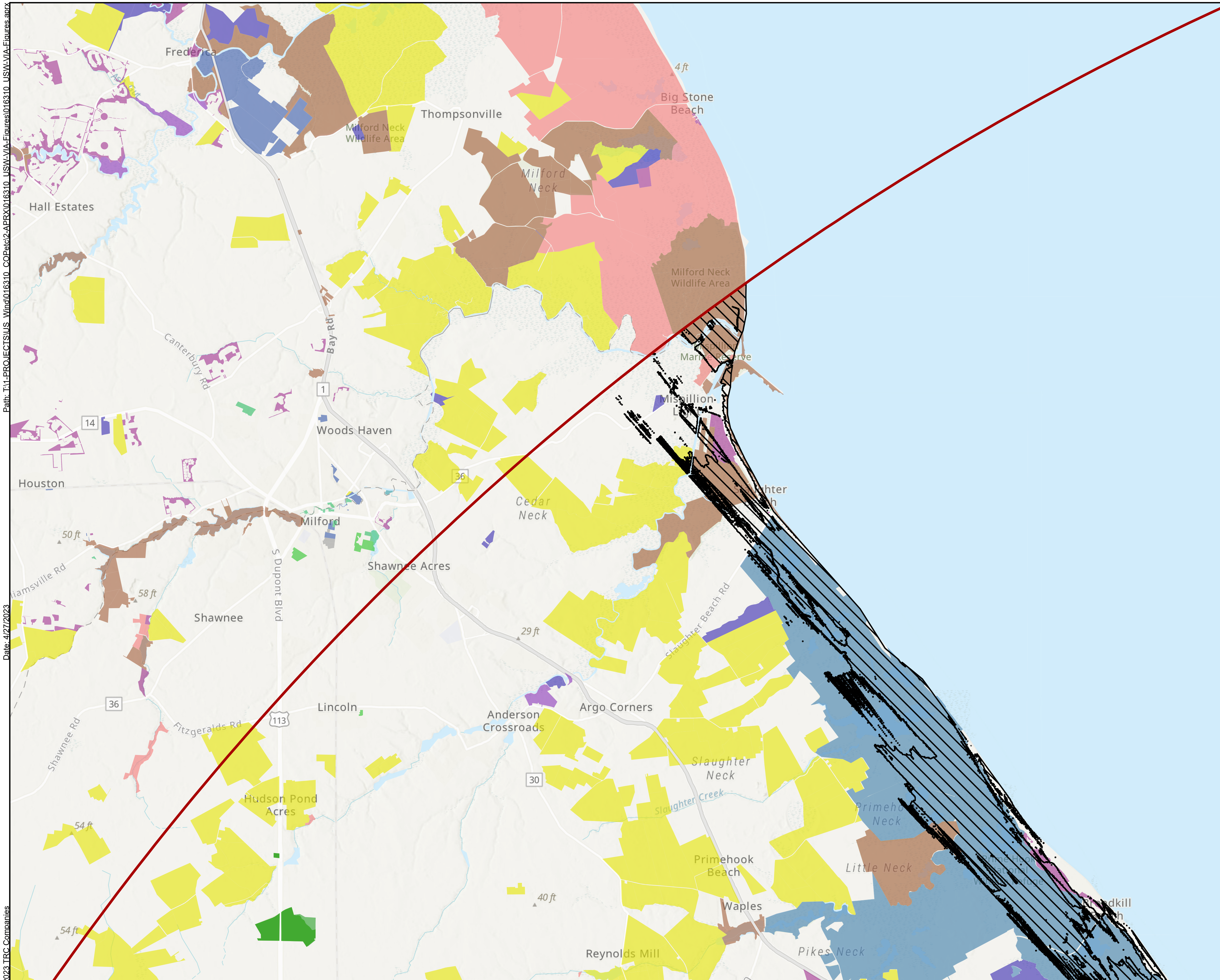


TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 8
Sheet 1 of 12

Project Viewshed with Natural Resource Areas

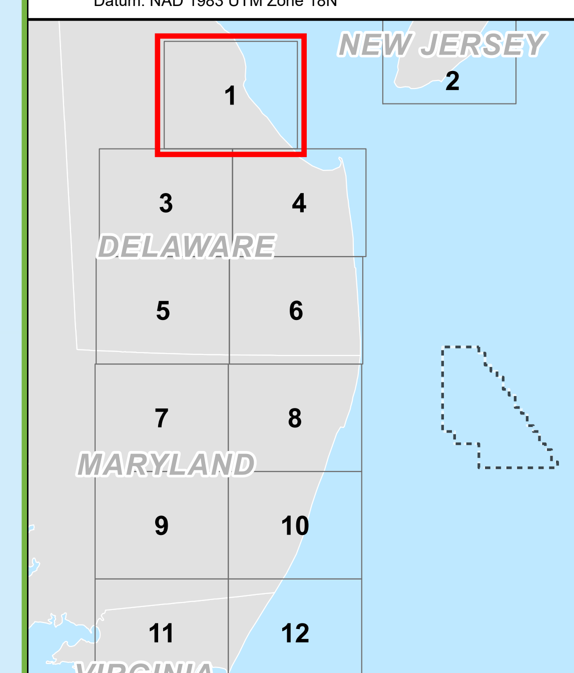
Legend

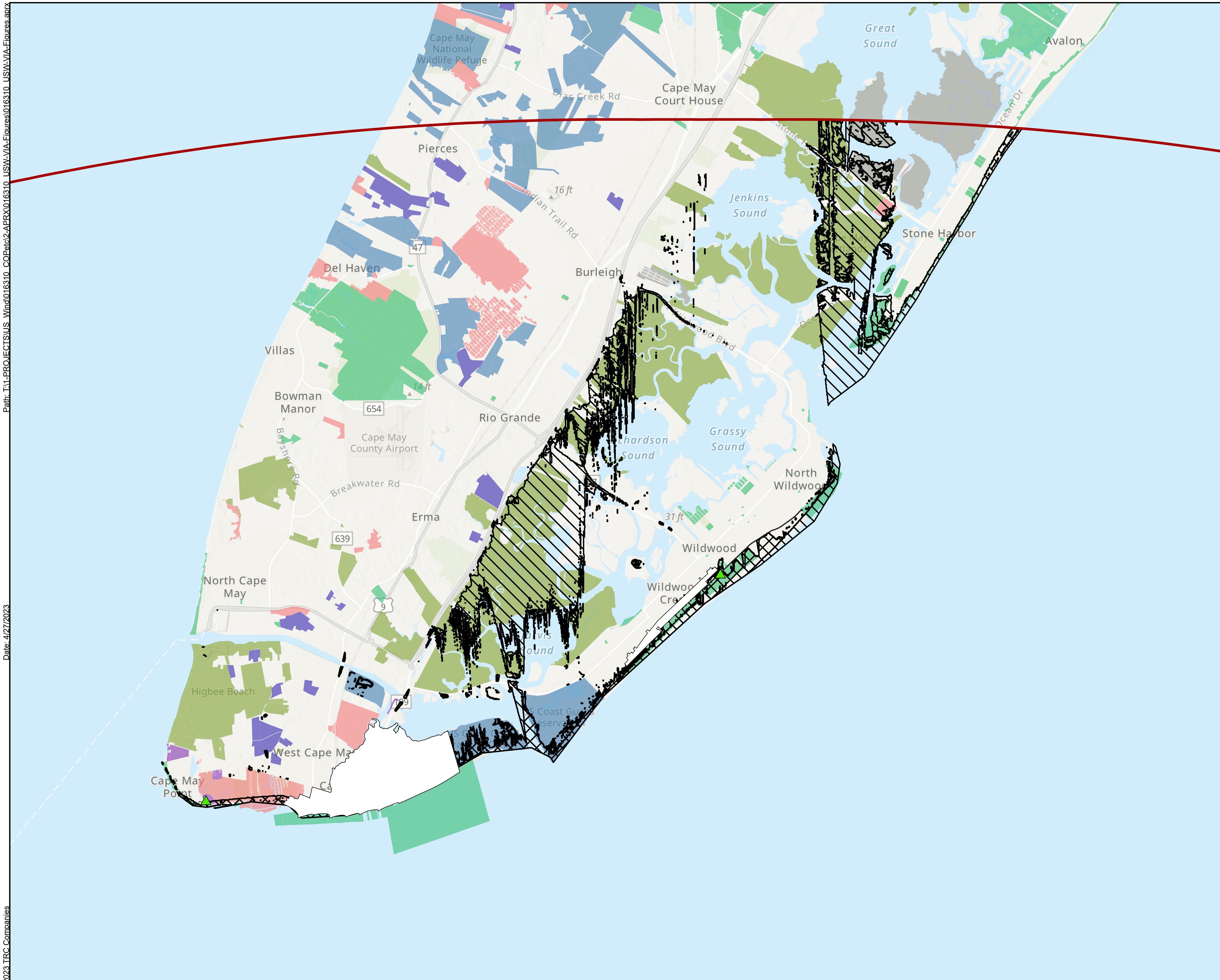
- Selected Simulation Location
- 43-Mile Visual Study Area
- Potential Turbine Blade Visibility (43 mi)
- Agricultural Easement
- Conservation Easement
- Educational Land
- Federal Land
- Municipal Land
- Municipal Park
- National Wildlife Refuge
- Nature Reserve / Preserve / Sanctuary
- Other Land
- Private Conserved Land
- State Forest
- State Land
- State Park

0 0.5 1 2 Miles
0 1 2 4 Kilometers

Source: 1) ESRI, Topography, 2023
2) BOEM, Lease Area, 2013
3) TNC, Secured Lands, 2015
4) DE Dept. of Agriculture, State Forests, 2021
5) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

Datum: NAD 1983 UTM Zone 18N





Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 8

Sheet 2 of 12

Project Viewshed with Natural Resource Areas

Legend

- Selected Simulation Location
- Historic Resources (area)
- 43-Mile Visual Study Area
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)
- Conservation Easement
- Municipal Park
- National Wildlife Refuge
- Nature Reserve / Preserve / Sanctuary
- Other Land
- State Park
- Wildlife Management Area

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Topography, 2023
2) BOEM, Lease Area, 2013
3) TNC, Secured Lands, 2015
4) DE Dept. of Agriculture, State Forests, 2021
5) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

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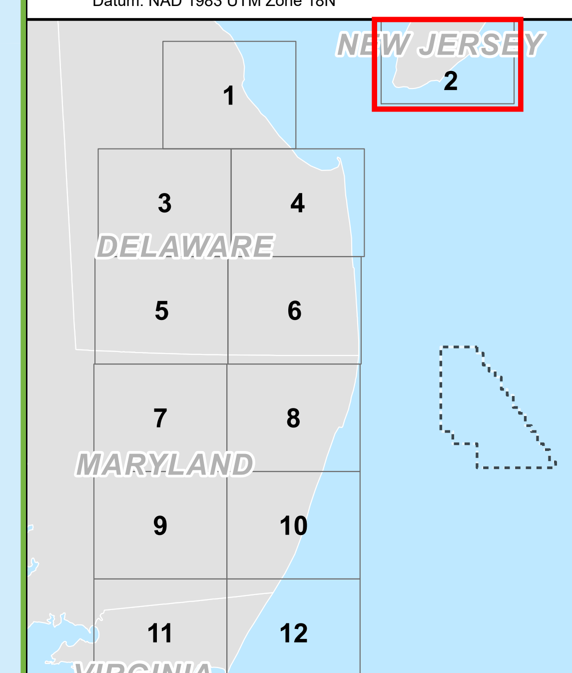

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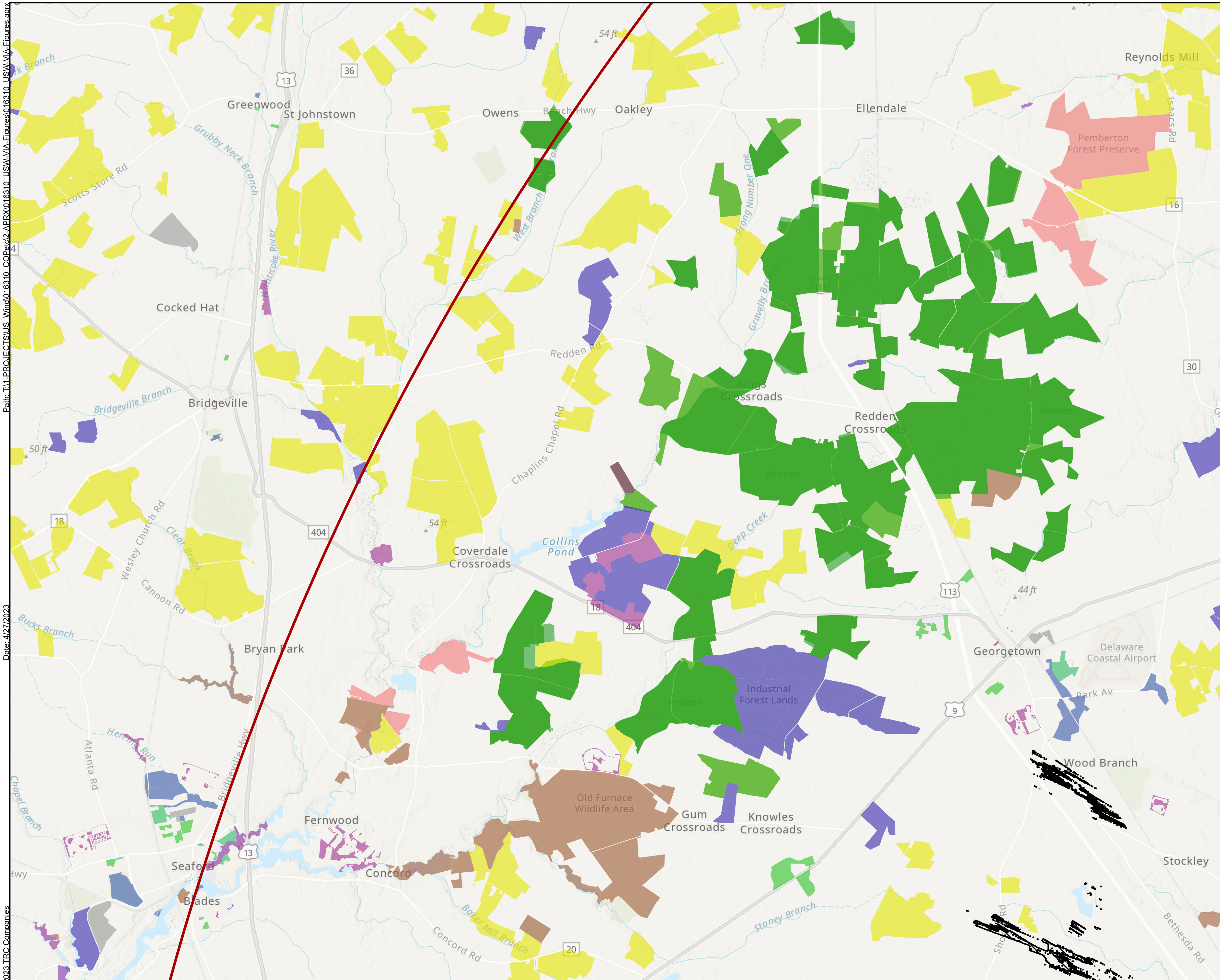

TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 8
Sheet 3 of 12

Project Viewshed with Natural Resource Areas

Legend

- Selected Simulation Location
- 43-Mile Visual Study Area
- Potential Turbine Blade Visibility (43 mi)
- Agricultural Easement
- Conservation Easement
- Educational Land
- Municipal Land
- Municipal Park
- Nature Reserve / Preserve / Sanctuary
- Other Land
- Private Conserved Land
- State Forest
- State Land
- State Park

0 0.5 1 2 Miles
0 1 2 4 Kilometers

Source: 1) ESRI, Topography, 2023
2) BOEM, Lease Area, 2013
3) TNC, Secured Lands, 2015
4) DE Dept. of Agriculture, State Forests, 2021
5) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

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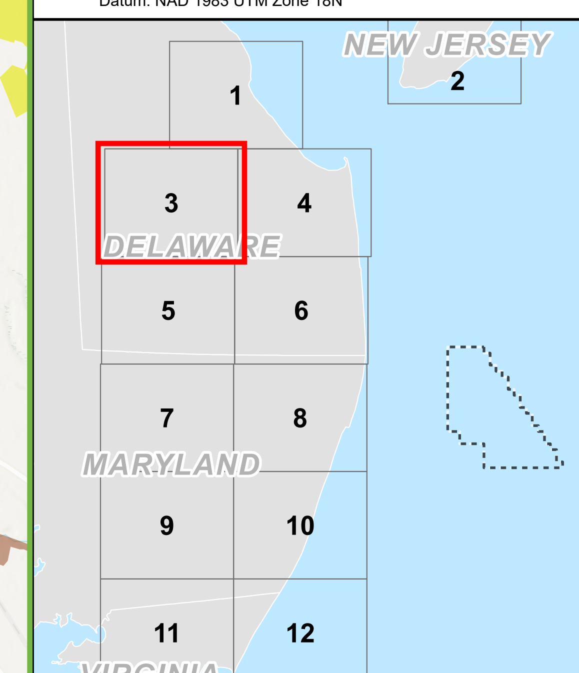

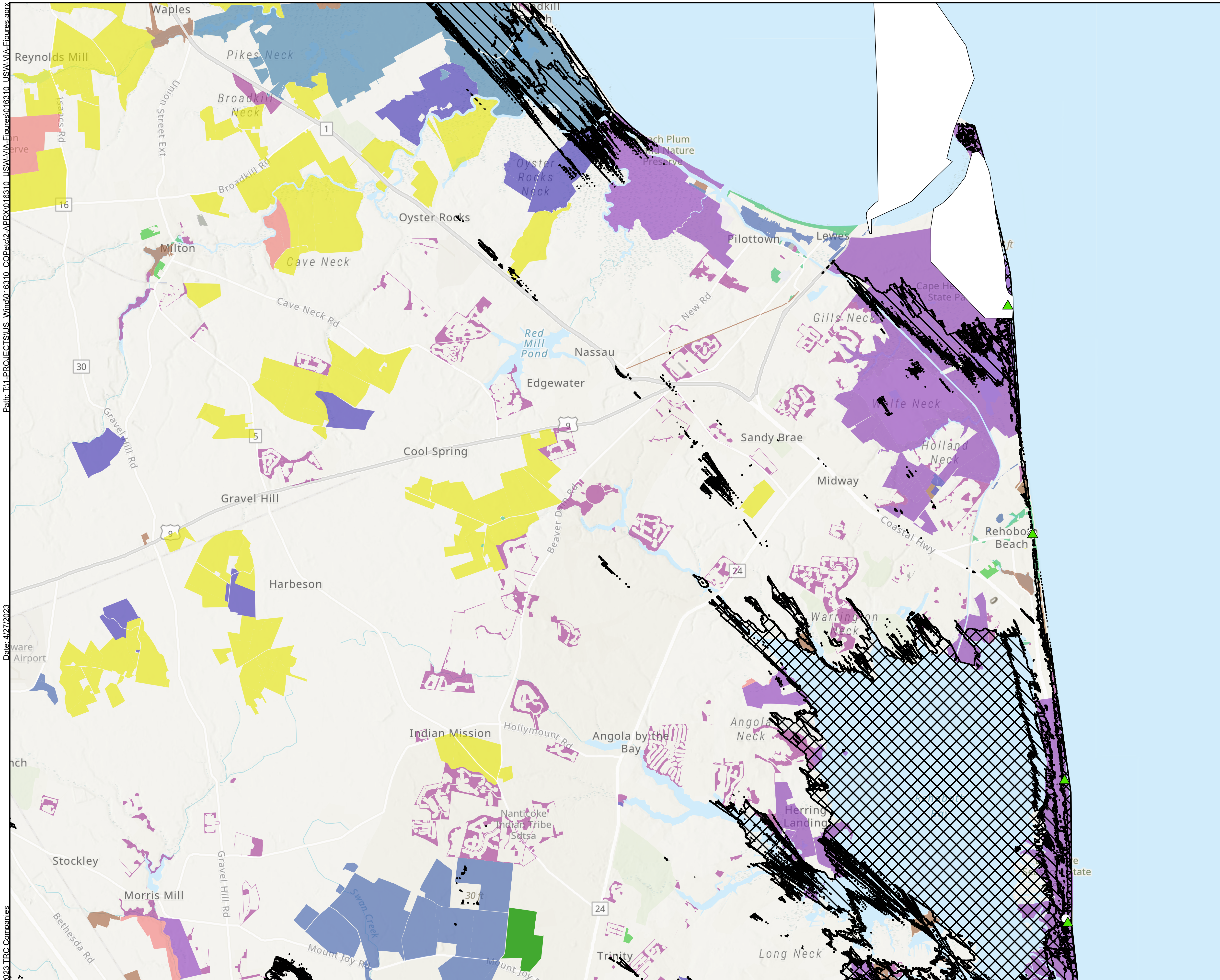

TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 8
Sheet 4 of 12

Project Viewshed with Natural Resource Areas

Legend

- Selected Simulation Location
- Historic Resources (point)
- Historic Resources (area)
- 43-Mile Visual Study Area
- Potential Offshore Substation Visibility (43 mi)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)
- Agricultural Easement
- Conservation Easement
- Educational Land
- Municipal Land
- Municipal Park
- National Wildlife Refuge
- Nature Reserve / Preserve / Sanctuary
- Other Land
- Private Conserved Land
- State Forest
- State Land
- State Park

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Topography, 2023
2) BOEM, Lease Area, 2013
3) TNC, Secured Lands, 2015
4) DE Dept. of Agriculture, State Forests, 2021
5) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

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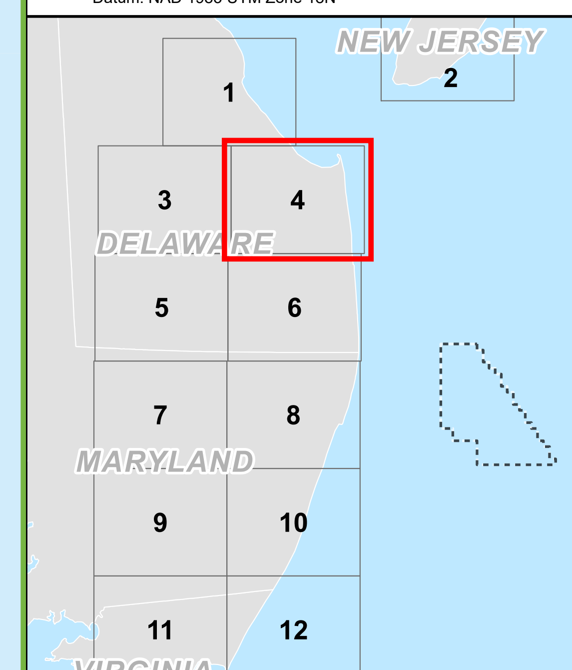

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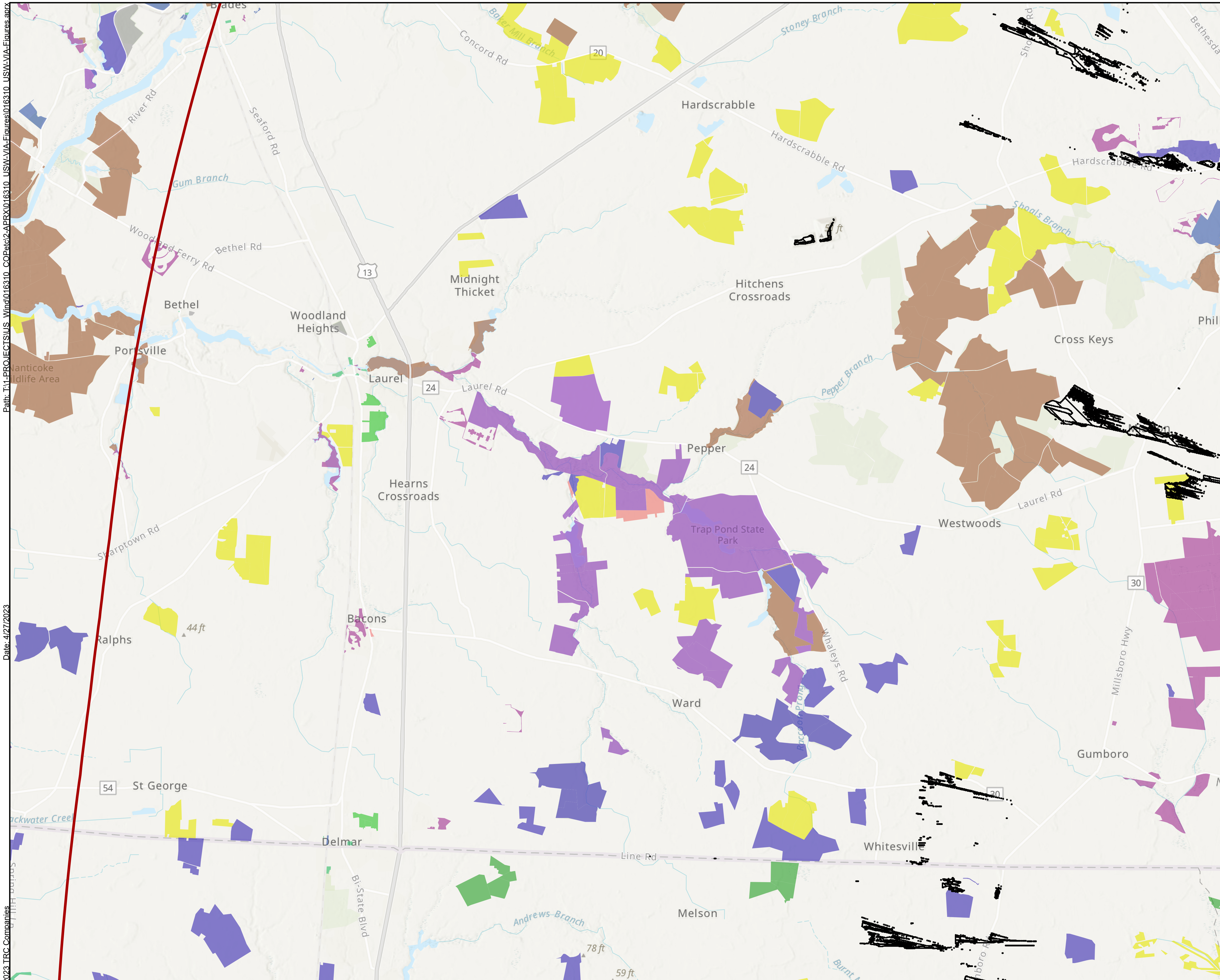

TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 8
Sheet 5 of 12

Project Viewshed with Natural Resource Areas

Legend

- Selected Simulation Location
- 43-Mile Visual Study Area
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)
- Agricultural Easement
- Conservation Easement
- Educational Land
- Municipal Land
- Municipal Park
- Nature Reserve / Preserve / Sanctuary
- Other Land
- Private Conserved Land
- State Forest
- State Land
- State Park

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Topography, 2023
2) BOEM, Lease Area, 2013
3) TNC, Secured Lands, 2015
4) DE Dept. of Agriculture, State Forests, 2021
5) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

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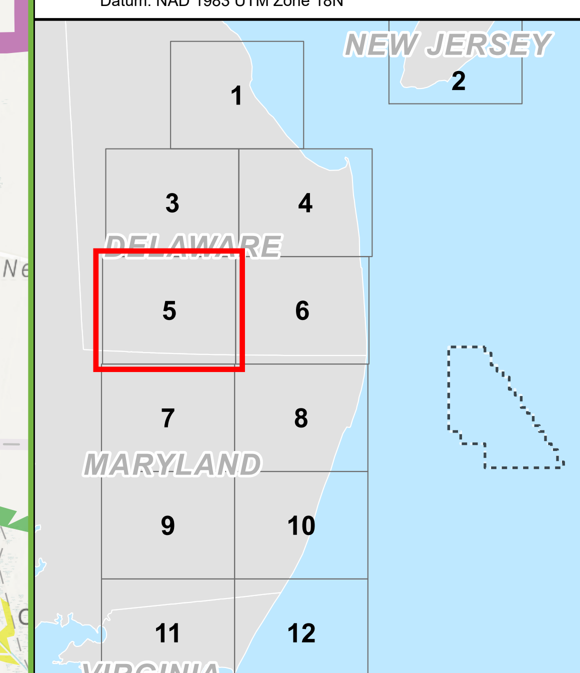

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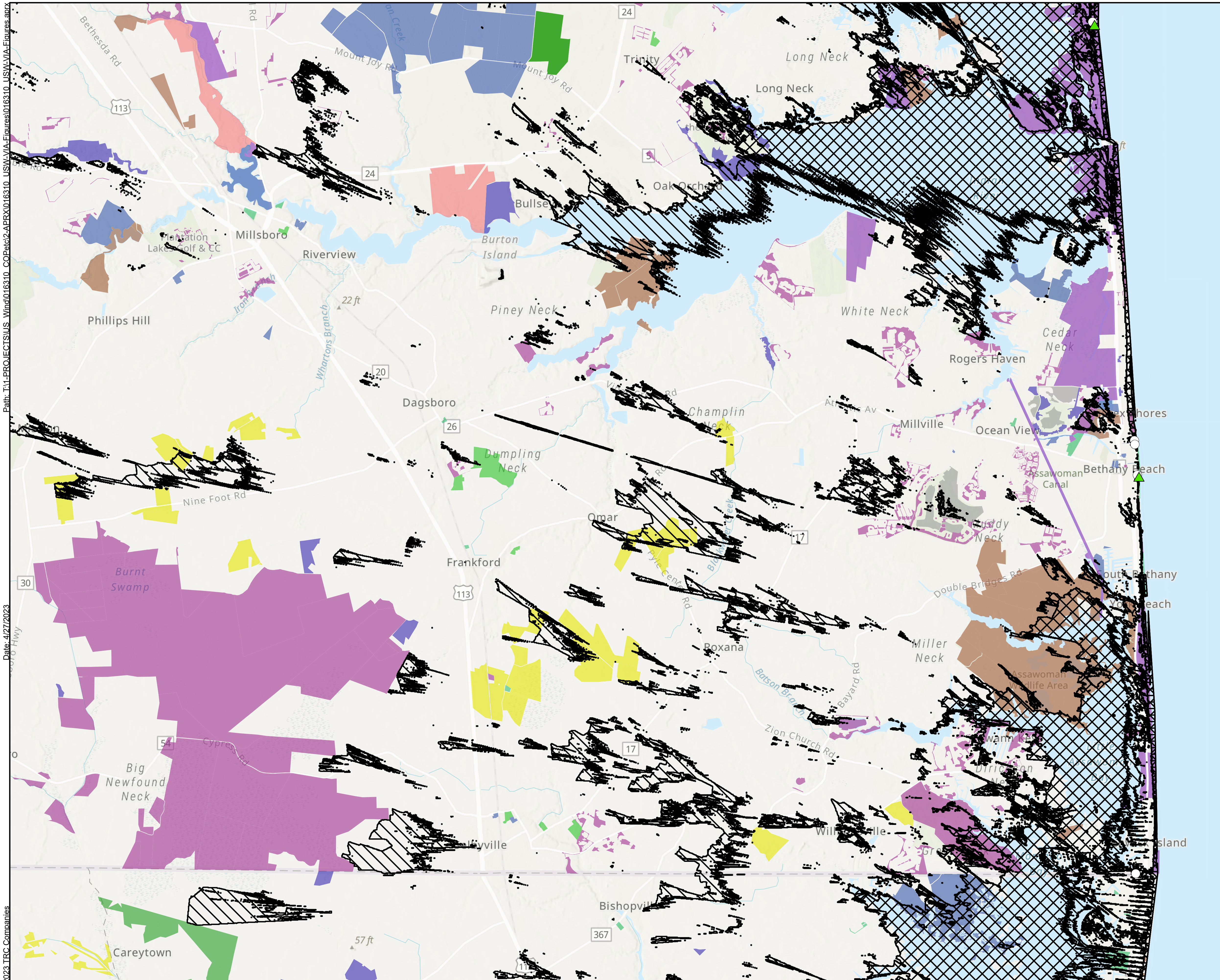

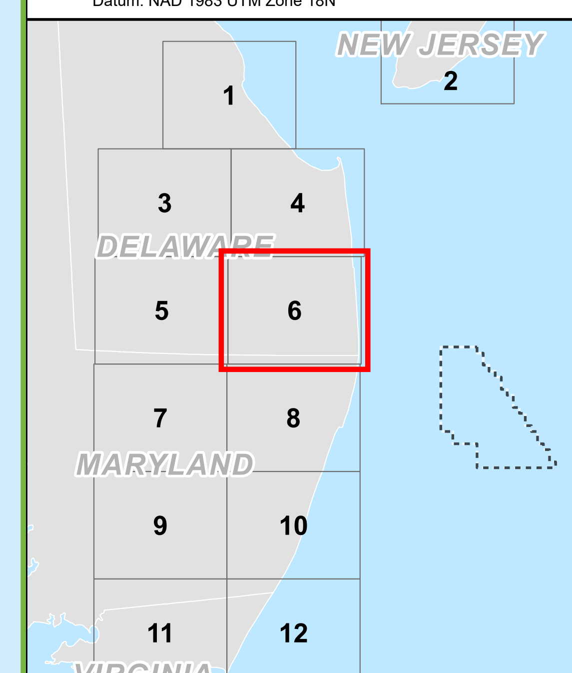

Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 8

Sheet 6 of 12

Project Viewshed with Natural Resource Areas

Legend

- Selected Simulation Location
- Historic Resources (point)
- 43-Mile Visual Study Area
- Potential Offshore Substation Visibility (43 mi)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)
- Agricultural Easement
- Conservation Easement
- Educational Land
- Municipal Land
- Municipal Park
- Nature Reserve / Preserve / Sanctuary
- Other Land
- Private Conserved Land
- State Forest
- State Land
- State Park

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Topography, 2023
2) BOEM, Lease Area, 2013
3) TNC, Secured Lands, 2015
4) DE Dept. of Agriculture, State Forests, 2021
5) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

Datum: NAD 1983 UTM Zone 18N

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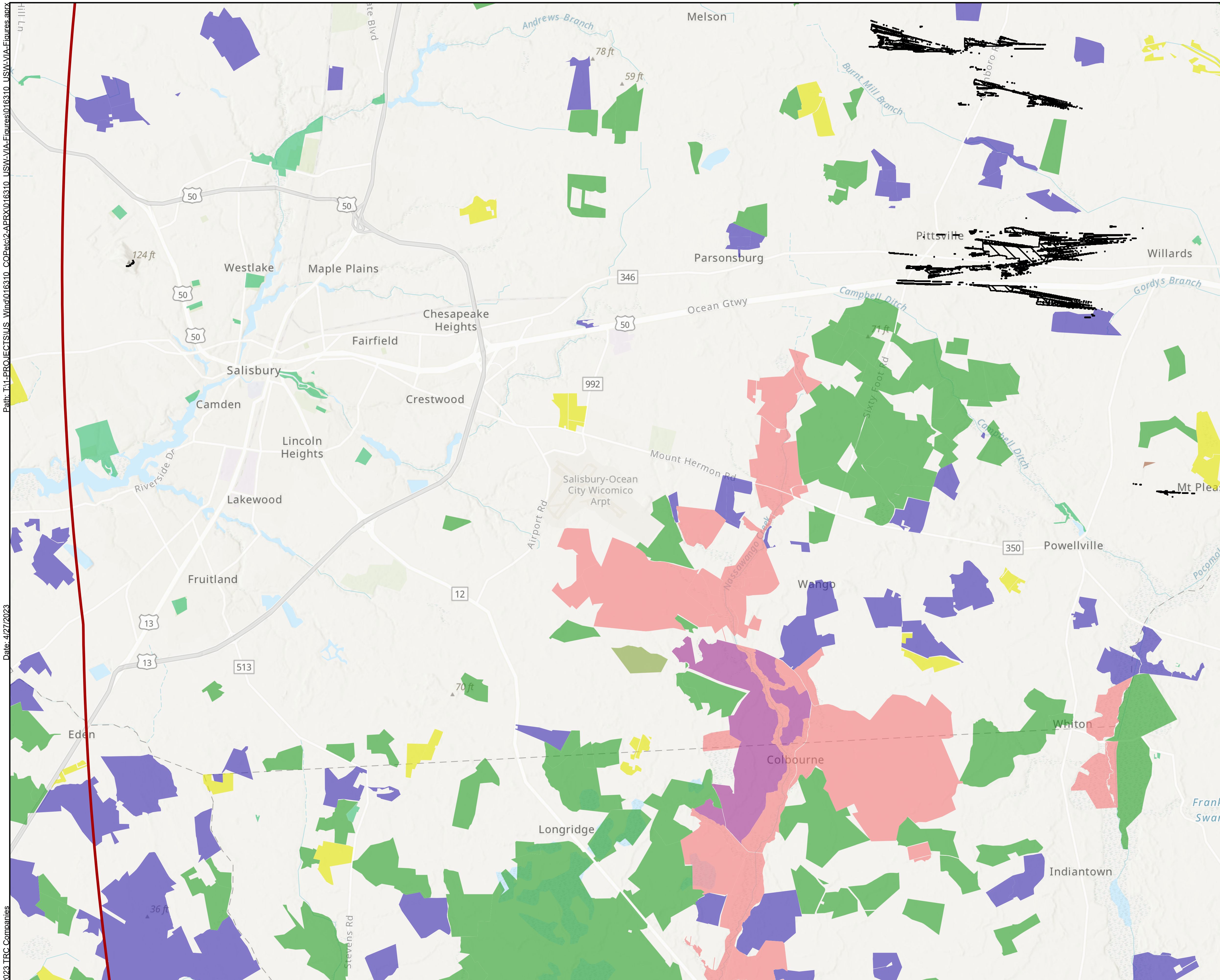

Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 8

Sheet 7 of 12

Project Viewshed with Natural Resource Areas

Legend

- Selected Simulation Location
- 43-Mile Visual Study Area
- Potential Turbine Blade Visibility (43 mi)
- Agricultural Easement
- Conservation Easement
- Municipal Park
- Nature Reserve / Preserve / Sanctuary
- Private Conserved Land
- State Forest
- State Land
- Wildlife Management Area

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Topography, 2023
2) BOEM, Lease Area, 2013
3) TNC, Secured Lands, 2015
4) DE Dept. of Agriculture, State Forests, 2021
5) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

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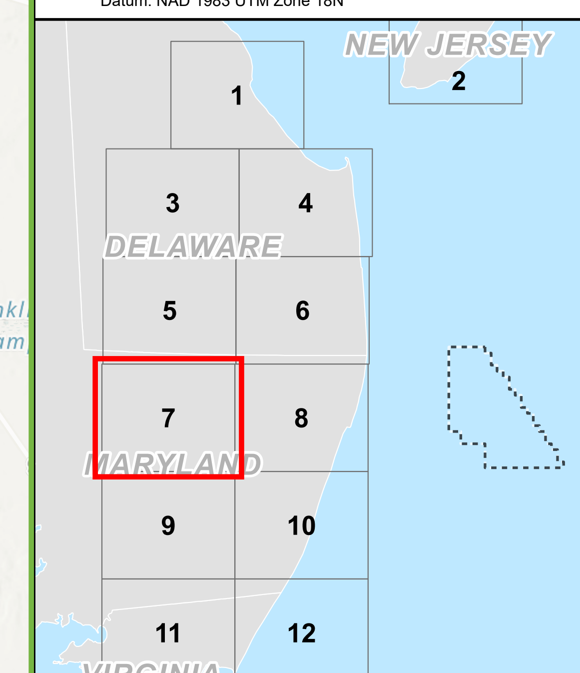

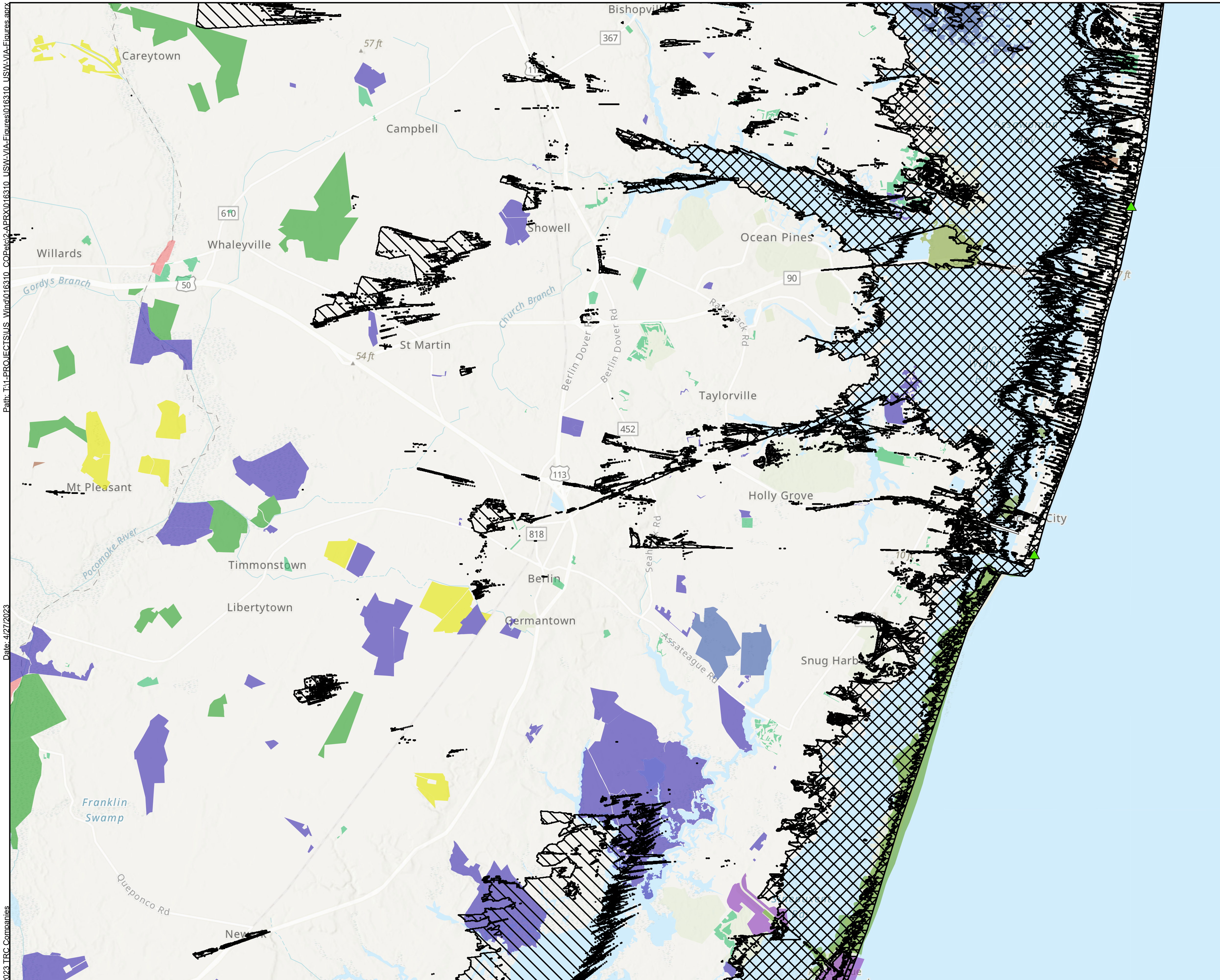

Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 8

Sheet 8 of 12

Project Viewshed with Natural Resource Areas

Legend

- Selected Simulation Location
- Historic Resources (area)
- 43-Mile Visual Study Area
- Potential Offshore Substation Visibility (43 mi)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)
- Agricultural Easement
- Conservation Easement
- Federal Land
- Municipal Land
- Municipal Park
- National Seashore
- Nature Reserve / Preserve / Sanctuary
- State Forest
- State Land
- State Park
- Wildlife Management Area

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Topography, 2023
2) BOEM, Lease Area, 2013
3) TNC, Secured Lands, 2015
4) DE Dept. of Agriculture, State Forests, 2021
5) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

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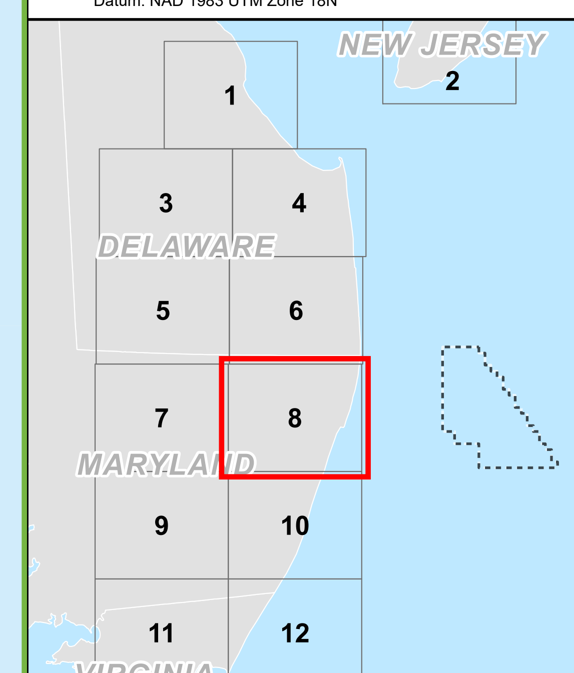

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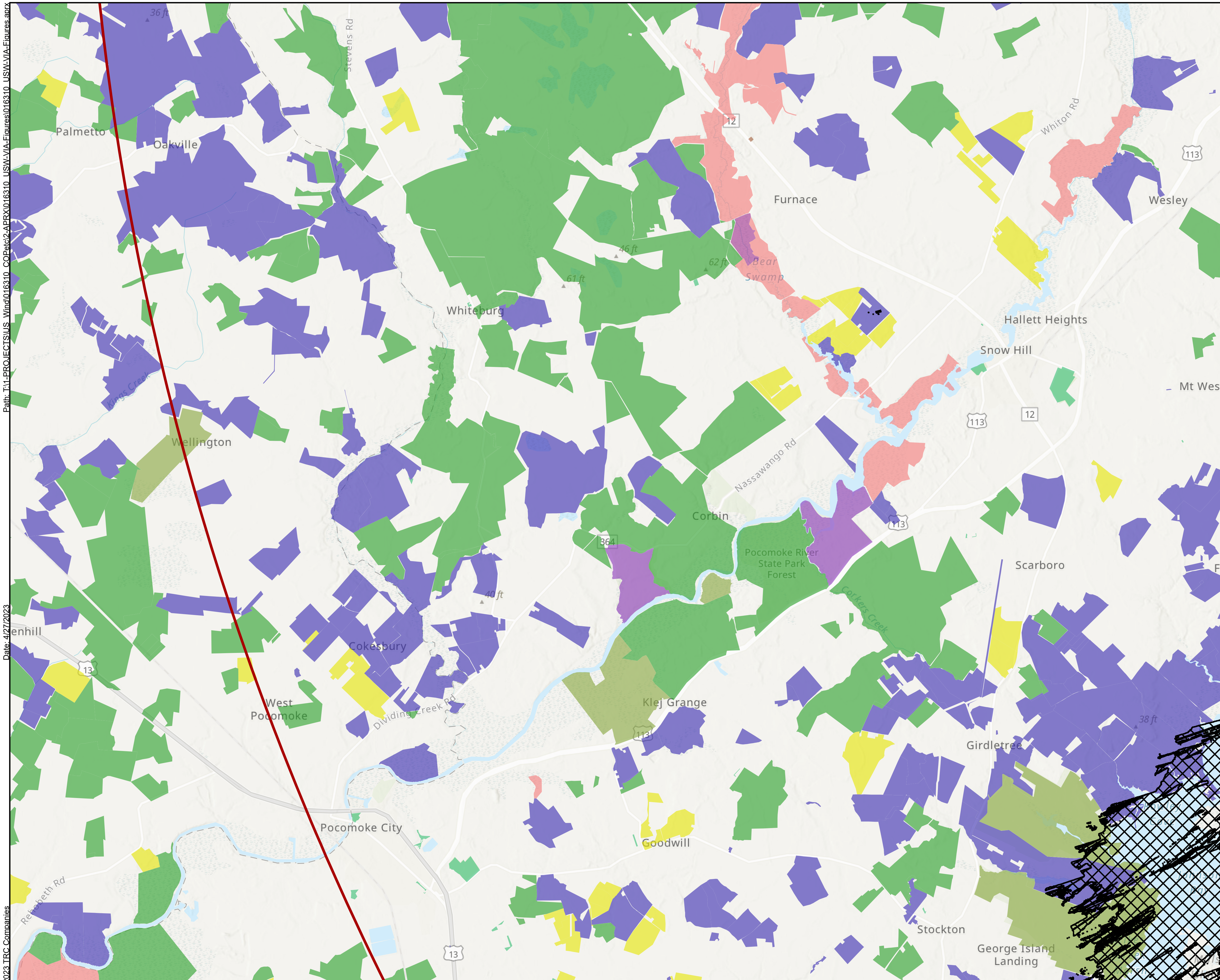

Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 8

Sheet 9 of 12

Project Viewshed with Natural Resource Areas

Legend

- Selected Simulation Location
- 43-Mile Visual Study Area
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)
- Agricultural Easement
- Conservation Easement
- Municipal Park
- Nature Reserve / Preserve / Sanctuary
- Private Conserved Land
- State Forest
- State Land
- State Park
- Wildlife Management Area

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Topography, 2023
2) BOEM, Lease Area, 2013
3) TNC, Secured Lands, 2015
4) DE Dept. of Agriculture, State Forests, 2021
5) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

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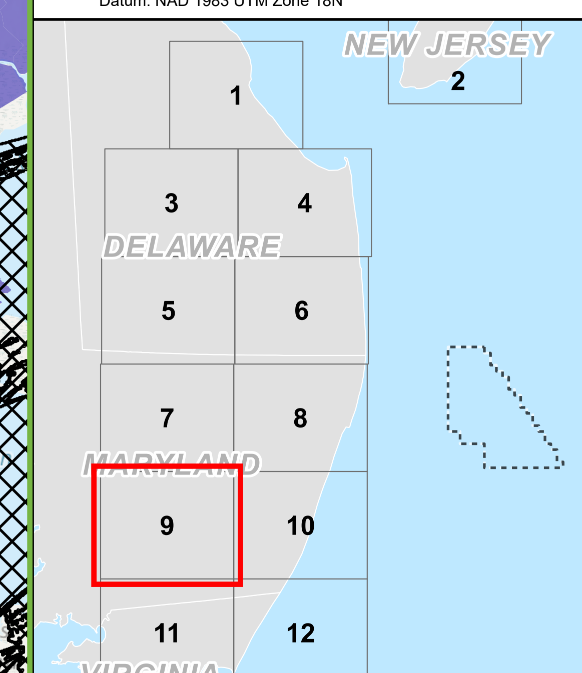

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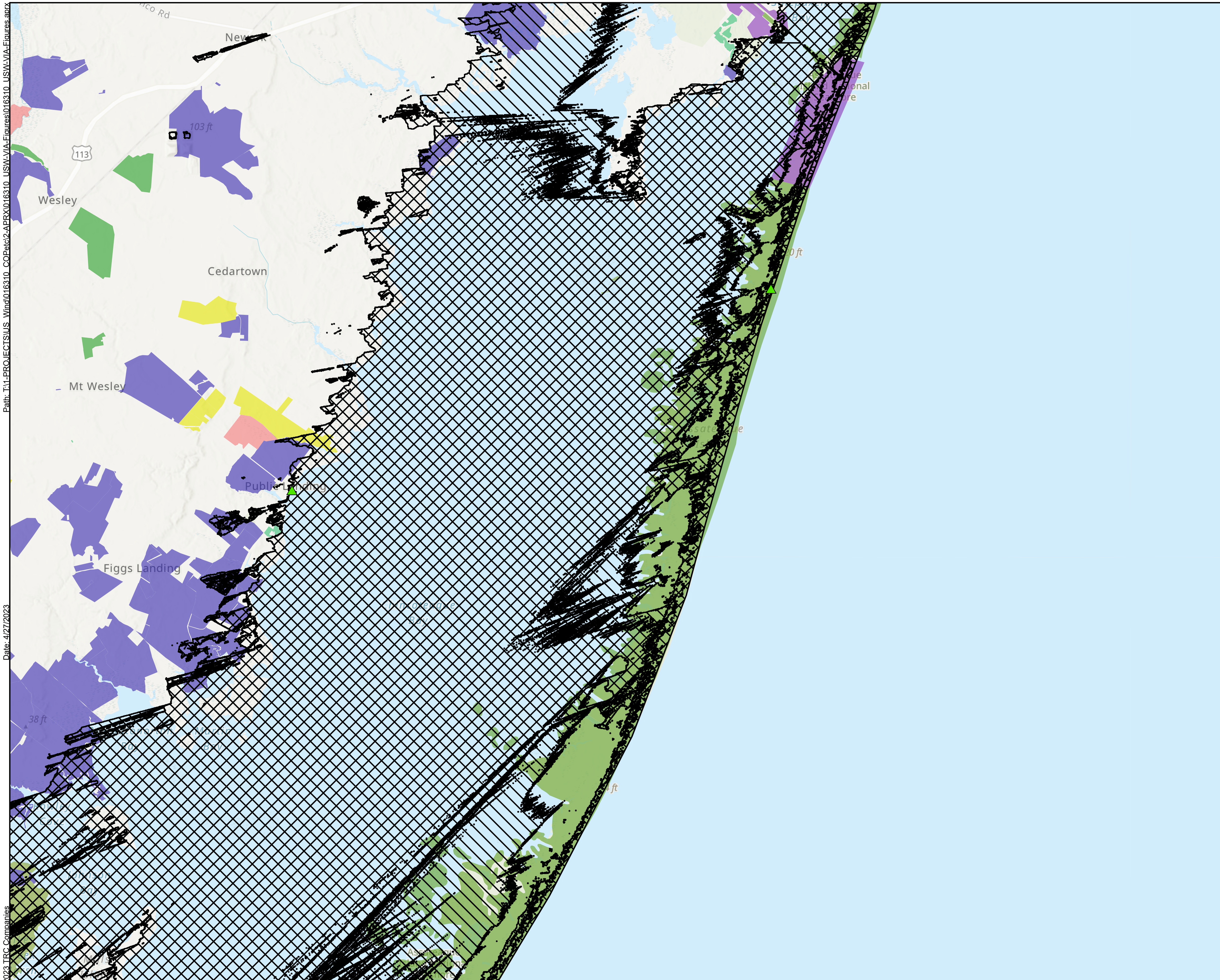

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Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 8
Sheet 10 of 12

Project Viewshed with Natural Resource Areas

Legend

- Selected Simulation Location
- 43-Mile Visual Study Area
- Potential Offshore Substation Visibility (43 mi)
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)
- Agricultural Easement
- Conservation Easement
- Federal Land
- Municipal Park
- National Seashore
- Nature Reserve / Preserve / Sanctuary
- State Forest
- State Park
- Wildlife Management Area

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Topography, 2023
2) BOEM, Lease Area, 2013
3) TNC, Secured Lands, 2015
4) DE Dept. of Agriculture, State Forests, 2021
5) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

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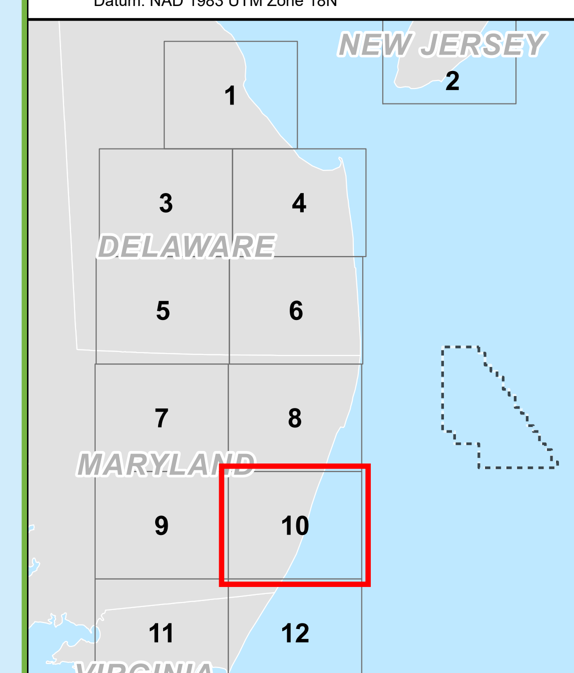

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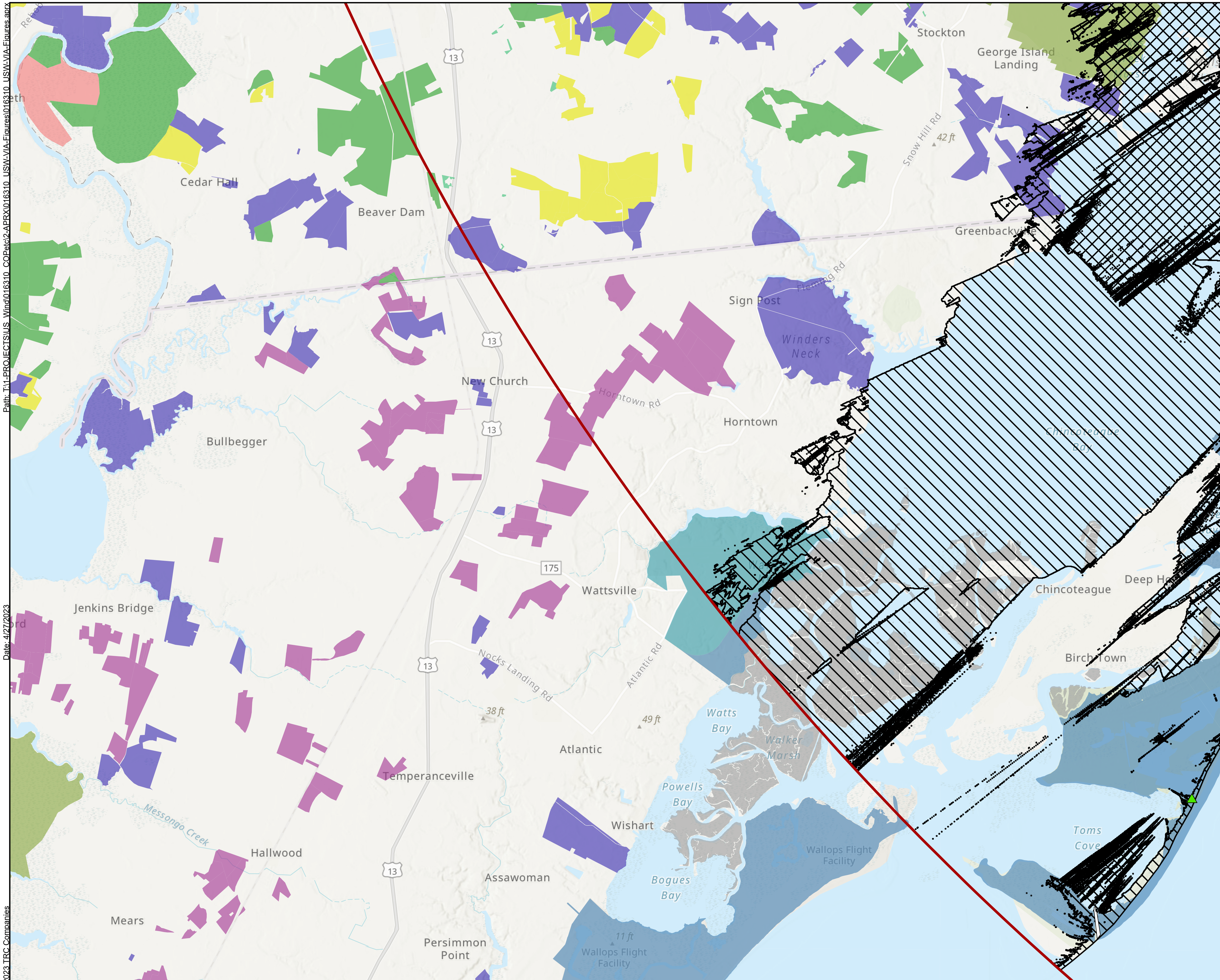

Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 8

Sheet 11 of 12

Project Viewshed with Natural Resource Areas

Legend

- Selected Simulation Location
- Historic Resources (area)
- 43-Mile Visual Study Area
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)
- Agricultural Easement
- Conservation Easement
- Federal Land
- Municipal Park
- National Wildlife Refuge
- Nature Reserve / Preserve / Sanctuary
- Other Land
- Private Conserved Land
- State Forest
- Wildlife Management Area

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Topography, 2023
2) BOEM, Lease Area, 2013
3) TNC, Secured Lands, 2015
4) DE Dept. of Agriculture, State Forests, 2021
5) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

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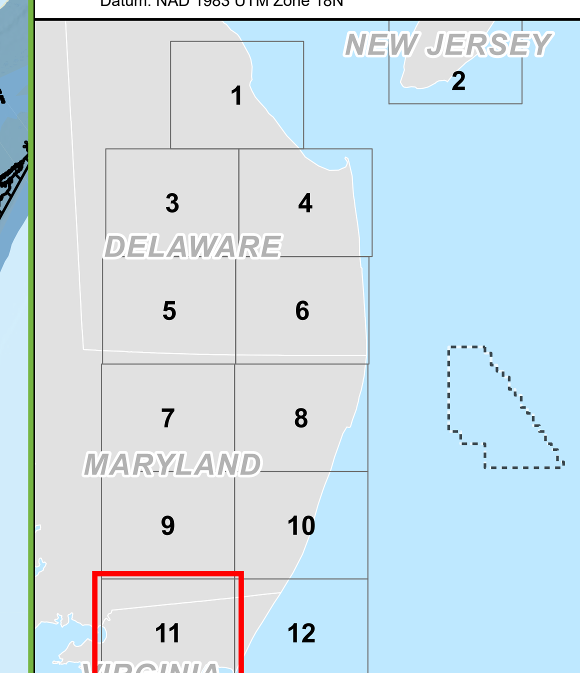

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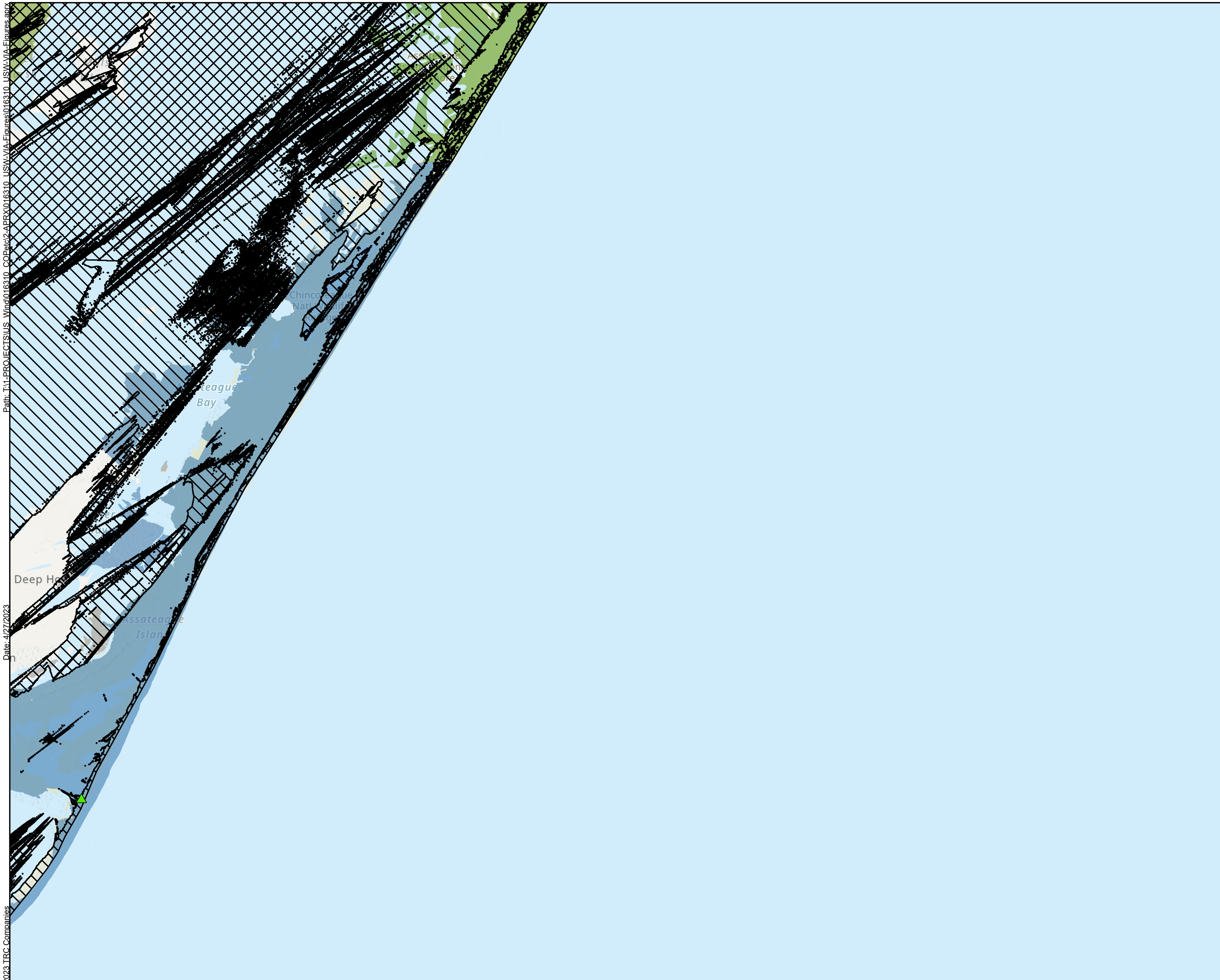

Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 8

Sheet 12 of 12

Project Viewshed with Natural Resource Areas

Legend

- Selected Simulation Location
- 43-Mile Visual Study Area
- Potential Turbine Nacelle Visibility (43 mi)
- Potential Turbine Blade Visibility (43 mi)
- National Seashore
- National Wildlife Refuge
- Other Land

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Topography, 2023
2) BOEM, Lease Area, 2013
3) TNC, Secured Lands, 2015
4) DE Dept. of Agriculture, State Forests, 2021
5) R. Christopher Goodwin & Associates, Inc., Historic Resources, 2022

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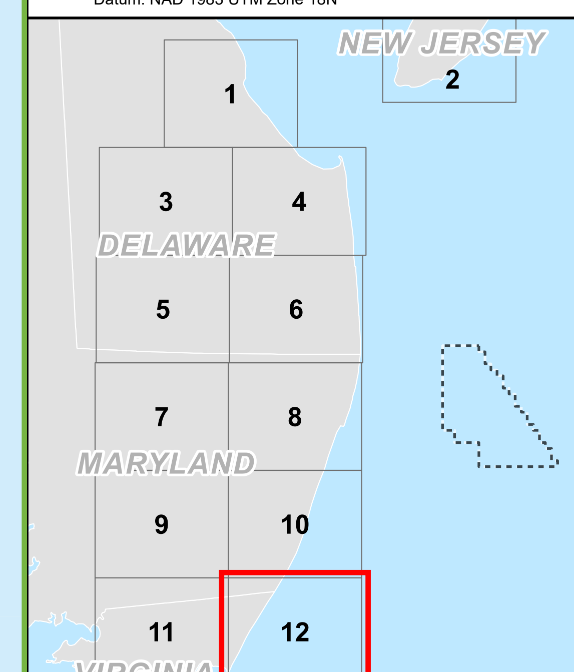

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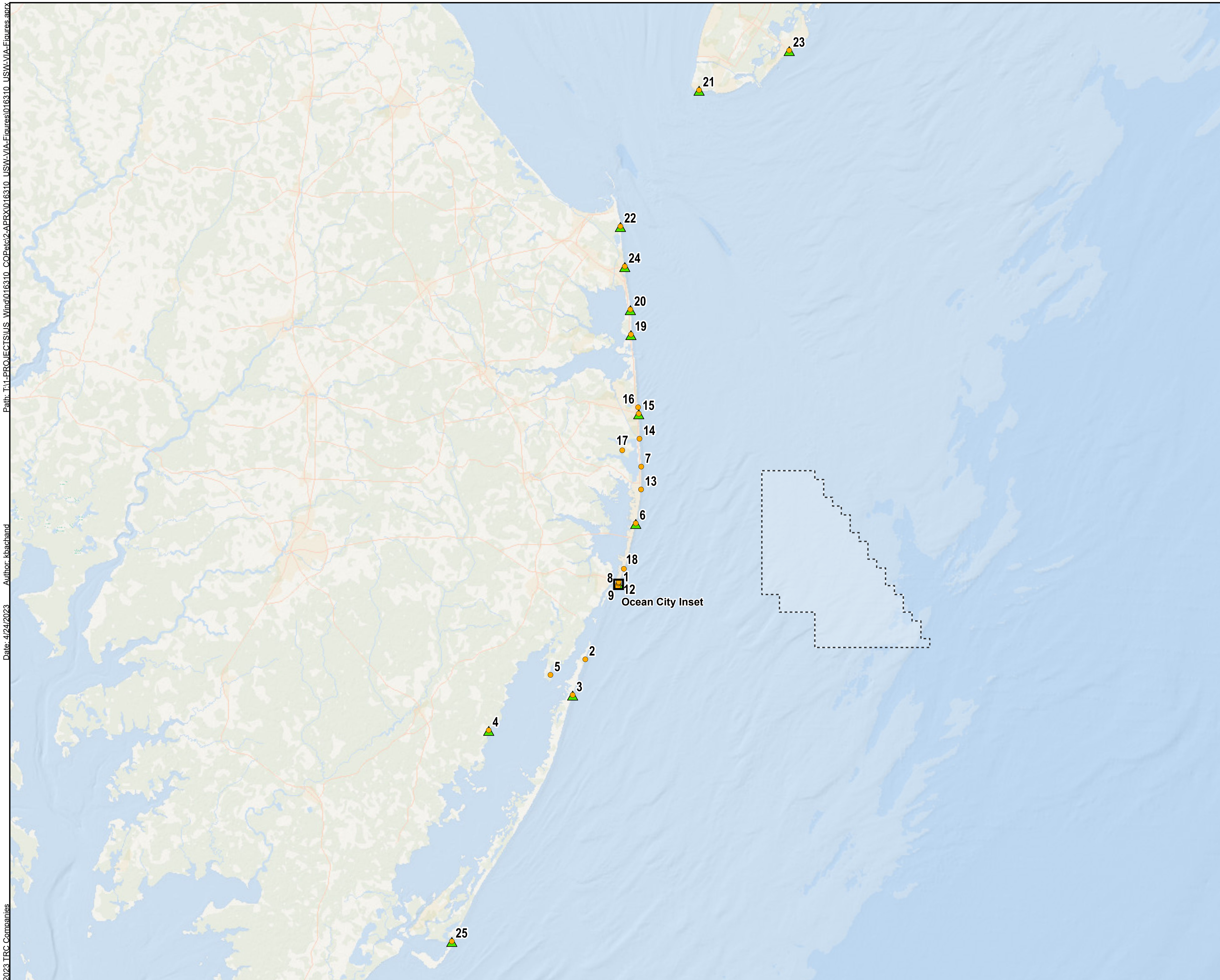


Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 9

Photo Locations for Visual Simulations (Spring 2016/2023)

Photo Location (2016/2023)

Selected Simulation Location

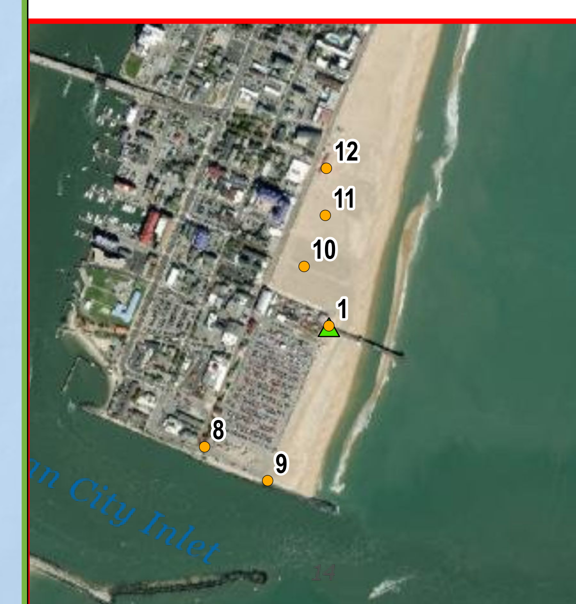
US Wind Lease Area

Map ID	Location
1	Pier Building, Pier, Atlantic Hotel
2	Assateague Island State Park
3	Assateague Island National Seashore
4	Mansion House NRHP and Public Landing
5	Public Boat Launch
6	Isle of Wight Lifesaving Station (84th Street Beach)
7	Fenwick Island State Park
8	US Coast Guard Tower, US Life Saving Station
9	Ocean City Harbor Entrance
10	Atlantic Hotel
11	Margaret Vandergrift Cottage, Lambert Ayres House
12	Mount Vernon Hotel
13	Ocean City Beach
14	WWII Observation Tower (Ground Level)
15	Bethany Beach Boardwalk and Wreck Site
16	Ocean View Parkway Beach Entrance
17	Assawoman Bay Wildlife Area
18	Ocean City Beach, Boardwalk
19	Indian River Life Saving Station
20	Delaware Seashore State Park
21	Cape May Lighthouse Observation Deck
22	Fort Miles Historic District
23	Wildwood Boardwalk
24	Rehoboth Beach Boardwalk
25	Assateague Island Beach Near Tom's Cove

0 2.75 5.5 11 Miles

0 4.25 8.5 17 Kilometers

Source: 1) ESRI, Ocean Basemap/Imagery, Various Dates
2) ESS, Photo Locations, 2016 and 2023



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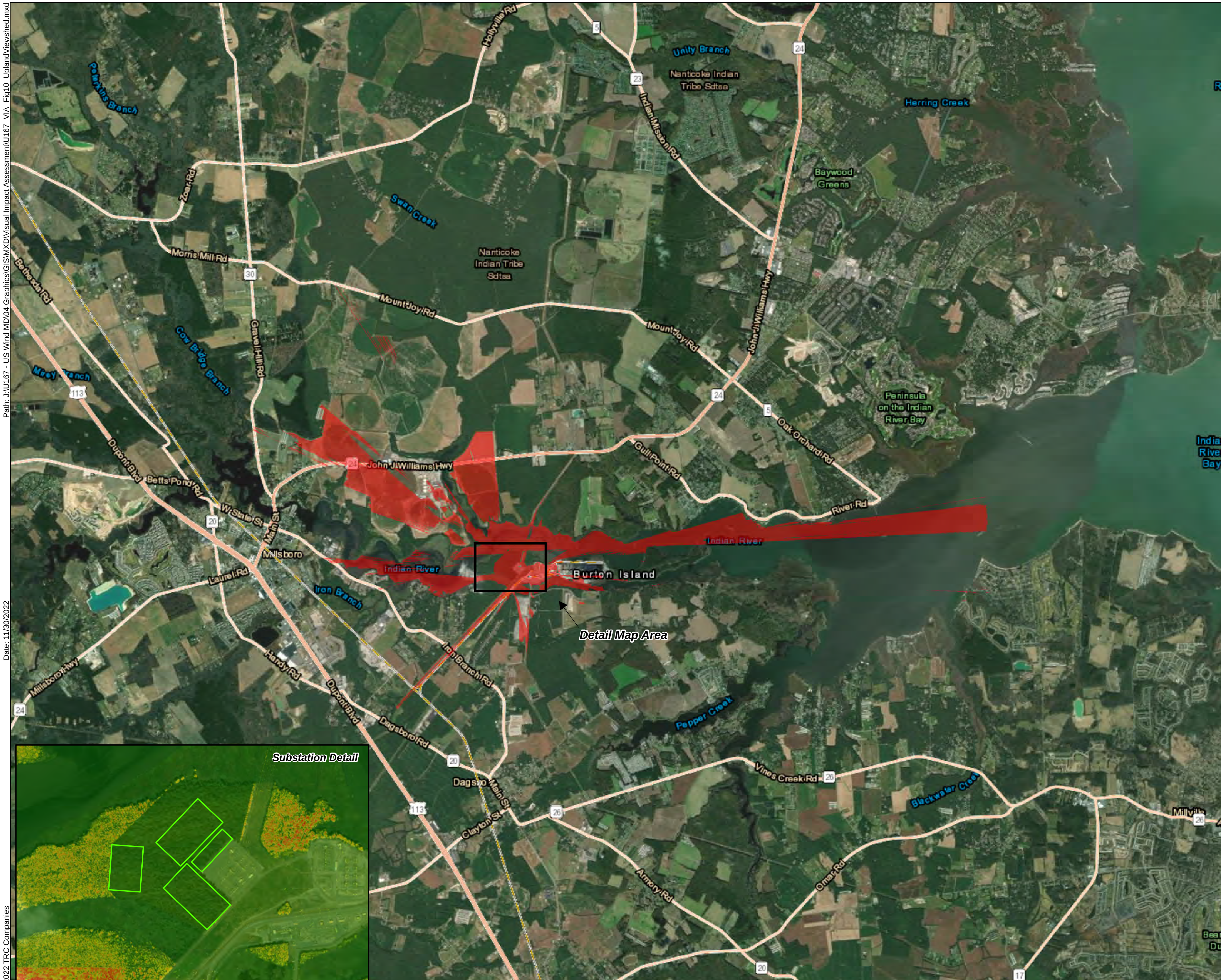
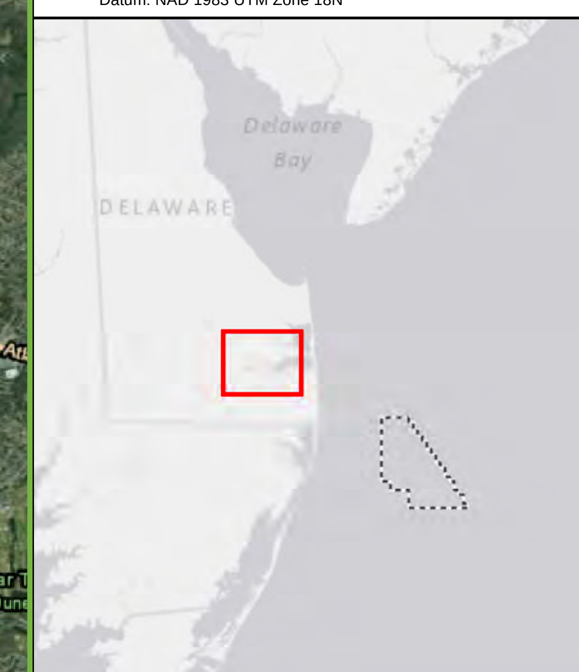




TRC

Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 10

Onshore Substation Viewshed

Legend

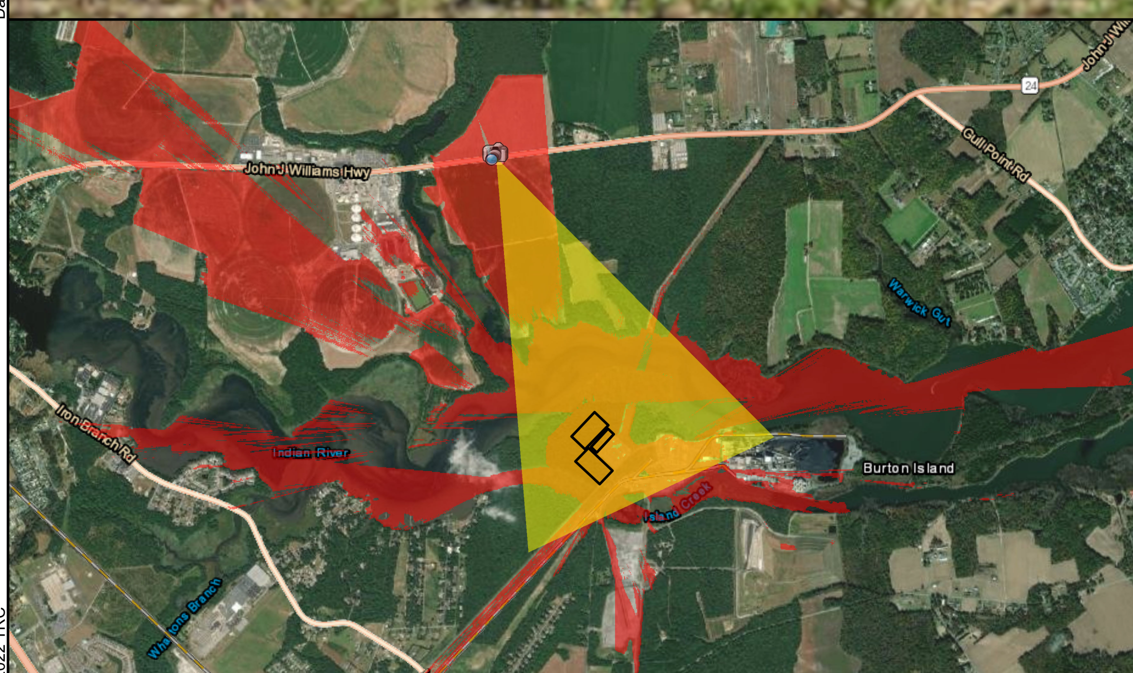
- US Wind Lease Area
- Substation LiDAR Viewshed (60' PDE)

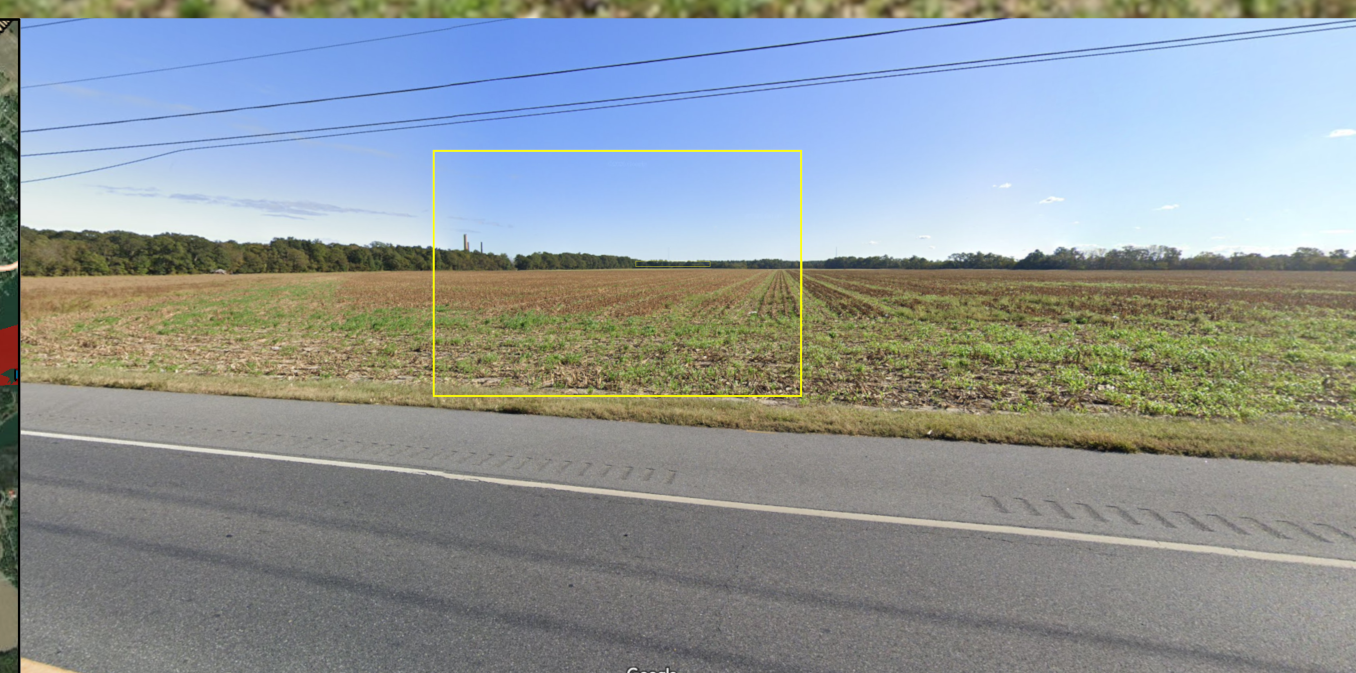
0 0.5 1 Miles

0 1 2 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) USGS, DE LiDAR, 2014

Datum: NAD 1983 UTM Zone 18N





Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 11

Onshore Substation Simulation

Legend

- US Wind Lease
- Substation LiDAR Viewshed (60' PDE)
- Onshore Substation PDE
- Photo Simulation Field of View
- Simulation Location

0 0.5 1 Miles

0 1 2 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) TRC, Simulation Locations, 2022
3) Google, StreetView Imagery, 2019

Datum: NAD 1983 UTM Zone 18N

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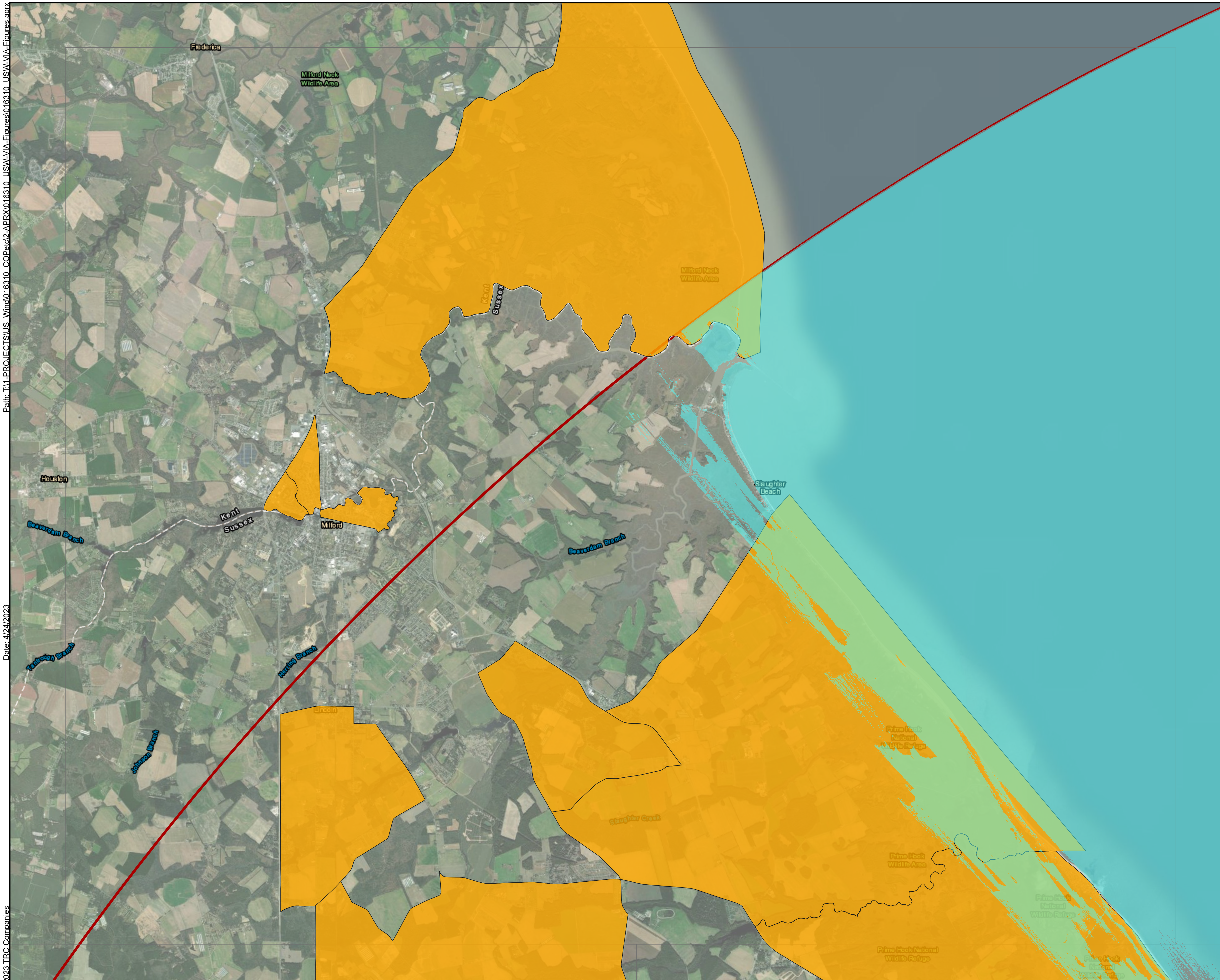

Maryland Offshore Wind Project

Offshore Maryland and Delaware

Figure 12

Sheet 1 of 12

Environmental Justice Areas

Legend

- 43-Mile Visual Study Area
- Environmental Justice Area*
- US Wind 938 ft Blade Tip Viewshed Area

* Defined being within the 50th percentile or greater for the minority index and/or the low income index on EJSCREEN.

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) EPA EHSCREEN, State Percentages, 2022

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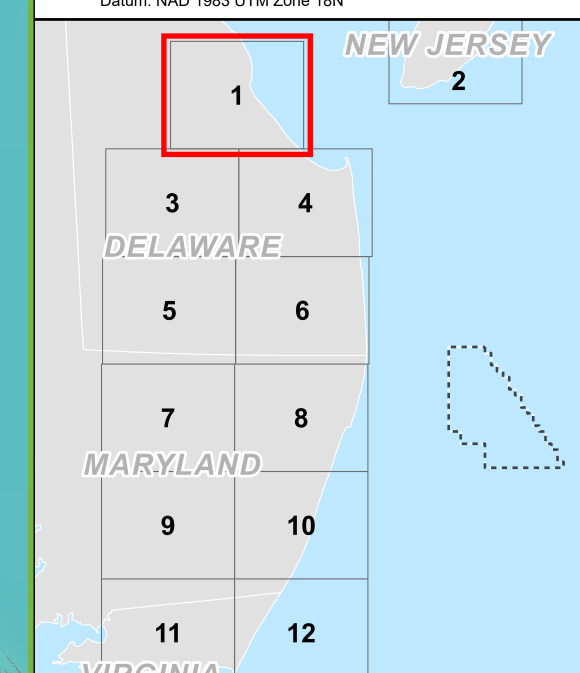

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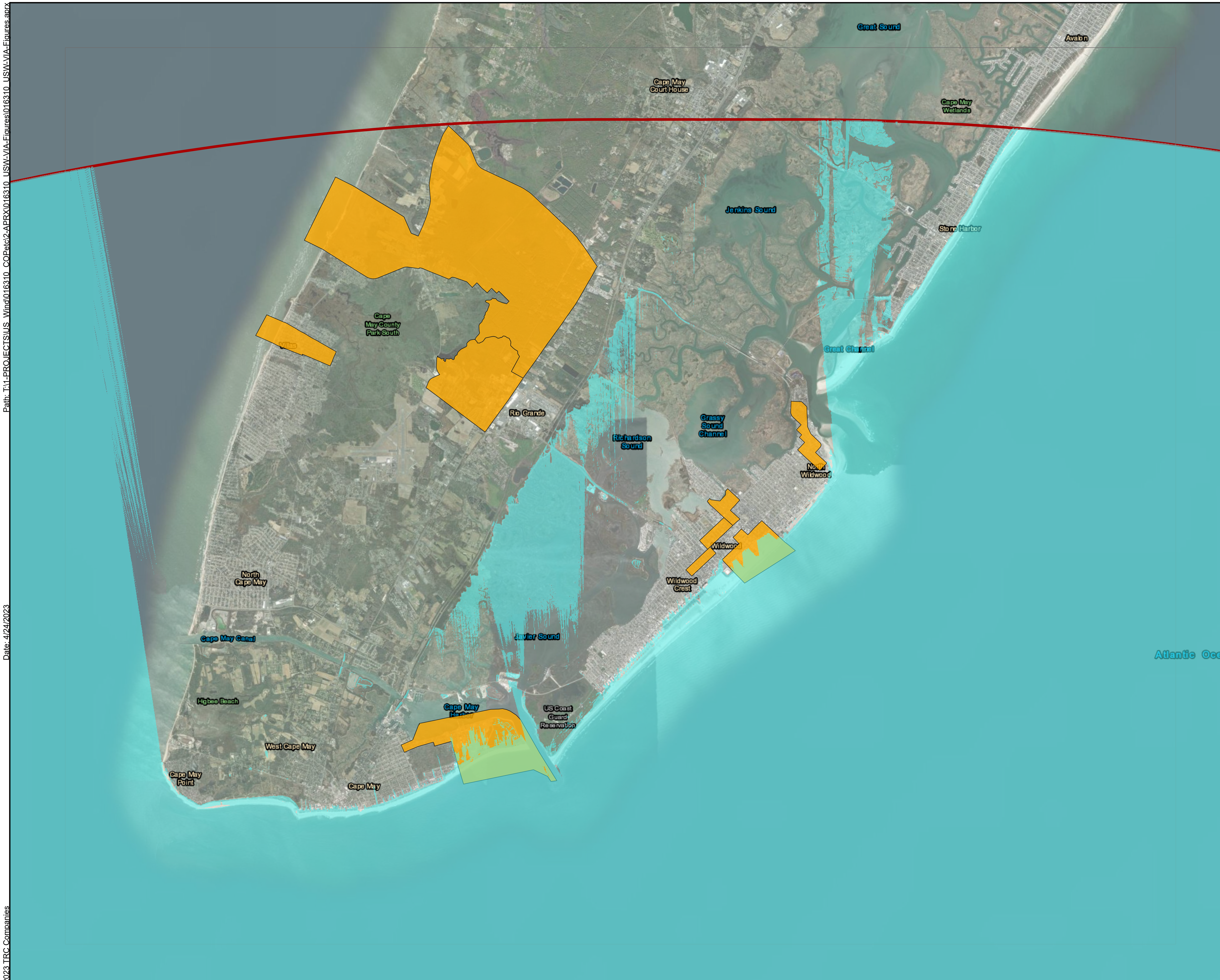


TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 12

Sheet 2 of 12

Environmental Justice Areas

Legend

- 43-Mile Visual Study Area
- Environmental Justice Area*
- US Wind 938 ft Blade Tip Viewshed Area

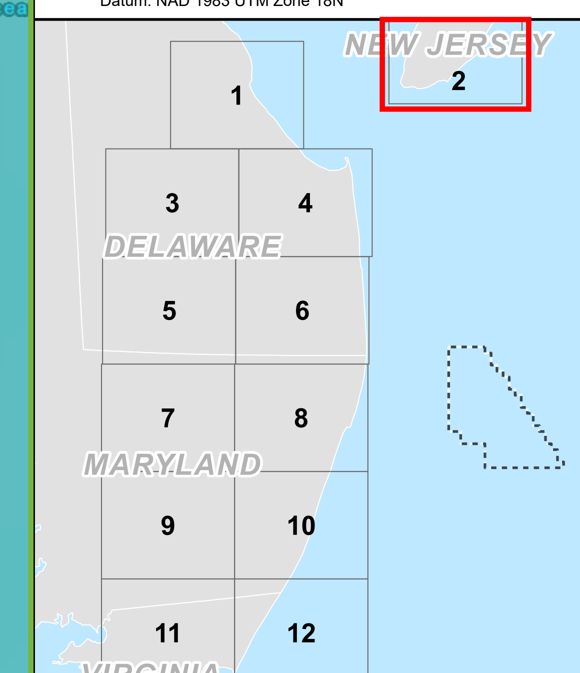
* Defined being within the 50th percentile or greater for the minority index and/or the low income index on EJSCREEN.

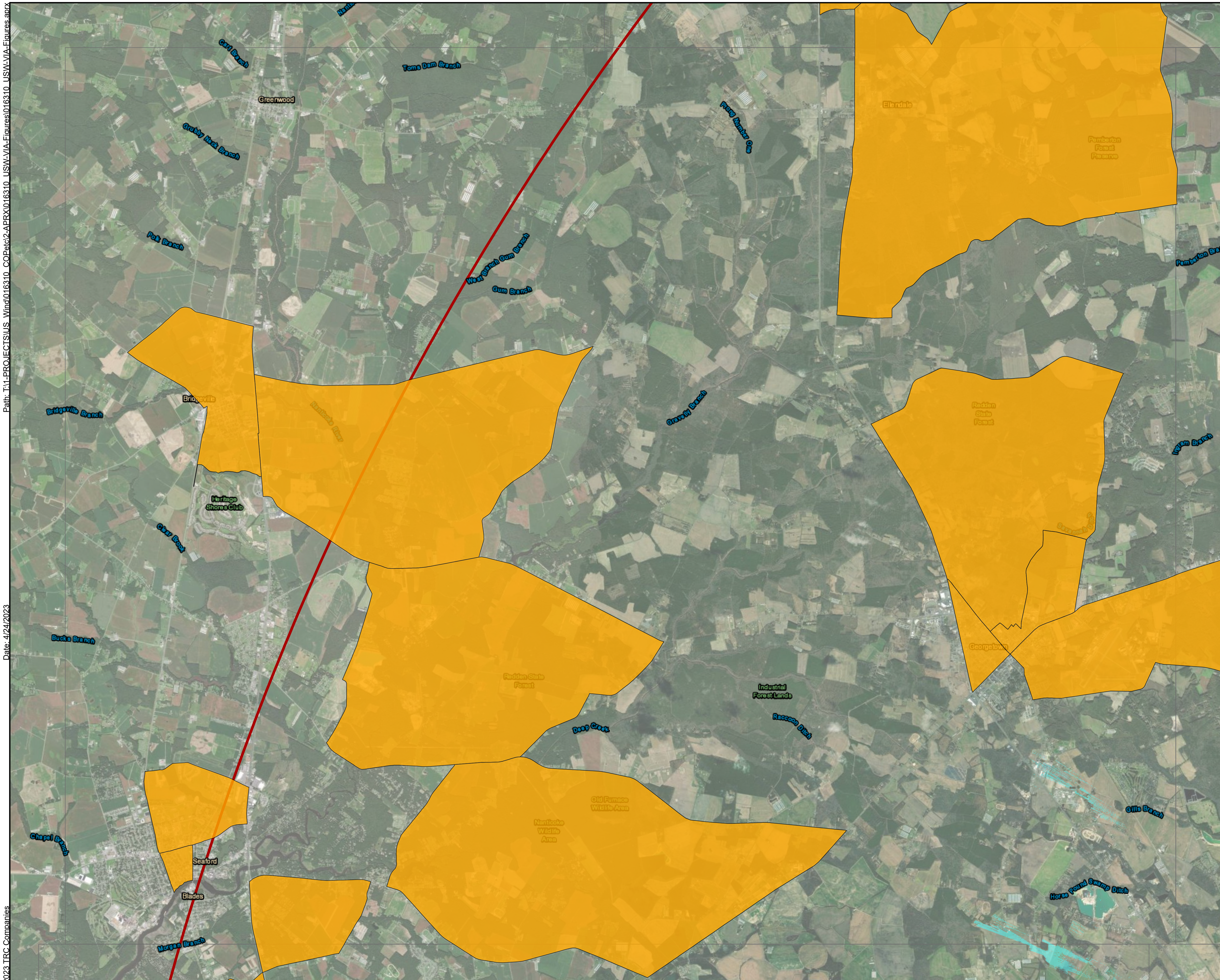
0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) EPA EHSCREEN, State Percentages, 2022

Datum: NAD 1983 UTM Zone 18N





TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 12
Sheet 3 of 12

Environmental Justice Areas

Legend

- 43-Mile Visual Study Area
- Environmental Justice Area*
- US Wind 938 ft Blade Tip Viewshed Area

* Defined being within the 50th percentile or greater for the minority index and/or the low income index on EJSCREEN.

0 0.5 1 2 Miles
0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) EPA EHSCREEN, State Percentages, 2022

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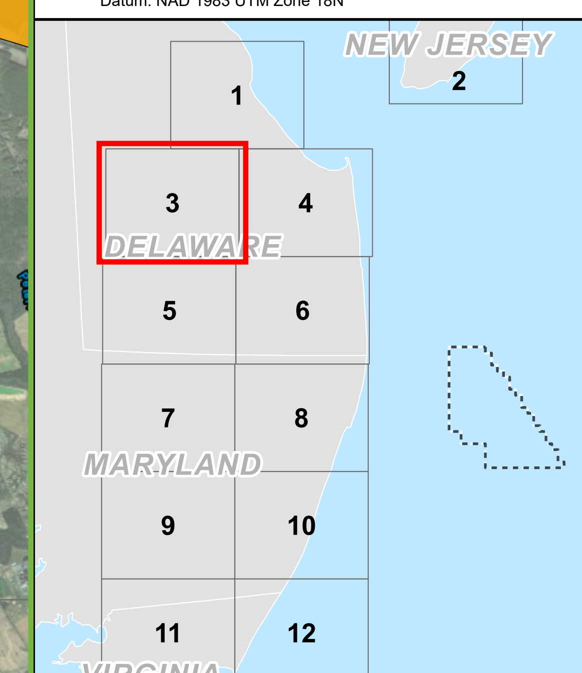

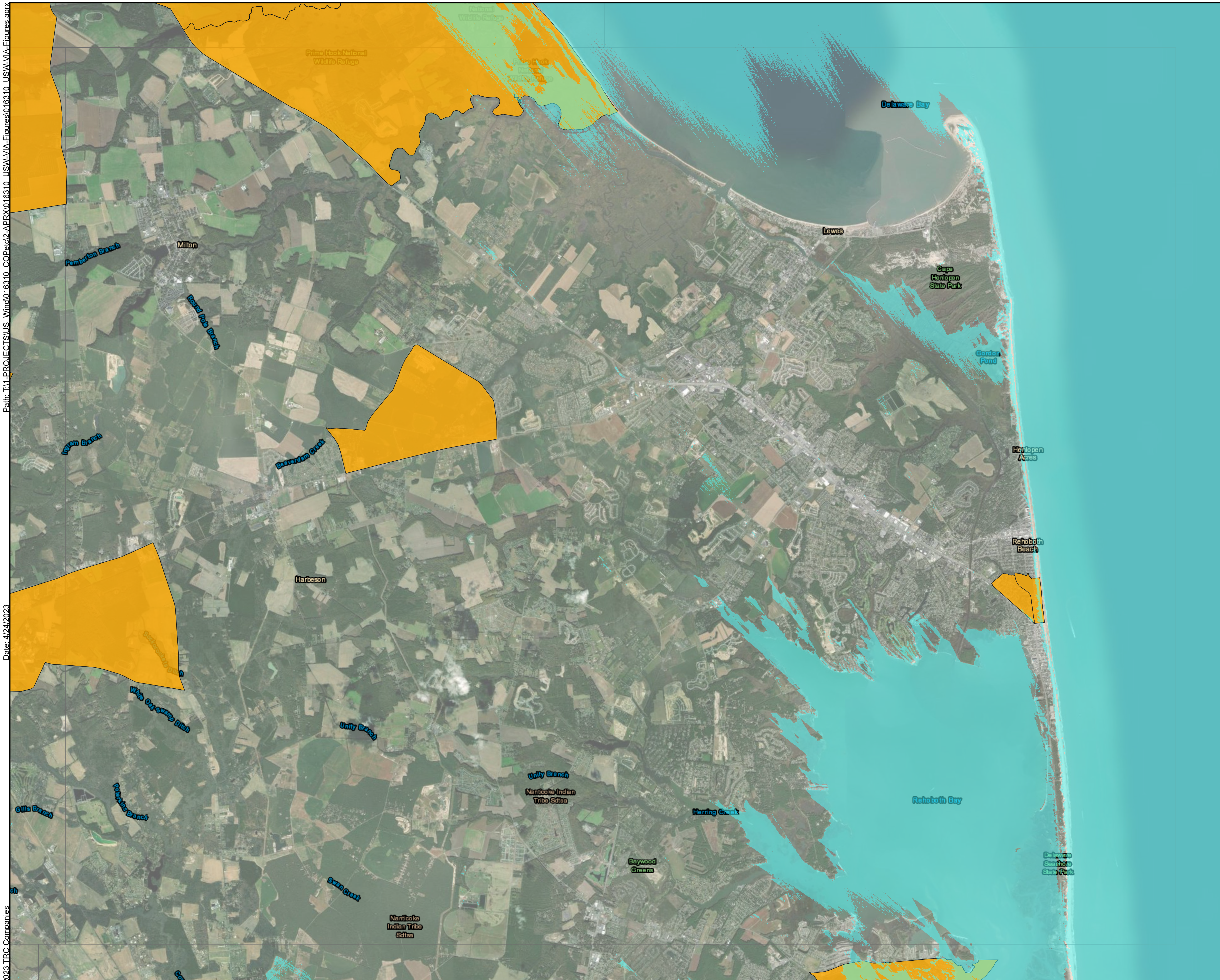

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 12
Sheet 4 of 12

Environmental Justice Areas

Legend

- 43-Mile Visual Study Area
- Environmental Justice Area*
- US Wind 938 ft Blade Tip Viewshed Area

* Defined being within the 50th percentile or greater for the minority index and/or the low income index on EJSCREEN.

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) EPA EHSCREEN, State Percentages, 2022

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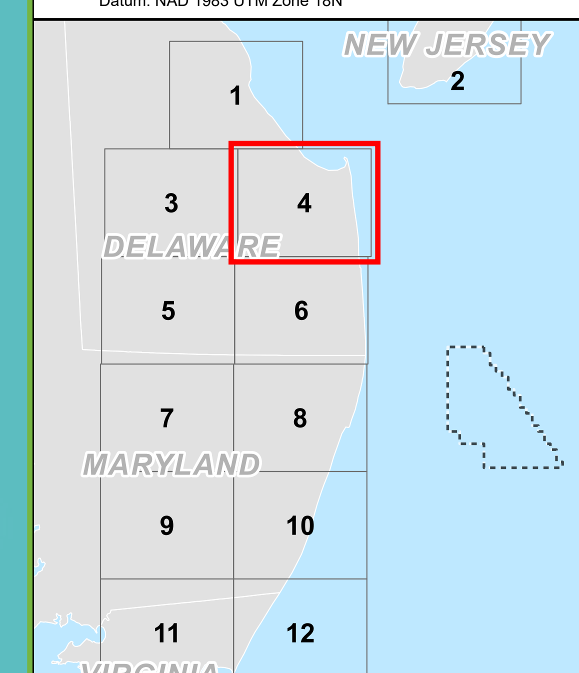
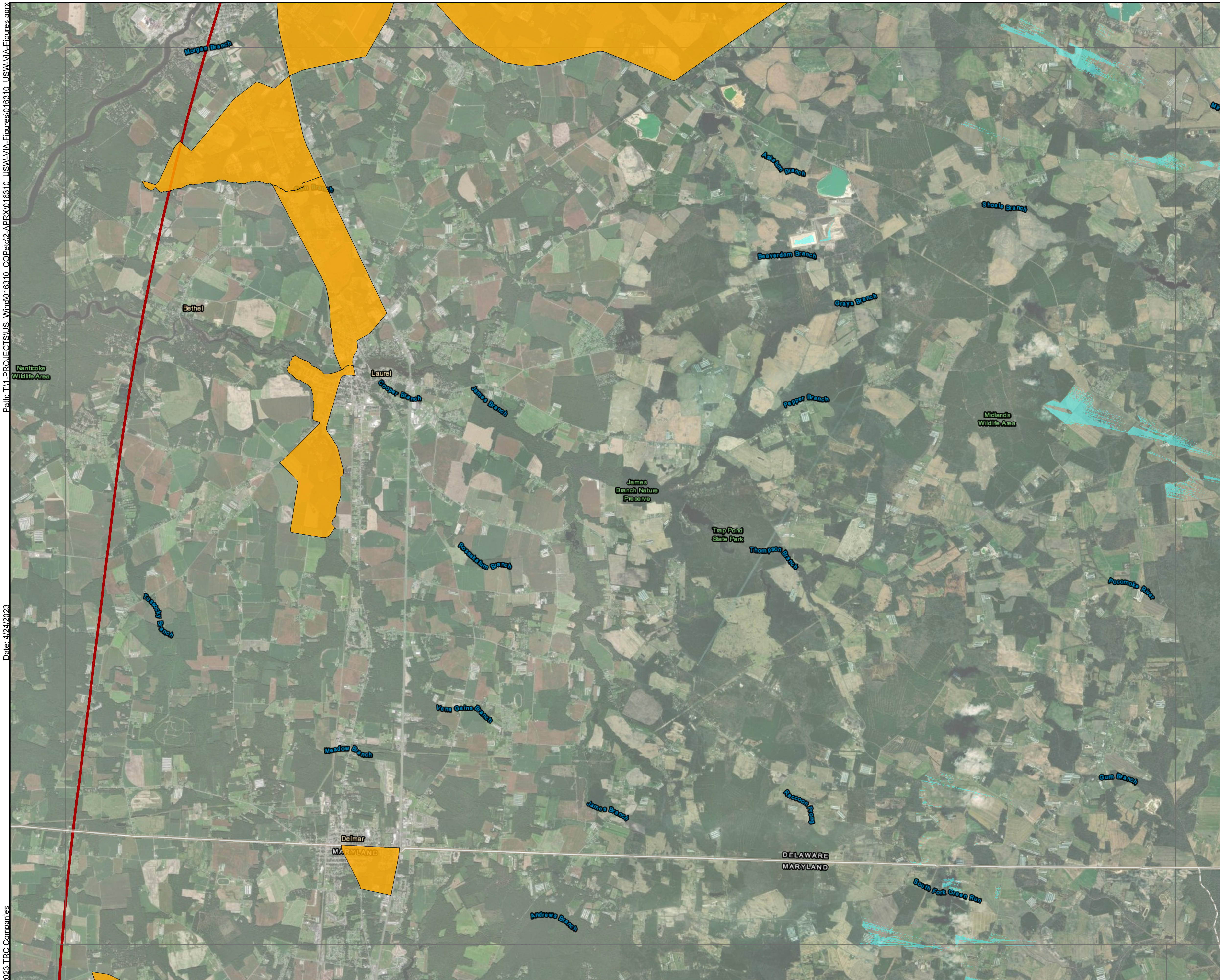


Date: 4/24/2023



Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 12
Sheet 5 of 12

Environmental Justice Areas

Legend

- 43-Mile Visual Study Area
- Environmental Justice Area*
- US Wind 938 ft Blade Tip Viewshed Area

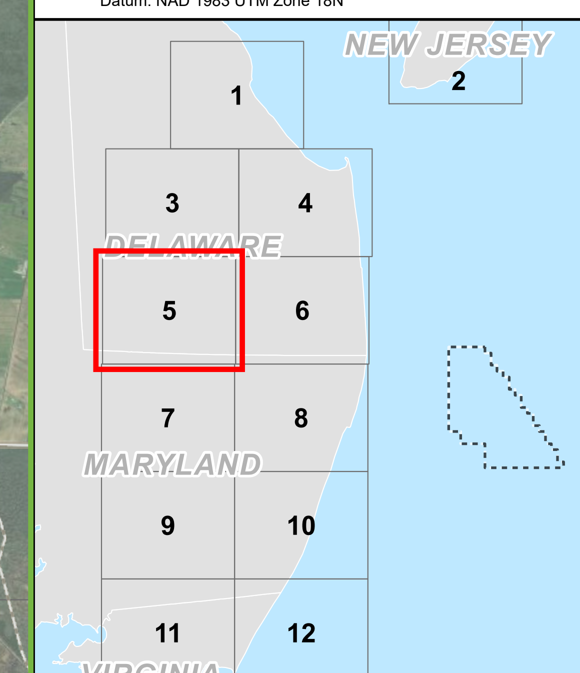
* Defined being within the 50th percentile or greater for the minority index and/or the low income index on EJSCREEN.

0 0.5 1 2 Miles

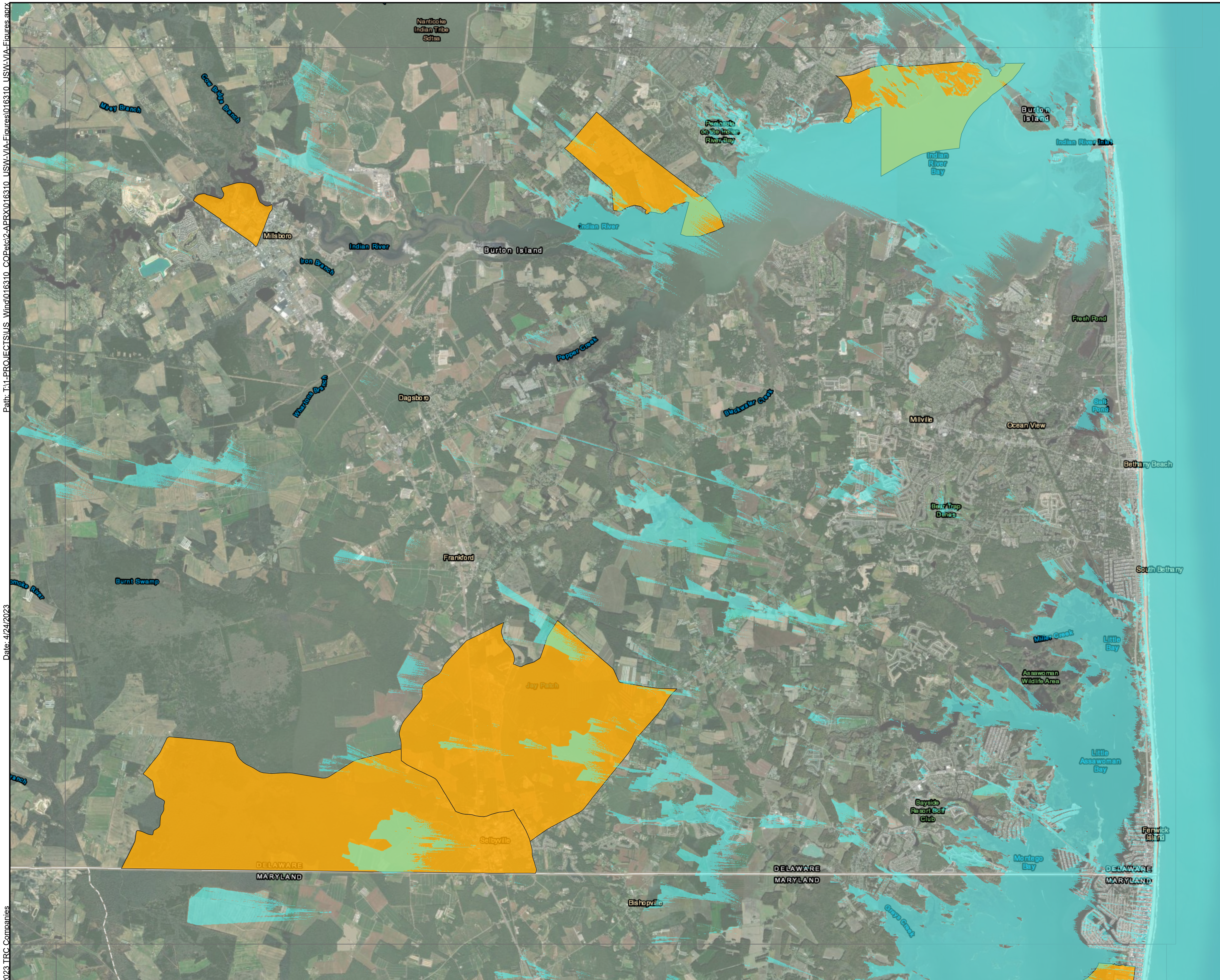
0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) EPA EHSCREEN, State Percentages, 2022

Datum: NAD 1983 UTM Zone 18N



Date: 4/24/2023



Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 12
Sheet 6 of 12

Environmental Justice Areas

Legend

- 43-Mile Visual Study Area
- Environmental Justice Area*
- US Wind 938 ft Blade Tip Viewshed Area

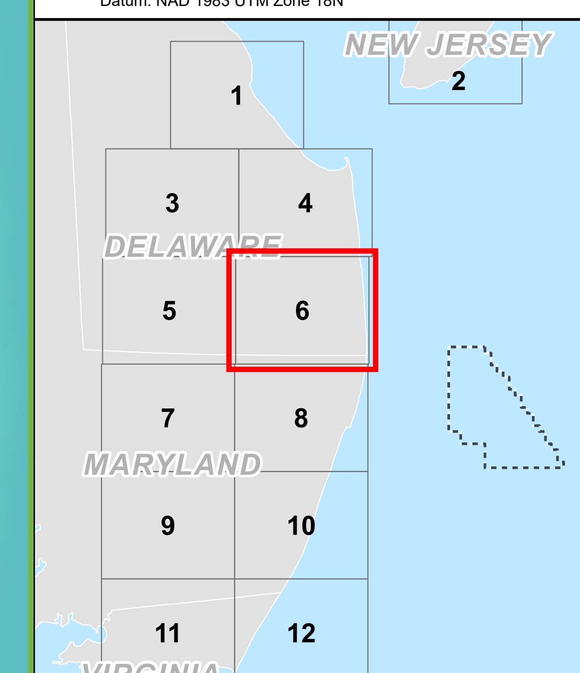
* Defined being within the 50th percentile or greater for the minority index and/or the low income index on EJSCREEN.

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) EPA EHSCREEN, State Percentages, 2022

Datum: NAD 1983 UTM Zone 18N



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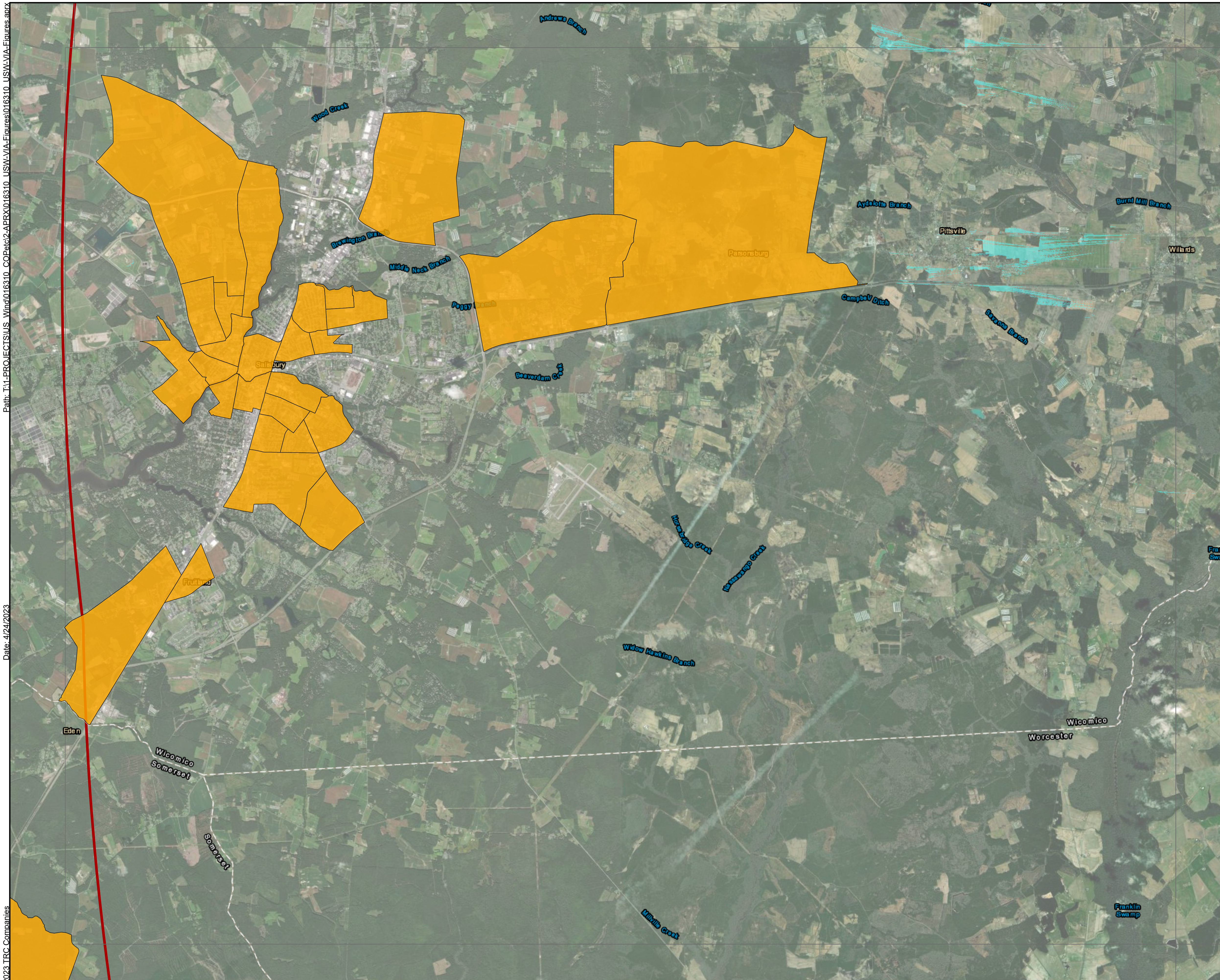

TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 12
Sheet 7 of 12

Environmental Justice Areas

Legend

- 43-Mile Visual Study Area
- Environmental Justice Area*
- US Wind 938 ft Blade Tip Viewshed Area

* Defined being within the 50th percentile or greater for the minority index and/or the low income index on EJSCREEN.

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) EPA EHSCREEN, State Percentages, 2022

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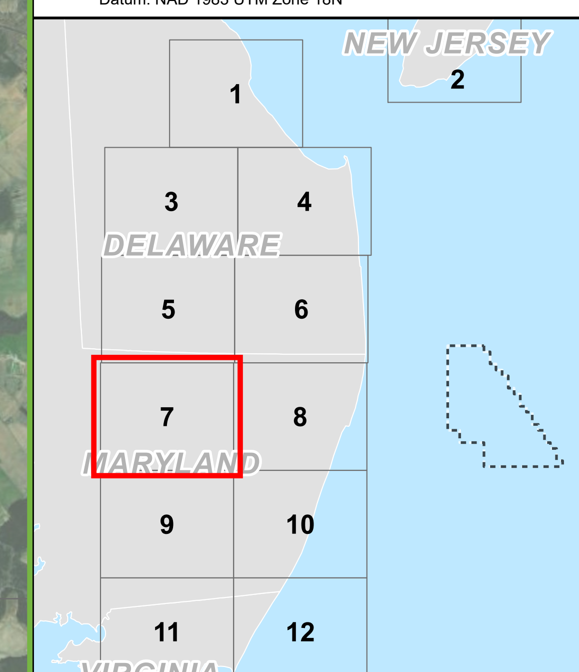

Date: 4/24/2023

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 12
Sheet 8 of 12

Environmental Justice Areas

Legend

- 43-Mile Visual Study Area
- Environmental Justice Area*
- US Wind 938 ft Blade Tip Viewshed Area

* Defined being within the 50th percentile or greater for the minority index and/or the low income index on EJSCREEN.

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) EPA EHSCREEN, State Percentages, 2022

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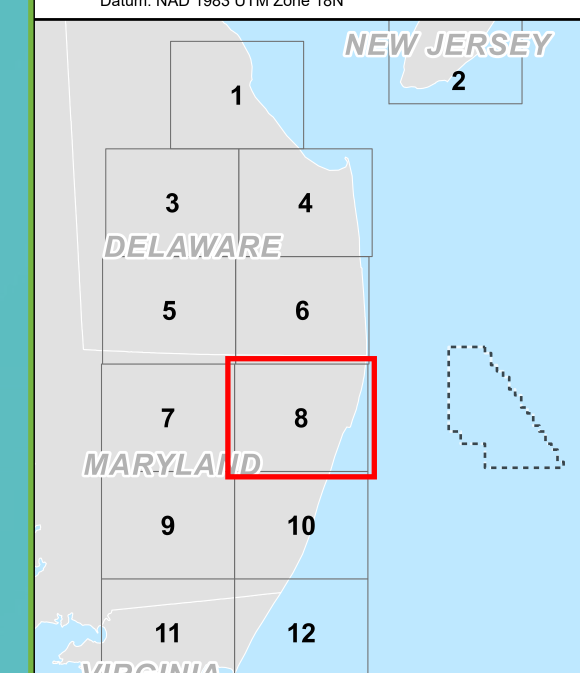

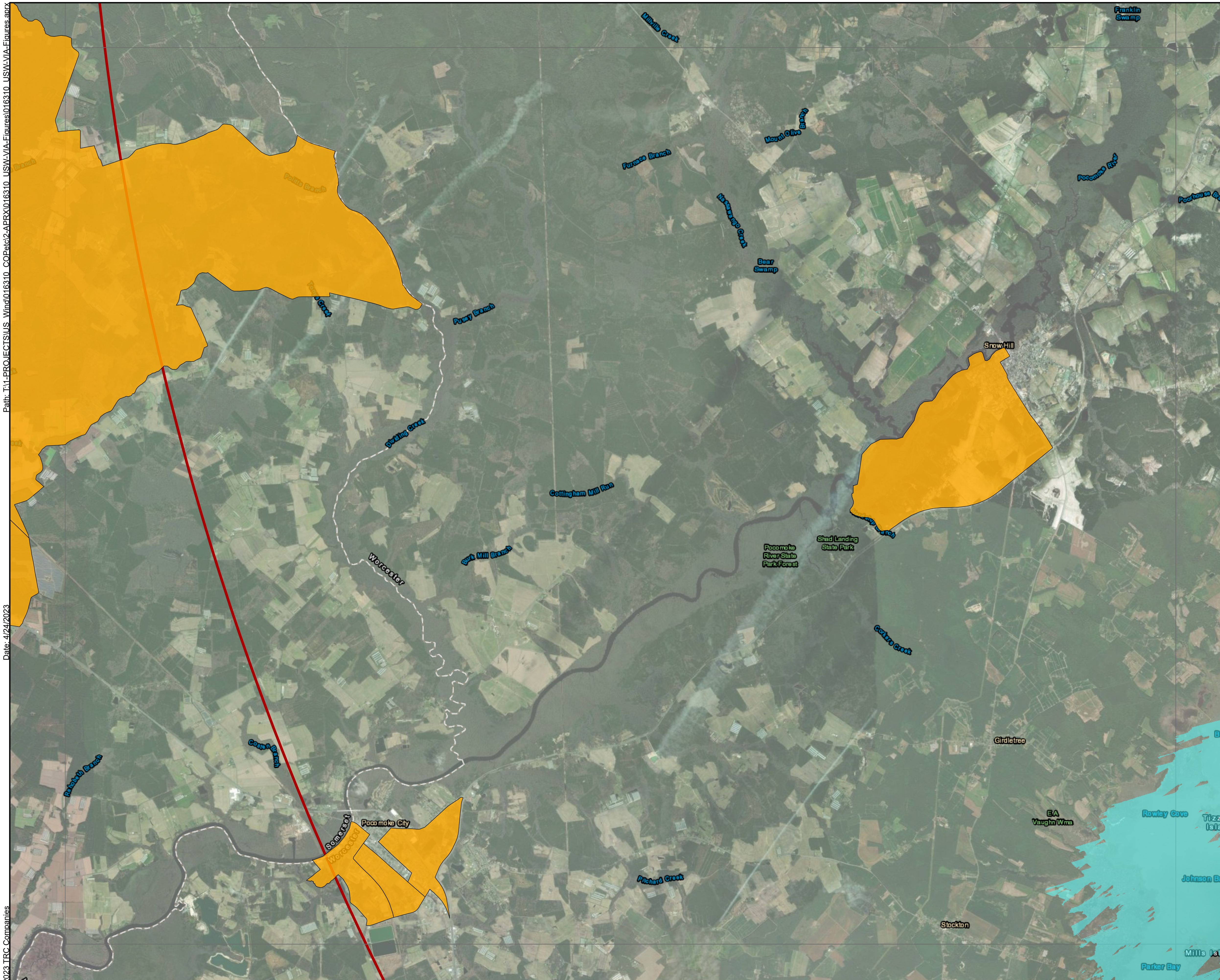

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 12
Sheet 9 of 12

Environmental Justice Areas

Legend

- 43-Mile Visual Study Area
- Environmental Justice Area*
- US Wind 938 ft Blade Tip Viewshed Area

* Defined being within the 50th percentile or greater for the minority index and/or the low income index on EJSCREEN.

0 0.5 1 2 Miles
0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) EPA EHSCREEN, State Percentages, 2022

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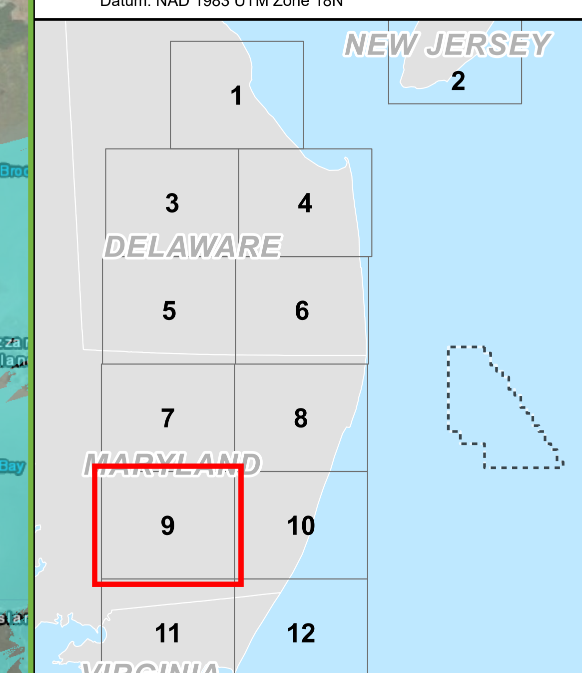

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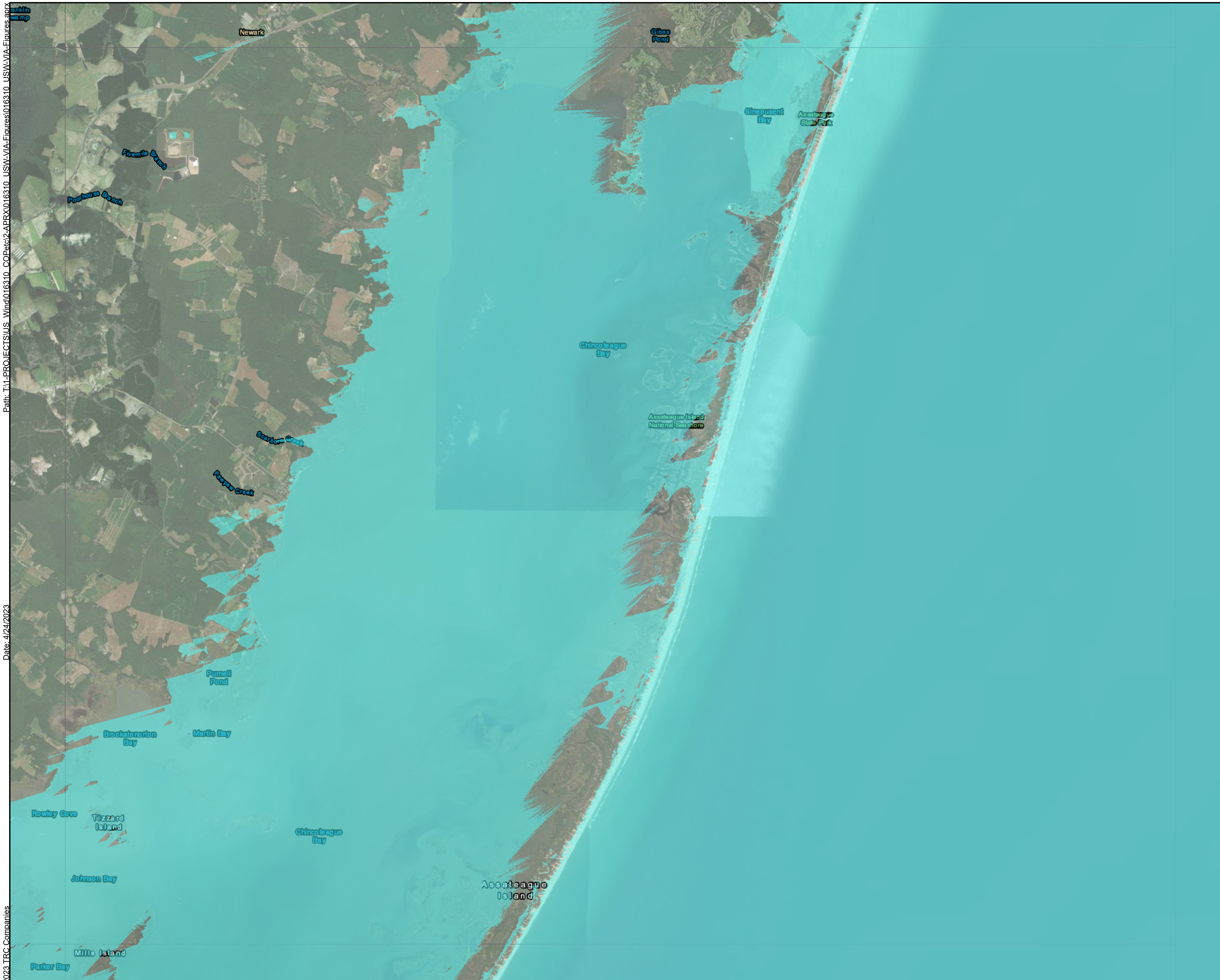

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Date: 4/24/2023

TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

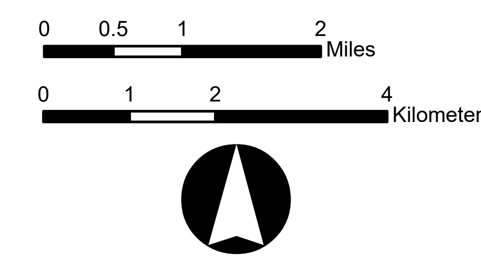
Figure 12
Sheet 10 of 12

Environmental Justice Areas

Legend

- 43-Mile Visual Study Area
- Environmental Justice Area*
- US Wind 938 ft Blade Tip Viewshed Area

* Defined being within the 50th percentile or greater for the minority index and/or the low income index on EJSCREEN.



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2) EPA EHSCREEN, State Percentages, 2022

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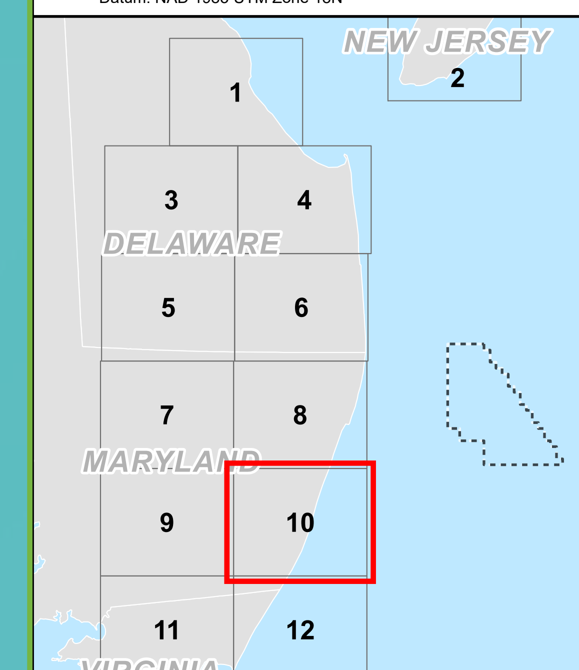

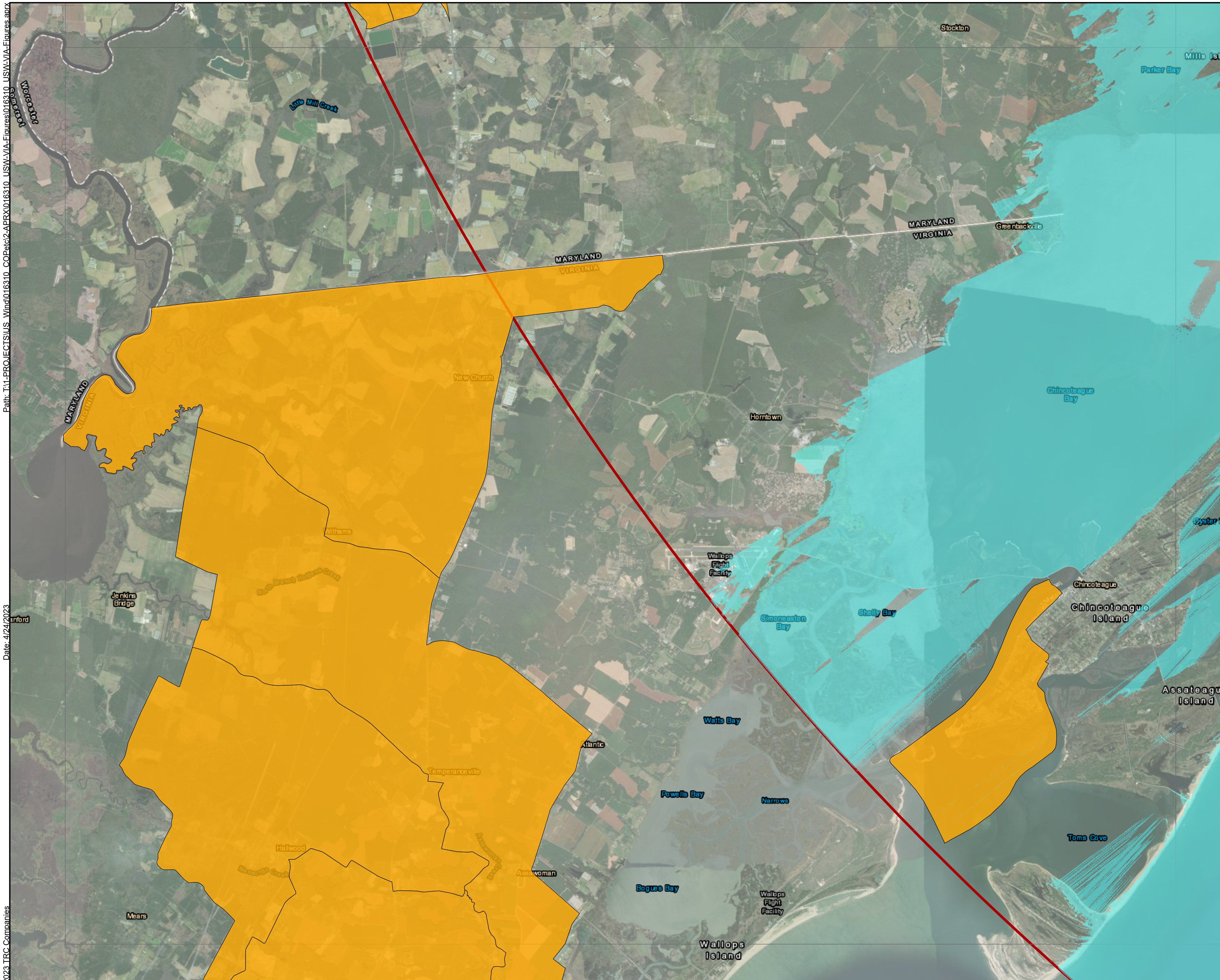

TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 12
Sheet 11 of 12

Environmental Justice Areas

Legend

- 43-Mile Visual Study Area
- Environmental Justice Area*
- US Wind 938 ft Blade Tip Viewshed Area

* Defined being within the 50th percentile or greater for the minority index and/or the low income index on EJSCREEN.

0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) EPA EHSCREEN, State Percentages, 2022

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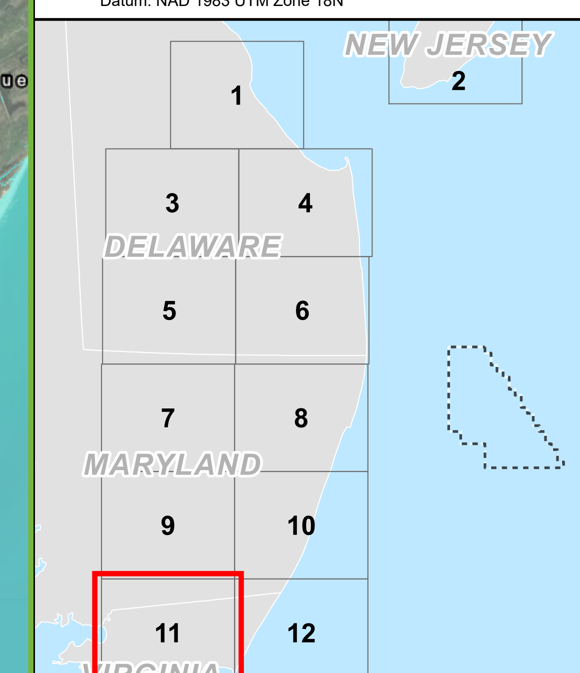

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Date: 4/24/2023

TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 12

Sheet 12 of 12

Environmental Justice Areas

Legend

- 43-Mile Visual Study Area
- Environmental Justice Area*
- US Wind 938 ft Blade Tip Viewshed Area

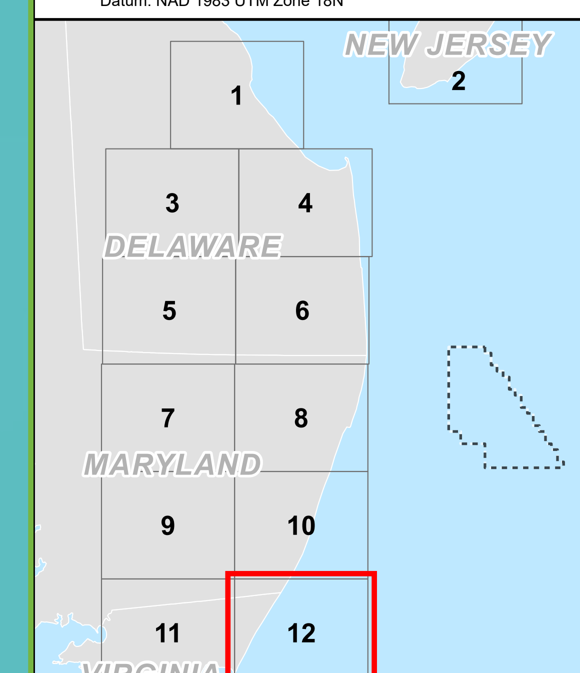
* Defined being within the 50th percentile or greater for the minority index and/or the low income index on EJSCREEN.

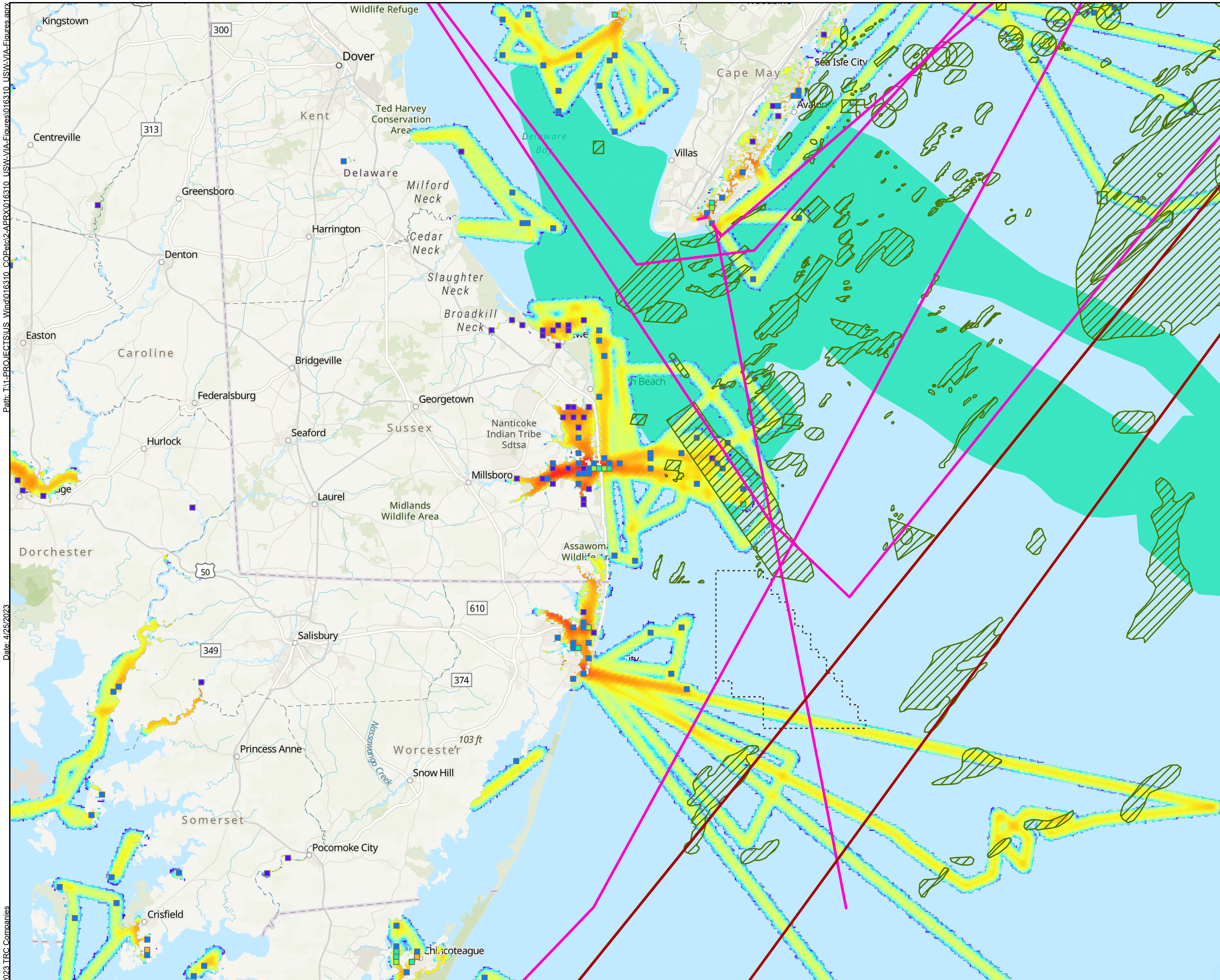
0 0.5 1 2 Miles

0 1 2 4 Kilometers

Source: 1) ESRI, Imagery, Various Dates
2) EPA EHSCREEN, State Percentages, 2022

Datum: NAD 1983 UTM Zone 18N





TRC

Maryland Offshore Wind Project
Offshore Maryland and Delaware

Figure 13
Offshore Recreational Activities

Legend

- Distance Sailing Race Route
- Recreational Boater Route
- New Jersey Prime Fishing Ground
- Commercial Whale Watching Area
- US Wind Lease Area

Recreational Fishing Vessels 1km Intensity

- 0
- 1
- 2
- 3
- 4
- 5

0 4 8 16 Miles

0 5 10 20 Kilometers

Source: 1) ESRI, World Topo Basemap, 2022
2) BOEM, Lease Area, 2018
3) New England Ocean Data Portal, Multiple Layers, 2022
4) NJDEP, Prime Fishing Ground, 2022
5) UCI, et al., Fishing Vessel Density, 2014

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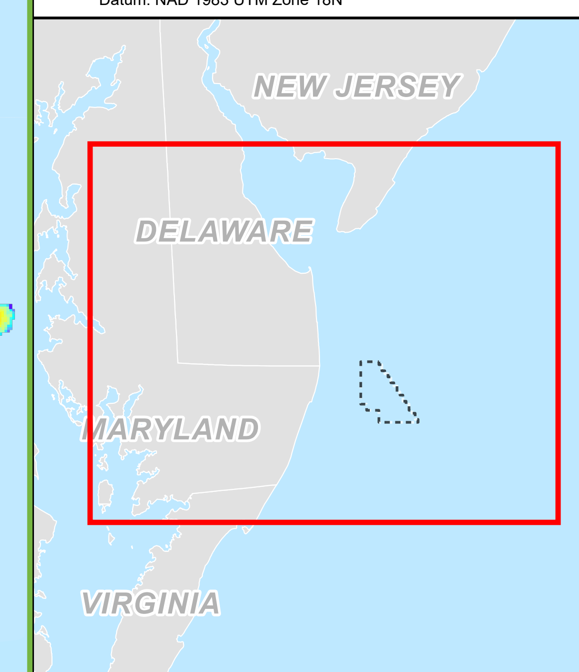


Appendix A. Visual Simulations

Appendix B. Photo Log

Site 1 Pier Building, Pier, Atlantic Hotel - Ocean City, Maryland (Lat: 38.32766, Lon: 75.08493, Elevation FT: 14.634)

Site 2 Assateague Island State Park - Assateague Island, Maryland (Lat: 38.23586, Lon: 75.13672, Elevation FT: 13.318)

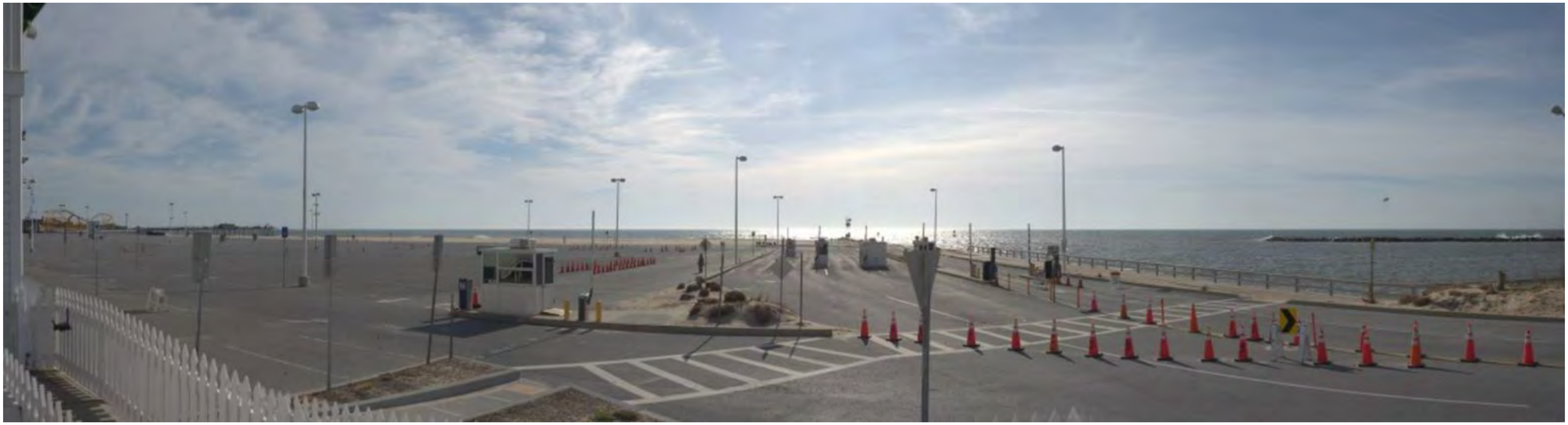
Site 3 Assateague Island National Seashore – Assateague Island, Maryland (Lat: 38.19223, Lon: 75.15631, Elevation FT: 16.321)

Site 4 Mansion House NRHP and Public Landing - Snow Hill, Maryland (Lat: 38.14877, Lon: 75.28625, Elevation FT: 0.103)

Site 5 Public Boat Launch - Sinepuxent Neck, Maryland (Lat: 38.21674, Lon: 75.19072, Elevation FT: 0.164)

Site 6 Isle of Wight Lifesaving Station - Ocean City, Maryland (Lat: 38.40237, Lon: 75.05862, Elevation FT: 14.645)

Site 7 Fenwick Island State Park - Rehoboth Beach, Delaware (Lat: 38.47174, Lon: 75.05017, Elevation FT: 12.788)



Site 8 US Coast Guard Tower, US Life Saving Station - Ocean City, Maryland (Lat: 38.32535, Lon: 75.08794, Elevation FT: 12.66)

Site 9 Ocean City Harbor Entrance - Ocean City, Maryland (Lat: 38.3247, Lon: 75.08641, Elevation FT: 6.757)

Site 10 Atlantic Hotel - Ocean City, Maryland (Lat: 38.32879, Lon: 75.08553, Elevation FT: 11.747)

Site 11 Margaret Vandergrift Cottage, Lambert Ayres House - Ocean City, Maryland (Lat: 38.32977, Lon: 75.08502, Elevation FT: 10.205)

Site 12 Mount Vernon Hotel - Ocean City, Maryland (Lat: 38.33066, Lon: 75.08499, Elevation FT: 10.158)

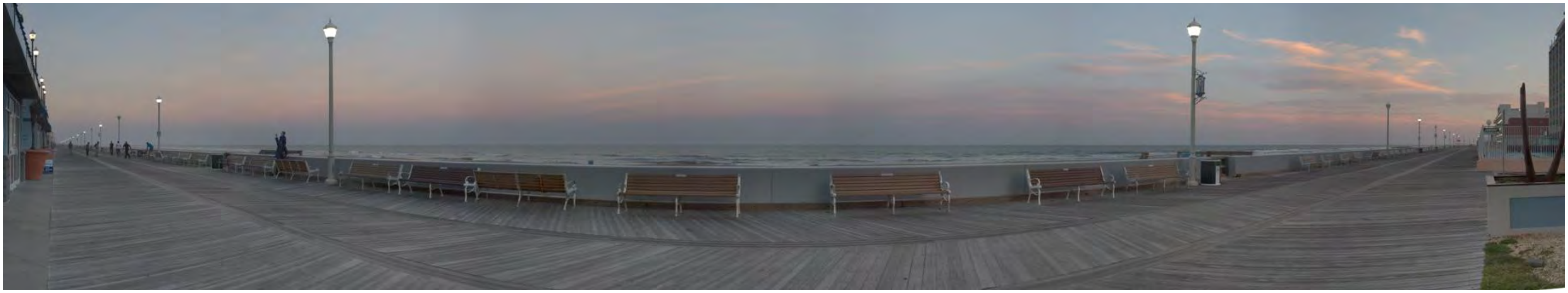
Site 13 Ocean City Beach - Ocean City, Maryland (Lat: 38.44383, Lon: 75.05038, Elevation FT: 10.623)

Site 14 WWII Observation Tow er (Ground Level) - Bethany Beach, Delaware (Lat: 38.50588, Lon: 75.05293, Elevation FT: 10.429)

Site 15 Bethany Beach Boardwalk and Wreck Site - Bethany Beach, Delaware (Lat: 38.53658, Lon: 75.0541, Elevation FT: 11.525)

Site 16 Ocean View Parkway Beach Entrance - Bethany Beach, Delaware (Lat: 38.54439, Lon: 75.05502, Elevation FT: 5.853)

Site 17 Assawoman Bay Wildlife Area - Assawoman Bay, Delaware (Lat: 38.49173, Lon: 75.07971, Elevation FT: 1.38)



Site 18 Ocean City Beach, Boardwalk - Ocean City, Maryland (Lat: 38.34664, Lon: 75.07699, Elevation FT: 10.983)

Site 19 Indian River Life Saving Station - Rehoboth Beach, Delaware (Lat: 38.63347, Lon: 75.06632, Elevation FT: 7.465)

Site 20 Delaware Seashore State Park - Dewey Beach, Delaware (Lat: 38.67826, Lon: 75.06954, Elevation FT: 12.342)

Appendix C. LSZ Photo Log


85th Street


PLIM PLAZA
A RESORT HOTEL
CARIBBEAN


Hilton
Thunderbird
BEACH
MOTEL

Appendix D. Meteorological Conditions Report

Meteorological Conditions Report for U. S. Wind Offshore Maryland Wind Energy Lease Area

PREPARED FOR:
US Wind, Inc.
1 North Charles Street, Suite 2310
Baltimore, MD 21201

PREPARED BY:
ESS Group, Inc.
10 Hemingway Drive, 2nd Floor
East Providence, Rhode Island 02915

ESS Project No. U167-061

December 8, 2016

Meteorological Conditions Report for U. S. Wind Offshore Maryland Wind Energy Lease Area

Prepared for:

US Wind, Inc.
1 North Charles Street, Suite 2310
Baltimore, MD 21201

Prepared by:

ESS Group, Inc.
10 Hemingway Drive, 2nd Floor
East Providence, Rhode Island 02915

ESS Project No. U167-061

December 8, 2016

TABLE OF CONTENTS

1.0 INTRODUCTION

This report provides an analysis of the meteorological conditions associated with the offshore Maryland Wind Energy Area where U. S. Wind is developing a wind energy project. Metrics associated with prevailing meteorology and will assist in understanding the meteorological conditions experienced in this area and how they may influence the visibility of a wind energy project. The analysis used existing meteorological information from a measurement site within the area where the project is located. Data for visibility at the measurement site is reported to a distance of up to 10 nautical miles (nm) and therefore, visibility beyond 10 nm was calculated beyond this distance as described further below.

2.0 DATA COLLECTION

The meteorological assessment utilized hourly meteorological surface data collected at National Weather Service (NWS) measurement site located at the Ocean City Municipal Airport in Ocean City, Maryland (Figure 1) over the 10-year period of January 1, 2006–December 31, 2015. Surface observations for the site were obtained from the National Climatic Data Center (now referred to as National Center for Environmental Information).

The hourly observations in the data sets include wind speed, wind direction, cloud cover, cloud ceiling height, visibility, weather codes denoting precipitation, ambient, dew point temperatures, and precipitation amounts.

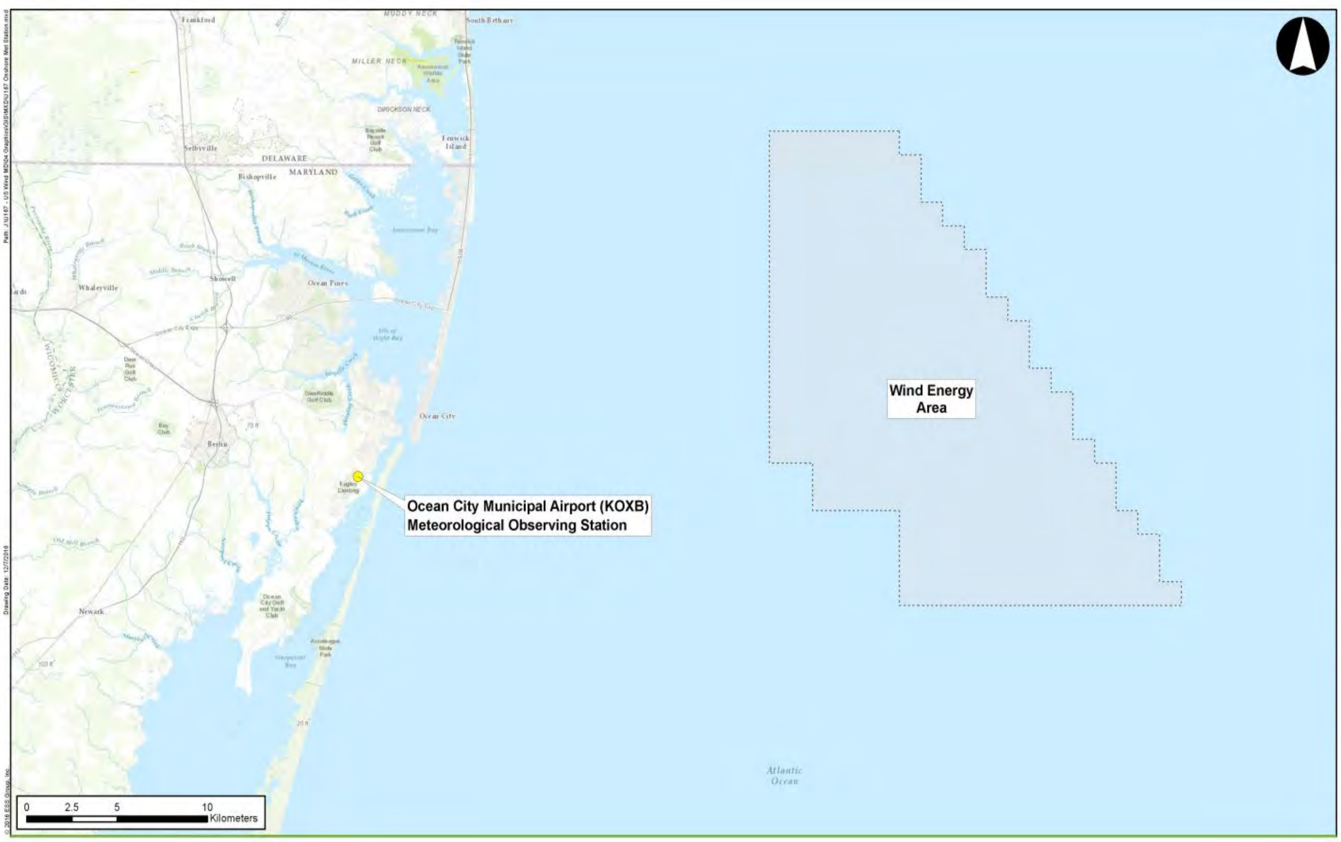


Figure 1: Location of Meteorological Measurement Site

3.0 METEOROLOGICAL CONDITIONS AND VISIBILITY ASSESSMENT

Hourly surface observations were evaluated to determine the following meteorological conditions and visibility.

Meteorological Condition

- Average number of days when it is clear, cloudy, foggy, rainy and hazy during daylight hours in each of the four seasons,
- Average number of days when it is clear, cloudy, foggy, rainy and hazy for 50% of the daylight hours in each of the four seasons,
- Average percent of daylight hours when it is clear, cloudy, foggy, rainy and hazy in each of the four seasons, and
- Average percent of nighttime hours when it is clear, cloudy, foggy, rainy and hazy in each of the four seasons (i.e. the average conditions for nighttime during each of the seasons).

Visibility

- The average number of days that there is visibility to 10 nm, 20 nm and 30 nm.
- The average number of days that have visibility to 10 nm, 20nm and 30nm for at least 50% of the day in each of the four seasons.
- The average number of days that there is visibility to 10 nm, 20nm and 30nm for at least 75% of the day in each of the four seasons.
- The average distance that visibility is reduced (from clear conditions) on each day that haze is reported in each of the 4 seasons.
- The average visibility distance in each of the four seasons.

3.1 Definition of Data Parameters

Since the analysis covers daylight and nighttime conditions, it was important to define what constitutes daylight as it changes in duration over the year. Sunrise and sunset times are recorded at the measurement site and provided in the surface observation data. Thirty minutes were added before sunrise and after sunset to account for those periods where there is sufficient light to start, or continue, outdoor activities without lighting. This corresponds to civil dusk, when the sun is 6 degrees, or less, below the horizon.

NWS stations provide excellent data capture; however, it is not 100% and missing data periods do occur. Only daylight and nighttime periods with data capture at or better than 50% for the 24-hour data period were included in the analysis, avoiding possible biases in considering periods of a few hours.

The data was evaluated for clear, cloudy, rainy, foggy and hazy conditions during daylight and nighttime hours based upon the following criteria:

- Clear conditions were defined as having an unlimited cloud ceiling height. Unlimited ceiling heights are associated with clear and scattered sky cover (up to 50% of the sky).
- Cloudy conditions were defined as broken or overcast sky cover, greater than 50% of the sky.
- Rainy conditions were defined as any “trace” or measureable precipitation (rain, snow, sleet, etc.) amount. The Local Climatological Data (LCD) data set includes weather codes that define the type and intensity of different weather conditions. Examples of the codes are RA

(rain), SN (snow), FZRA (freezing rain). A complete code list can be found in “Local Climatological Data (LCD) Dataset Documentation” (ncdc.noaa.gov).

- Foggy and hazy conditions are defined only by weather codes. Fog has a weather code of FG. Haze has a weather code of HZ.

Each individual daylight period was characterized as being clear, cloudy, rainy, foggy or hazy. When examining the five meteorological conditions, it is possible to have multiple conditions occurring concurrently. For example, haze can occur when it is sunny. Fog and rain occur when it is cloudy or there can be light rain during fog events. In order to avoid 'double counting' any of the conditions and maintaining a 100% count, conditions were assigned based on the following:

1. An hour is either clear or cloudy.
2. If clear or cloudy conditions occur for 50% or more of the daylight hours, assign the day based on visibility restriction.
3. Clear conditions are based on unlimited ceiling height and can include haze. A day was counted as hazy before being counted as sunny.
4. Cloudy conditions are based on limited ceiling height and can also include rain and fog. The day classification order was foggy, rainy and finally cloudy.
5. If clear and cloudy conditions each account for 50% of the daylight hour, the clear condition (sunny, hazy) was assigned 0.5 day as was the cloudy condition (fog, rain, cloud).

This prioritization was also used for evaluating individual hours.

Seasons were defined as follows:

- Winter = December 22–March 21
- Spring = March 22–June 21
- Summer = June 22–September 21
- Autumn = September 22–December 21

4.0 METEOROLOGICAL CONDITIONS AND VISIBILITY RESULTS

4.1 Meteorological Conditions

Table 1 presents representative seasonal and annual meteorological conditions observed at the Ocean City Municipal Airport and the frequency of occurrence and distribution of clear, foggy, rainy, hazy and cloudy conditions. The data has been rounded to a whole day value. The topmost data group presents the average number of days per season/year that each of the five conditions was observed to occur at least for one hour during the daylight period. These numbers are independent of each other and should not be summed as multiple tallies could occur in any single daylight period. For example, clouds and fog could occur in the early morning giving way to clear skies later in the morning. A thunderstorm could occur in the late afternoon. In that case, clear, cloudy, rainy and foggy conditions would all occur for at least one hour.

The second data grouping characterizes days where each day is clear, cloudy, rainy, foggy or hazy and only a single tally is made for any daylight period. This characterization is based on which of the five meteorological conditions occur for at least 50% of the hours in the daylight period. These numbers can be summed to equal to the number of valid daylight periods occurring during the year.

The third data group presents the distribution of the five meteorological conditions during daylight hours as a percentage. Each hour is characterized as clear, foggy, rainy, hazy or cloudy. The percentages of the five meteorological conditions can be summed to equal 100%.

he fourth data group presents the distribution of the five meteorological conditions during nighttime hours s a percentage. Each hour is characterized as clear, foggy, rainy, hazy or cloudy. The percentages of the ve meteorological conditions can be summed to equal 100%.

Table 1 Summary of Meteorological Conditions

	Winter	Spring	Summer	Autumn	Annual
Days/Year with 1 or More Daylight Observations					
Clear	80	82	87	78	327
Foggy	5	7	2	4	19
Rainy	36	40	41	38	155
Hazy	6	15	19	6	45
Cloudy	40	52	48	51	191
Days/Year with 50% or More Daylight Observations					
Clear	62	66	74	59	260
Foggy	1	<1	0	<1	1
Rainy	13	8	4	12	37
Hazy	<1	<1	2	<1	4
Cloudy	14	16	11	21	61
Distribution of Hourly Daylight Observations (%)					
Clear	66	66	71	65	67
Foggy	2	1	<1	<1	1
Rainy	17	13	10	14	13
Hazy	1	3	6	1	3
Cloudy	15	17	13	19	16
Distribution of Hourly Nighttime Observations (%)					
Clear	63	60	62	57	60
Foggy	1	2	<1	2	2
Rainy	20	19	18	20	19
Hazy	<1	3	5	1	2
Cloudy	15	16	14	20	17

Clear conditions occur at least one hour during daylight 327 days per year with seasonal values ranging from 78 days during winter to 87 days during summer. Cloudy conditions occur 191 days per year, with seasonal values ranging from 40 days in winter to 52 days in spring. Fog occurred 19 days per year. Seasonal values range from 2 days in summer to 7 days in spring. Rain, without associated fog, occurred 155 days per year. Seasonal values range from 36 days in winter to 41 days in summer. Haze occurred about 45 days per year, ranging from 6 days in winter and autumn to 19 days in summer.

Days were characterized as clear, cloudy, foggy, rainy or hazy based on an occurrence of the meteorological condition 50% or more of daylight hours. Clear days occurred 260 days per year, with seasonal values ranging from 59 days in autumn to 74 days in summer. Cloudy days occurred 61 days per year, ranging from 11 days in summer to 21 days in autumn. Foggy days occurred one day per year, with little variation seasonally. Rainy days occurred 37 days per year, ranging from 4 days in summer to 13 days in winter. Haze occurred 4 days per year, ranging from <1 day in all seasons except summer with 2 days.

Clear conditions occurred 67% of the daylight hours over the course of the year, with seasonal values ranging from 65% in autumn to 71% in summer. Fog occurred 1% of the time, with seasonal values ranging from <1% in summer and autumn to 2% in winter. Rain, without associated fog, occurred 13% of the time, with seasonal values ranging from 10% in summer to 17% in winter. Cloudy conditions, without associated fog or rain, occurred 16% of the time, with seasonal values ranging from 13% in summer to 19% in autumn. Haze occurred 3% of the time with seasonal values ranging from 1% in autumn to 6% in summer.

Clear conditions occurred 60% of the nighttime hours over the course of the year, with seasonal values ranging from 57% in autumn to 63% in winter. Fog occurred 2% of the time, with seasonal values ranging from less than one percent in summer to 2% in spring. Rain, without associated fog, occurred 19% of the time, with seasonal values ranging from 18% in summer to 20% in autumn and winter. Cloudy conditions, without associated fog or rain, occurred 17% of the time, with seasonal values ranging from 14% in summer to 20% in autumn. Haze occurred 2% of the time with seasonal values ranging from less than one percent in winter to 5% in summer.

4.2 Visibility

Visibility observations in the NWS surface data are limited to a maximum of 10 statute miles and therefore in order to evaluate visibility at the 20 nm and 30 nm distances, a methodology was developed using the observed visibility (out to 10 statute miles) and a relational algorithm. The algorithm was developed by Egan Environmental and has been used in other analysis and calculates the visibility distance based on relative humidity.

Hourly surface observations include calculated relative humidity values. Relative humidity is calculated from ambient and dew point temperatures, which were also included in the data record. Relative humidity is calculated from the following equation:

$$RH = 100 * ((112 - 0.1 * TA + DP) / (112 + 0.9 * TA))^8$$

Where,
RH = relative humidity
TA = ambient temperature (ºC)
DP = dew point temperature (ºC)

As previously stated, relative humidity values are provided in the data record. These values are calculated using the temperature observations. There were some missing relative humidity values, however, in every case, this appears to be because there was insufficient temperature data to perform the relative humidity calculation.

The visible distance algorithm was developed from a regression analysis of Martha's Vineyard visibility and relative humidity observations. Visibility distance was calculated as:

$$VIS = 69.9 - 0.742 * RH$$

Where,
VIS = visibility distance (statute miles)

The calculated statue miles were then converted to nautical miles by applying a factor of 0.86839.

Visibility calculations were performed for each hour with a valid relative humidity. The calculated distance was compared to the observed distance to determine which value to carry forward in the analysis. Observations up to 10 statute miles used the observed value. Observations at 10 statute miles used the greater of the observed or calculated values.

The following table presents representative estimated visibility distances and the frequency of occurrence of visibility greater than 10, 20 and 30 nautical miles, along with the average visibility for clear, foggy, rainy, hazy and cloudy conditions. The topmost data group presents the average number of days per season/year that there was at least one hour when visibility was at least 10, 20 and 30 nautical miles during a daylight periods. The count for the 20 and 30 nm entries are also contained in the 10 nm entry. The count for the 30 nm entry is also contained in the 20 nm count.

The second and third data groups present the number of days per season/year that visibility exceeded 10, 20 and 30 nautical miles at least 50% and 75% of the daylight hours. As is the case with the topmost data group, the 20 nm and 30 nm values are subsets of the 10 nm values. The 30 nm values are subsets of the 20 nm values.

The last two data groups present the average seasonal and annual visibility distance for clear, foggy, rainy, hazy and cloudy conditions for daylight and nighttime hours. The annual and seasonal averages were determined by taking a weight average of the five meteorological conditions.

Observations up to 10 statute miles used the observed value and observations reported as 10-statute mile in the data used the greater of the observed or calculated values, resulting in a conservative estimate of visibility. Table 2 presents a summary of the visibility results.

Table 2 Summary of Visibility

	Winter	Spring	Summer	Autumn	Annual
Days/Year with 1 or More Daylight Observations					
10 nm	78	78	78	74	309
20 nm	67	57	52	58	233
30 nm	45	35	19	31	130
Days/Year with 50% or More Daylight Observations					
10 nm	68	60	55	64	246
20 nm	52	37	26	41	157
30 nm	25	14	4	14	57
Days/Year with 75% or More Daylight Observations					
10 nm	58	44	35	51	187
20 nm	39	21	10	25	95
30 nm	14	6	<1	4	24
Average Daylight Visibility (nm)					
Clear	26	21	17	21	21
Foggy	<1	<1	<1	<1	<1
Rainy	7	6	6	6	6
Hazy	5	4	4	4	4
Cloudy	18	15	14	15	15
Average	21	17	15	17	17
Average Nighttime Visibility (nm)					
Clear	18	13	10	14	14
Foggy	<1	<1	<1	<1	<1
Rainy	6	5	5	5	5
Hazy	5	4	4	4	4
Cloudy	14	11	11	12	12
Average	15	11	9	11	12

Visibility of at least 10 nm occurred for at least hour during daylight 309 days per year, with seasonal values ranging from 74 days during autumn to 78 days during the three other seasons. Visibility to 20 nm occurred 233 days per year, with seasonal values ranging from 51 days in summer to 67 days in winter. Visibility extended to 30 nm 130 days per year. Seasonal values range from 19 days in summer to 45 days in winter.

Visibility extended to 10 nm for 50% or more of the daylight hours 246 days per year, with seasonal values ranging from 55 days in summer to 68 days in winter. Visibility to 20 nm occurred 157 days per year, ranging from 26 days in summer to 52 days in winter. Visibility to 30 nm occurred 57 days per year. Seasonal values ranged from 4 days in summer to 25 days in spring.

Visibility extends to 10 nm for 75% or more of the daylight hours 187 days per year, with seasonal values ranging from 35 days in summer to 58 days in winter. Visibility to 20 nm occurred 95 days per year, ranging from 10 days in summer to 39 days in winter. Visibility to 30 nm occurred 27 days per year. Seasonal values ranged from no days in summer to14 days in winter.

The average daylight visibility for clear conditions was 21 nm, with seasonal values ranging from 17 nm in summer to 26 nm in winter. Cloudy conditions reduce the average visibility to 15 miles, ranging from 14 nm in summer to 18 nm in winter. Rainy, hazy and foggy conditions have an average visibility of 6, 4, and <1 nm, respectively. These visibilities are consistent through the year. The average daylight visibility in winter, spring, summer and fall, regardless of meteorological condition, is 21, 17, 15, and 17 nm, respectively.

The average nighttime visibility for clear conditions is 14 nm, with seasonal values ranging from 10 nm in summer to 18 nm in winter. Cloudy conditions reduce the average visibility to 12 miles, ranging from 11 nm in summer to 14 nm in winter. Rainy, hazy and foggy conditions have an average visibility of 5, 4 and <1 nm, respectively. These visibilities are consistent through the year. The average nighttime visibility in winter, spring, summer and fall, regardless of meteorological condition, is 15, 11, 9 and 11 nm, respectively.

5.0 EFFECT OF HAZE ON VISIBILITY

As shown in the table above, haze can greatly reduce visibility. Clear skies, on average, result in daytime visibilities of 17 to 26 nm, whereas hazy skies result in an average visibility of approximately 4 to 5 nm.

Based on data from the Ocean City site, daylight hazy skies result in average visibilities of 4 nm compared to 21 nm for clear conditions. In winter, clear skies have an average visibility of 26 nm, compared to 4 nm for hazy skies. This represents approximately an 83% reduction in visibility. In spring, visibility decreases from 21 nm for clear conditions to 4 nm for hazy conditions, a reduction of approximately 79%. In summer, the average visibility for clear skies is 17 nm, compared to 4 nm for hazy skies, representing a 74% reduction in visibility. In autumn, clear skies have an average visibility of 21 nm compare to 4 nm for hazy conditions, an 80% reduction in visibility.

Nighttime hazy skies result in average visibilities of 4 nm compared to 14 nm for clear conditions. In winter, clear skies have an average visibility of 18 nm compare to 5 nm for hazy skies. This represents approximately a 75% reduction in visibility. In spring, visibility decreases from 13 nm for clear conditions to 4 nm for hazy conditions, a reduction of approximately 69%. In summer, the average visibility for clear skies is 10 nm compared to 4 nm for hazy skies, representing a 58% reduction in visibility. In autumn, clear skies have an average visibility of 14 nm compare to 4 nm for hazy conditions, an approximately 70% reduction in visibility.

Appendix E. Aircraft Detection Lighting System (ADLS) Efficacy Analysis

US Wind Offshore Wind Project

TRC

Offshore Ocean City, Maryland

Aircraft Detection Lighting System (ADLS) Efficacy Analysis

March 31, 2023

Capitol Airspace Group

capitolairspace.com

(703) 256 - 2485

Summary

Capitol Airspace conducted an Aircraft Detection Lighting System (ADLS) efficacy analysis for the US Wind Offshore wind project offshore Ocean City, Maryland. At the time of this analysis, 125 wind turbine locations had been identified (black points, ***Figure 1***) within the 125-square-mile study area (blue area, ***Figure 1***). This analysis utilized historic air traffic data obtained from the Federal Aviation Administration (FAA) in order to determine the total duration that an ADLS-controlled obstruction lighting system would have been activated. The results of this analysis can be used to predict an ADLS's effectiveness in reducing the total amount of time that an obstruction lighting system would be activated.

An ADLS utilizes surveillance radar to track aircraft operating in proximity to the wind project. The ADLS will activate the obstruction lighting system when aircraft enter the light activation volume and will deactivate the system when all aircraft depart. As a result, the ADLS provides nighttime conspicuity on an as-needed basis thereby reducing the amount of time that obstruction lights will be illuminated. Depending on the volume of nighttime flights transiting a wind project's light activation volume, an ADLS could result in a significant reduction in the amount of time obstruction lights are illuminated.

Historical air traffic data for flights passing through the light activation volume indicates that ADLS-controlled obstruction lights would have been activated for a total of 5 hours 46 minutes and 22 seconds over a one-year period for 938-foot-tall wind turbines, the PDE maximum turbine height. Considering the local sunrise and sunset times, an ADLS-controlled obstruction lighting system could result in over a 99% reduction in system activated duration as compared to a traditional always-on obstruction lighting system.

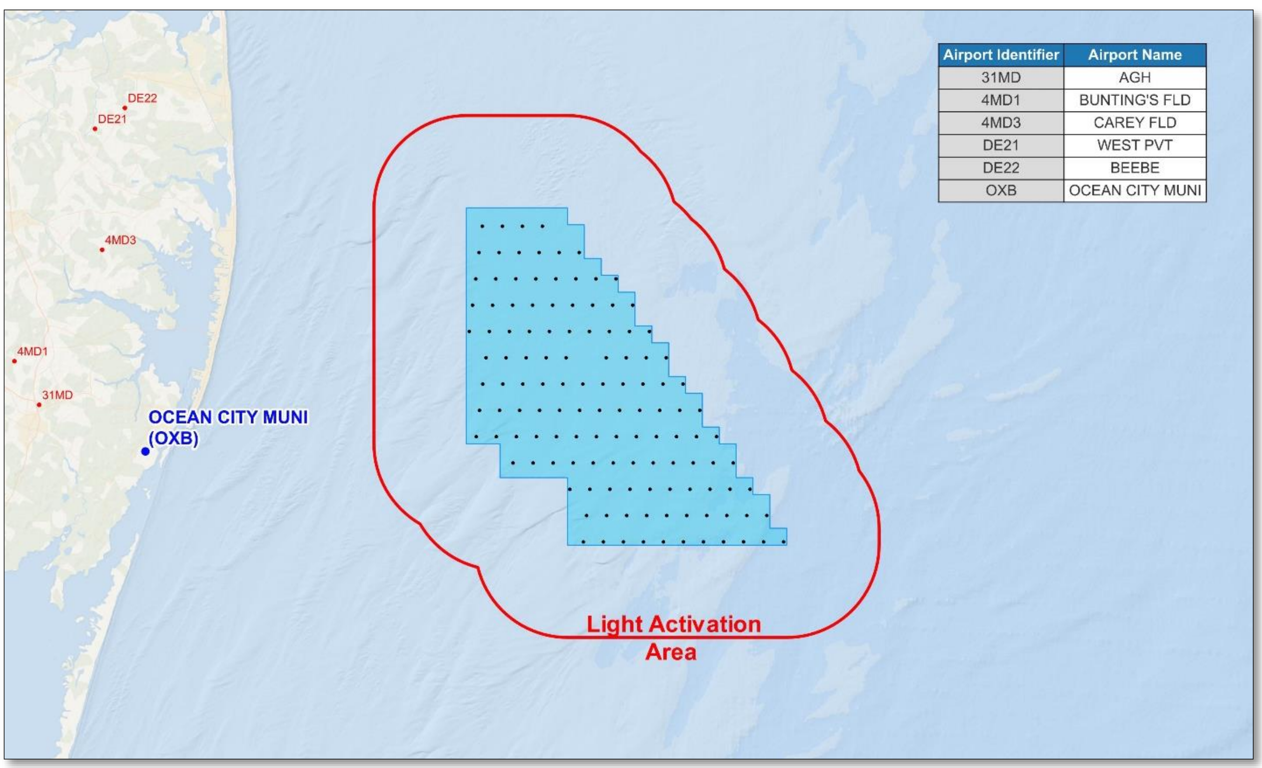


Figure 1: Public-use (blue) and private-use (red) airports in proximity to the US Wind Offshore wind project (blue area)

Methodology

Capitol Airspace analyzed FAA National Offload Program (NOP) radar returns in proximity to the US Wind Offshore wind project for the 2020 calendar year. Flight tracks from the 2020 dataset were assessed since it contained a greater number of flights in the affected airspace than the 2019 and 2021 datasets. FAA NOP data only include secondary radar returns which are created if the identified aircraft is equipped with a transponder. Aircraft operations without an active transponder were not captured as part of this dataset.

The following process was used to determine the frequency of nighttime aviation operations in proximity to the US Wind Offshore wind project:

1. **Define Three-Dimensional Light Activation Volume** – In accordance with FAA Advisory Circular 70/7460-1M, obstruction lights controlled by an ADLS must be activated and illuminated prior to an aircraft reaching three nautical miles from, and 1,000 ft above, any obstruction. However, the actual light activation volume will vary depending on the specific ADLS selected for use. At the time of this analysis, a specific ADLS had not been selected for the US Wind Offshore wind project. In order to account for varying radar systems as well as aircraft speeds and descent rates, Capitol Airspace conservatively assessed a 3.55-nautical mile buffer (solid red outline, ***Figure 1***) around the US Wind Offshore wind project at altitudes up to 3,500 ft above the highest wind turbine location (4,500 feet above mean sea level [AMSL] based on the PDE maximum turbine height).
2. **Calculate Sunrise and Sunset** – Sunrise and sunset times were calculated for each day of the year based on the United States (US) Naval Observatory definition of sunrise and sunset. Sunrise time was calculated at the westernmost edge of the light activation perimeter. Sunset time was calculated at the easternmost edge of the light activation perimeter. The data was validated through comparison to the US Naval Oceanography Portal.[1]
3. **Select Nighttime Radar Returns** – Since traditional obstruction lights can rely on ambient light sensors to identify darkness, nighttime was considered to occur between 30 minutes prior to sunset until 30 minutes after sunrise. This represents the time during which a traditional obstruction lighting system would likely be activated. All radar returns within the light activation volume that occurred during this period were evaluated. In accordance with guidance provided by the FAA, if an ADLS loses track of an aircraft, a 30-minute timer should be initiated to keep the obstruction lights activated while the aircraft can clear the wind project area. Since the application of ADLS requires site specific radar surveillance systems that will be focused on the US Wind Offshore wind project, Capitol Airspace does not anticipate a likelihood of dropped tracks.
4. **Remove Time Overlap** – To remove the duration of overlap occurring when more than one flight transits the light activation volume at the same time, each nighttime flight was compared to every other nighttime flight. Where overlapping flights were found, the overlapping flight's duration within the light activation volume was removed from the total obstruction lighting system activation time.

[1] http://www.usno.navy.mil/USNO/astronomical-applications

Results

FAA NOP data indicates that as many as 1,271 flights had at least one radar return within the light activation volume (red outline, ***Figure 2***). However, most of these flights occurred during daytime. Using local sunrise and sunset times, Capitol Airspace determined that as many as 144 flights (purple tracks, ***Figure 3***) had at least one radar return within the light activation volume during the nighttime period when a traditional obstruction lighting system would be activated. Each of the 144 flights was further evaluated to determine the amount of time it remained within the light activation volume. Over a one-year period, these flights would have resulted in a total obstruction light system activated duration of 5 hours 46 minutes and 22 seconds for the PDE maximum turbine height.

Considering that the US Wind Offshore wind ADLS light activation perimeter observes approximately 4,714 hours of nighttime each year, an ADLS-controlled obstruction lighting system could result in over a 99% reduction in system activated duration as compared to a traditional always-on obstruction lighting system (***Table 1***).

Table 1: Monthly nighttime observed and associated light system activation durations

Month	Nighttime Observed (HH:MM:SS)	Light System Activated Duration (HH:MM:SS)
January	486:06:24	00:00:00 (0.00%)
February	412:23:27	00:00:00 (0.00%)
March	403:11:40	00:00:00 (0.00%)
April	353:00:47	00:00:00 (0.00%)
May	332:42:18	00:00:00 (0.00%)
June	306:56:28	01:15:01 (0.38%)
July	326:13:08	00:59:09 (0.28%)
August	355:05:38	00:08:08 (0.04%)
September	379:19:46	02:03:07 (0.48%)
October	430:17:14	01:07:18 (0.25%)
November	448:42:17	00:13:39 (0.05%)
December	480:19:28	00:00:00 (0.00%)
Total	**4714:18:35**	**05:46:22 (0.12%)**

Please contact ***Dan Underwood*** or ***Candace Childress*** at (703) 256-2485 with any questions regarding the findings of this analysis.

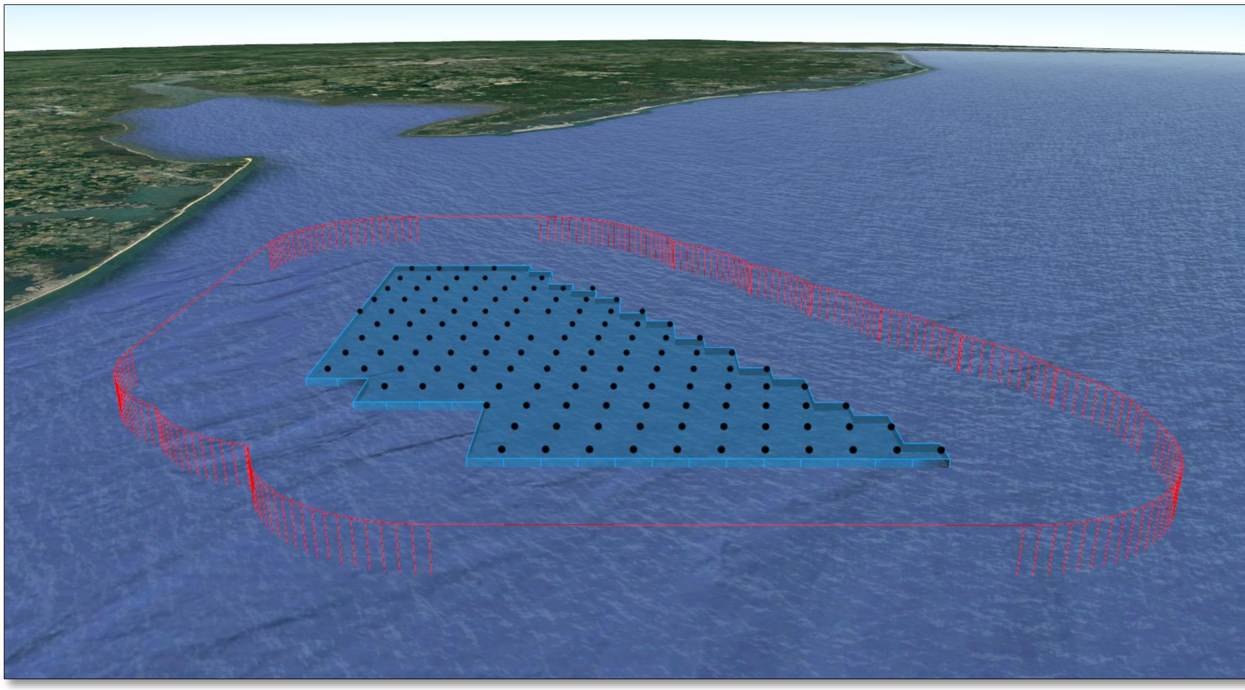


Figure 2: US Wind Offshore wind project (blue) and light activation volume (red outline)

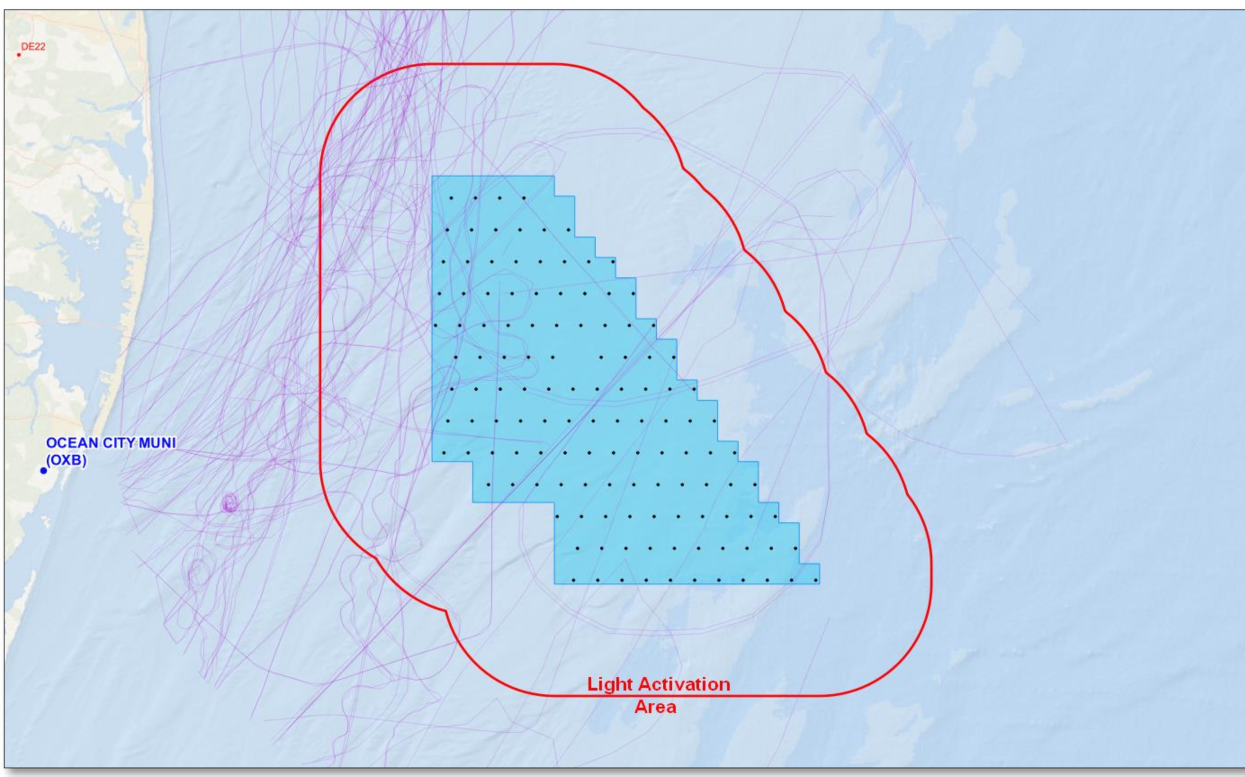


Figure 3: Flight tracks (purple) that would have activated ADLS obstruction lights (based on the PDE maximum turbine height)