Appendix Q – Visual Impact Assessment

VISUAL IMPACT ASSESSMENT REPORT

Virginia Offshore Wind Technology Advancement Project

(VOWTAP)

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ABBREVIATIONS AND ACRONYMS

Acronym	Definition
BLM	U.S. Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
CBBT	Chesapeake Bay Bridge Tunnel
Dominion	Virginia Electric and Power Company, a wholly-owned subsidiary of Dominion Resources, Inc.
dSLR	Digital single lens reflex
FAA	Federal Aviation Administration
FPM	flashes per minute
ft	feet
GAP	General Activities Plan
GPS	Global Positioning System
HDD	horizontal directional drill
INRMP	Integrated Natural Resources Management Plan
km	kilometers
KOP	Key Observation Point
kV	kilovolts
M	meters
mm	millimeter
MSL	mean sea level
MW	megawatt
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
nm	nautical miles
O&M	operations and maintenance
OCS	Outer Continental Shelf
PI	point of intersection
USCG	U.S. Coast Guard
VDHR	Virginia Department of Historic Resources
VOWTAP	Virginia Offshore Wind Technology Advancement Project
VRM	Visual Resource Management
WTG	Wind Turbine Generator

1 INTRODUCTION

Tetra Tech, Inc. (Tetra Tech) was contracted by Virginia Electric and Power Company, a wholly-owned subsidiary of Dominion Resources, Inc. (Dominion), to prepare a Visual Impact Assessment (VIA) in support of the proposed Virginia Offshore Wind Technology Advancement Project (VOWTAP or Project); a 12-megawatt (MW), two-turbine offshore wind demonstration project located approximately 24 nautical miles (nm) (27 statute miles, 43 kilometers [km]) offshore of the city of Virginia Beach, Virginia (Figure 1). The purpose of this VIA is to assess the potential visual impacts resulting from the construction and operation of the VOWTAP. For the purposes of the assessment, "Project Area" refers to the footprint of the VOWTAP facilities, including both the offshore turbines and onshore components. "Project Study Area" refers to those landscapes within 27 statute miles (24 nm or 43 km) of the offshore Project components, or within 0.5 mile of the onshore Project components (see Figures 2 and 3).

2 PROJECT DESCRIPTION

This section describes the proposed location and infrastructure currently under consideration for the VOWTAP, which will be reviewed for potential visual impacts, as follows.

2.1 Wind Turbines

The VOWTAP facilities will include two 6 MW Alstom Haliade 150 wind turbine generators (WTG), to be located within Federal Lease Block 6111 Aliquot H, approximately 24 nm [27 statute miles, 43 km] offshore of Virginia Beach, Virginia (Figure 1). A diagram of the proposed turbine is included as Figure 4. The maximum height of each turbine is 574 feet (ft) (175 meters [m]), measured from mean sea level to rotor tip. It is currently anticipated that the turbines will be sited approximately 3,445 ft (1,050 m) apart in a north-south orientation. In compliance with Federal Aviation Administration (FAA) and U.S. Coast Guard (USCG) regulations, the WTGs will have nighttime lighting. FAA lighting will consist of a L-864 medium intensity aeronautical lights with a flash rate of 20 flashes per minute (FPM) atop each WTG nacelle. USCG lighting will consist of two (2) quick flashing, amber lights with 4 nm (7.4 km) 360 degree visibility placed on the foundation of each WTG at a height of not more than 50 ft (15 m) above the highest astronomical tide.

The two turbines will be interconnected with an Inter-Array Cable. Because the voltage of the Inter-Array Cable will be the same as the grid connection voltage (34.5 kilovolts [kV]), no offshore substation is required for the Project. The energy produced by the VOWTAP will be conveyed to shore via an additional 34.5-kV submarine transmission cable, referred to as the Export Cable.

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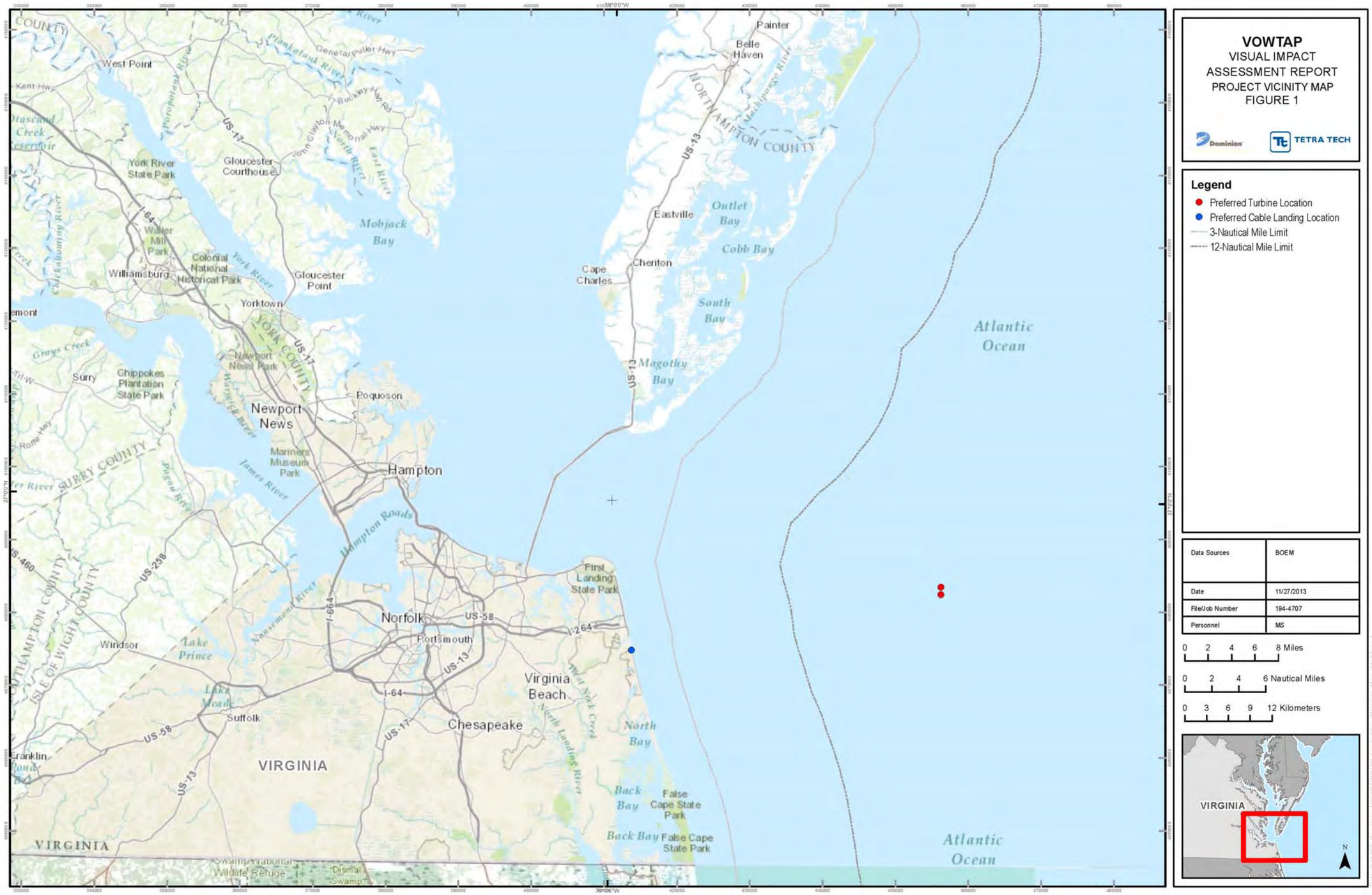
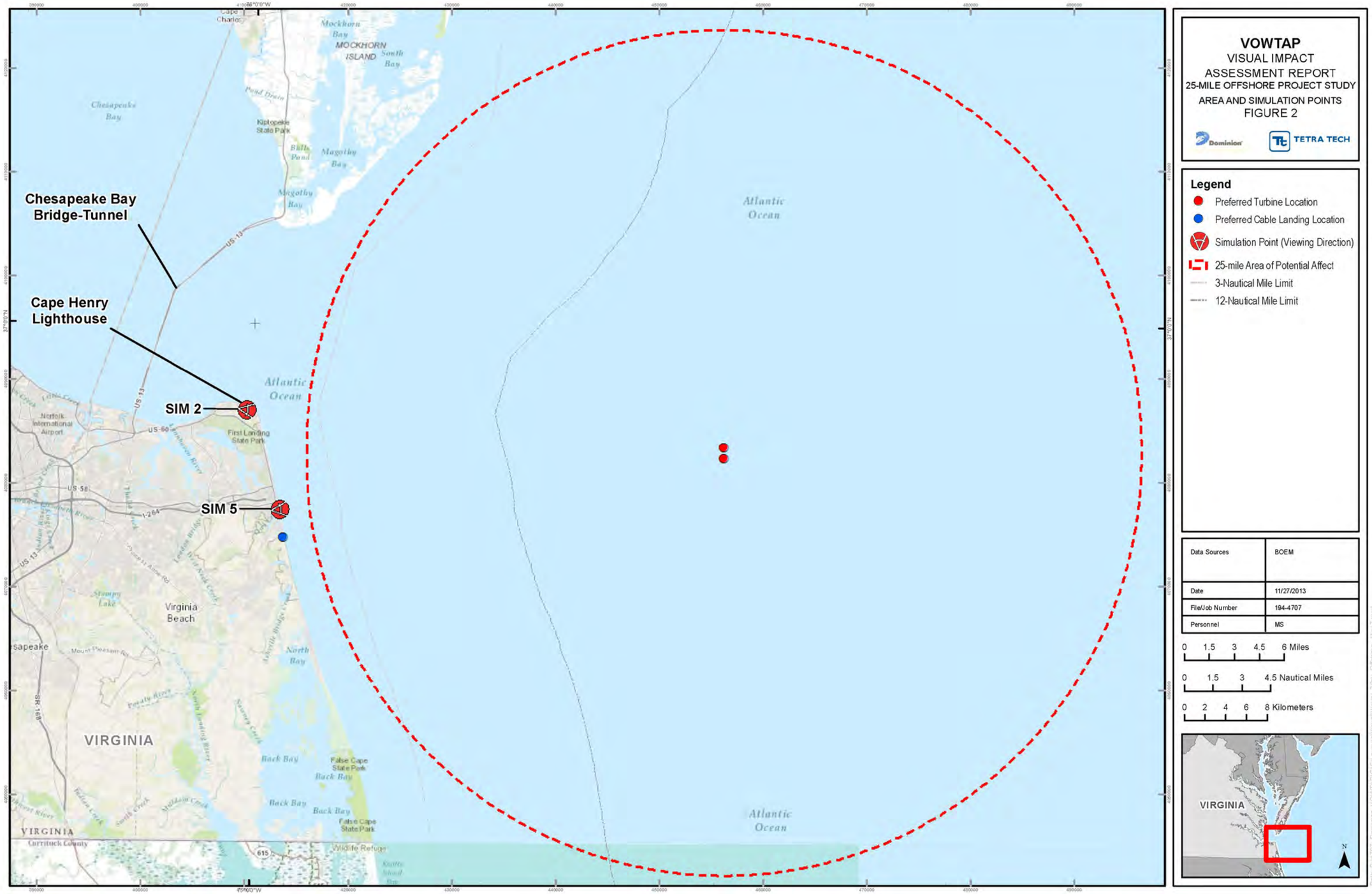
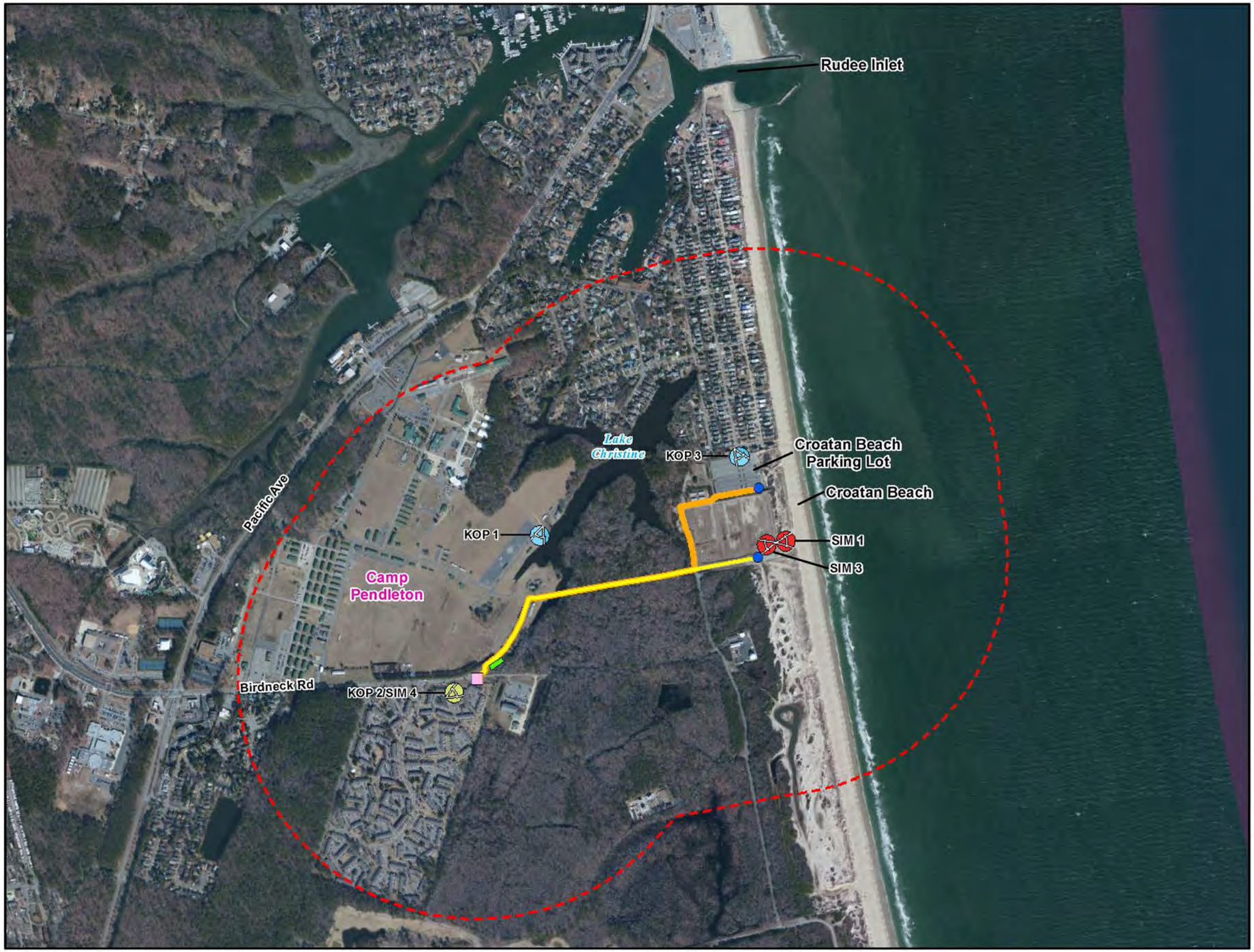

VOWTAP
VISUAL IMPACT
ASSESSMENT REPORT
PROJECT VICINITY MAP
FIGURE 1
Dominion
TETRA TECH
Legend
Preferred Turbine Location
Preferred Cable Landing Location
3-Nautical Mile Limit
12-Nautical Mile Limit
Data Sources BOEM
Date 11/27/2013
File/Job Number 194-4707
Personnel MS
0 2 4 6 8 Miles
0 2 4 6 Nautical Miles
0 3 6 9 12 Kilometers
VIRGINIA
N
Atlantic Ocean
Mobjack Bay
Outlet Bay
Cobb Bay
South Bay
Magothy Bay
Hampton Roads
North Bay
Back Bay
Lake Prince
Lake Meade
Chesapeake Bay
Northampton County
York County
Surry County
Isle of Wight County
Southampton County
Gloucester Courthouse
Gloucester Point
Yorktown
Williamsburg
Newport News
Hampton
Norfolk
Portsmouth
Virginia Beach
Chesapeake
Suffolk
Windsor
Franklin
Eastville
Cheriton
Cape Charles
Belle Haven
Painter
Poquoson
Surry
West Point
Chippokes Plantation State Park
Colonial National Historical Park
Newport News Park
Mariners Museum Park
First Landing State Park
False Cape State Park
Back Bay False Cape State Park
Dismal Swamp
Swamp National Wildlife Refuge
I-64
US-17
US-13
US-58
US-258
US-460
I-664
I-264
James River
York River
Mattaponi River
Pamunkey River
Piankatank River
Rappahannock River
Machipongo River
Nansemond River
Chickahominy River
Nomini Creek
Gerrys Creek
Warwick River
Lynnhaven River
Chesapeake Bay
Atlantic Ocean


VOWTAP
VISUAL IMPACT
ASSESSMENT REPORT
25-MILE OFFSHORE PROJECT STUDY
AREA AND SIMULATION POINTS
FIGURE 2
Dominion
TETRA TECH
Legend
Preferred Turbine Location
Preferred Cable Landing Location
Simulation Point (Viewing Direction)
25-mile Area of Potential Affect
3-Nautical Mile Limit
12-Nautical Mile Limit
Data Sources
BOEM
Date
11/27/2013
File/Job Number
194-4707
Personnel
MS
0 1.5 3 4.5 6 Miles
0 1.5 3 4.5 Nautical Miles
0 2 4 6 8 Kilometers
VIRGINIA
Chesapeake Bay Bridge-Tunnel
Cape Henry Lighthouse
SIM 2
SIM 5
Atlantic Ocean
Mockhorn Island
Virginia Beach
VIRGINIA
Currituck County
Norfolk International Airport
First Landing State Park
False Cape State Park
Back Bay
North Bay
Chesapeake Bay
Kiptopeke State Park
Magothy Bay
Mockhorn Bay
South Bay
Pond Drain
Stumpy Lake
Wildlife Refuge
US 13
US 60
US 58
I-264
SR-168
615



VOWTAP
VISUAL IMPACT ASSESSMENT REPORT
0.5-MILE ONSHORE PROJECT STUDY AREA AND KEY OBSERVATION/ SIMULATION POINTS
FIGURE 3

Dominion TETRA TECH

Legend

- Offshore Transmission Cable Landing Alternatives
- Interconnection Station
- Grid Interconnection Point
- Key Observation Point (Viewing Direction)
- Key Observation/Simululation Point (Viewing Direction)
- Simulation Point (Viewing Direction)
- Transmission Cable Alt1
- Transmission Cable Alt2
- 0.5-mile Area of Potential Affect

Data Sources	BOEM
Date	12/3/2013
File/Job Number	194-4707
Personnel	MS

0 325 650 975 1,300 Feet

0 90 180 270 360 Meters

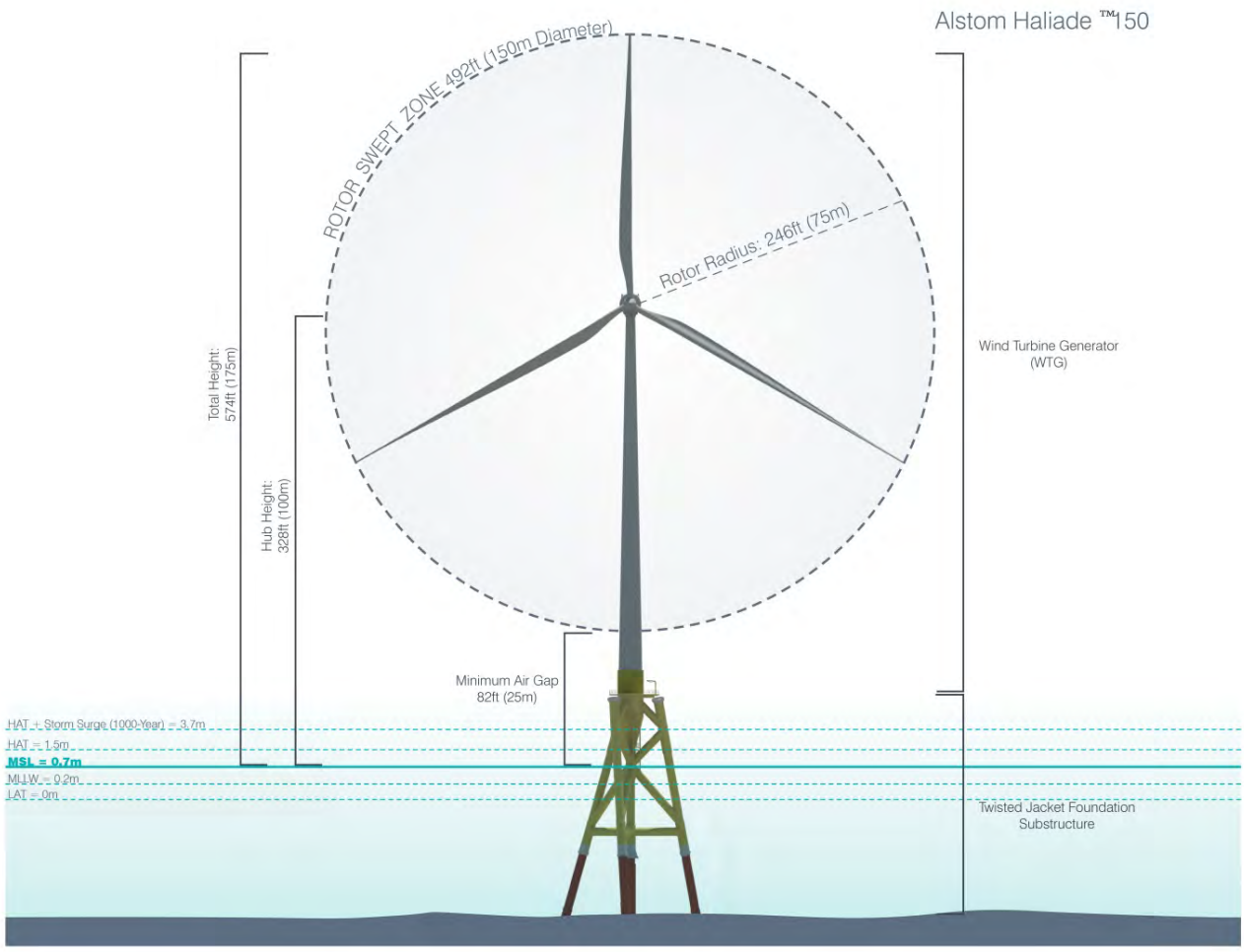


Figure 4. Proposed Turbine Detail

2.2 Onshore Facilities

The onshore components of the VOWTAP are located entirely within land owned by the Camp Pendleton State Military Reserve (Camp Pendleton) in Virginia Beach, Virginia, and will be comprised of the following facilities:

- A Switch Cabinet that will serve as the transition point were the Export Cable will be spliced with the Onshore Interconnection Cable and separate Fiber Optic Cable;
- An underground Onshore Interconnection Cable;
- An underground Fiber Optic Cable; and
- An Interconnection Station.

3 REGULATORY SETTING

Several federal, state, and local agencies have regulatory authority over the Project based on the location of the different Project components. The wind turbines and Inter-Array Cable are to be located entirely within federal waters of the United States and within the Bureau of Ocean Energy Management's (BOEM), Outer Continental Shelf (OCS). Onshore facilities including electrical interconnection equipment will be located in the City of Virginia Beach, Virginia.

3.1 Research Activities Plan

Prior to the development of the Project, BOEM will issue a Research Lease to DMME for lands on the Atlantic OCS. DMME intends to designate Dominion as the operator of the Research Lease. Per the direction of BOEM dated December 2, 2013, Dominion must prepare a Research Activities Plan (RAP) to demonstrate compliance with federal regulations (30 Code of Federal Regulations 585.626 and 627) for renewable energy projects including impacts to historic sites and social and economic resources.

This VIA assesses viewsheds and potential visual effects from the Project, including effects from historic sites if there are public viewing opportunities associated with them (e.g., guided or self-guided tours, overlooks). Potential impacts with respect to visual resources from historic locations not open or accessible to the public are addressed in a separate analysis in the main GAP (Dominion 2013).

3.2 Local Land Use Plans and Guidance

Development of the onshore facilities in the Project Area is guided by applicable land use plans. Land use plans reviewed for relevant guidelines and policies include the City of Virginia Beach Comprehensive Plan, the Virginia Outdoors Plan, and the Camp Pendleton Integrated Natural Resources Management Plan.

3.2.1 The City of Virginia Beach Comprehensive Plan

The City of Virginia Beach Comprehensive Plan (City of Virginia Beach 2009) includes various elements related to scenic and aesthetic values and the proposed Project.

The Environmental Stewardship Framework provides a comprehensive set of planning policies that protect and manage Virginia Beach's environmental assets.

Open Space and Green Infrastructure

- The comprehensive plan should encourage restoration of tree cover, preservation or creation of additional open spaces, connections between green spaces and visual access to areas of scenic beauty such as our marshlands and ocean.

Noise Impacts and Light Pollution

Recommendations:

- Adhere to AICUZ and other policy and programmatic recommendations cited in the Oceana Land Use Conformity Program and the 2005 Hampton Roads Joint Land Use Study, both adopted by City Council.

- In order to save energy and reduce night-time light haze, use directed lighting as advocated by the Dark Skies Initiative as much as is feasible for all City buildings and infrastructure.

Energy Resources Development and Management

Recommendations:

- Intensify efforts to work with the Virginia Coastal Energy Research Consortium on an array of alternative energy opportunities, particularly in offshore wind development and biomass power from algae.

3.2.2 Virginia Beach Outdoors Plan

The Virginia Beach Outdoors Plan is the city's guidance document for open space acquisition and outdoor recreational planning (VBDPR 2008). The Outdoors Recreation System Components section provides recommendations for addressing the City's Cultural and Natural Areas:

- Acquire certain natural areas for their special environmental, ecological, and/or aesthetic value. Some sites may not always have the opportunity to provide for physical access, but may be preserved primarily for visual enjoyment.

3.2.3 Camp Pendleton Integrated Natural Resources Management Plan

The Camp Pendleton Integrated Natural Resources Management Plan (INRMP) [VDMA, 2013] was developed to ensure that military training activities at Camp Pendleton are integrated and consistent with federal land stewardship objectives. The INRMP serves as the principal management plan governing all natural resource activities on Camp Pendleton.

The Water Resource Protection Program assesses water quality at Camp Pendleton and identifies current and potential water quality problems. Lake Christine is a water resource within Camp Pendleton and the values attributed to this resource include recreation and aesthetics. The following program is recommended to conserve and enhance water resources:

- Re-establish the natural riparian buffer along the edges of Lake Christine to reduce undesirable runoff that decreases water quality of the lake and surrounding wetlands.

The Forest Management Plan addresses military training needs, forest protection, invasive species, reforestation, and pest control. The following recommendations are included:

- Wherever feasible, existing groupings and/or clusters of trees and natural vegetation should remain on the site to provide aesthetic and environmental benefits.
- Protection of the existing forest should be considered. Trees not slated for removal can be protected from the effects of construction activities associated with future construction.

4 VISUAL RESOURCE INVENTORY

4.1 Visual Resource Inventory Methodology

The visual resource inventory considered visual resources potentially affected by the construction and operation of the proposed Project. BOEM does not have existing guidelines for conducting visual resource inventories. Therefore, a standard inventory and assessment approach that applied certain elements of the U.S. Bureau of Land Managements (BLM) Visual Resource Management (VRM) system was used for this project. The BLM VRM system is widely used for a variety of projects and, with some modifications, has been applied successfully to projects that do not occur on lands under the jurisdiction of the BLM.

A 25-mile (40.23-km) Project Study Area was established for the visual assessment, consistent with the approach used for Project cultural resource studies. The study area is based on the offshore components of the Project and the results of a recent study prepared for BOEM, *Preliminary Assessment of Offshore Wind Turbine Visibility and Visual Impact Threshold Distances.* This study found that small to moderately sized wind facilities (wind farms with turbine hub [nacelle] heights ranging from approximately 219 feet to 295 feet above mean sea level [MSL]) "were noticeable to casual observers at distances of almost 18 miles (29 km); and were visible with extended or concentrated viewing at distances beyond 25 miles (40 km)" [Sullivan et al. n.d]. The WTGs for the proposed Project will be 328 feet from MSL to the nacelle, approximately 33 feet higher than the turbines observed in the BOEM study. Although the WTGs may be partially visible under some conditions at locations beyond the identified 25-mile Project Study Area, it is not anticipated that the WTGs would be noticeable to the casual observer. Section 5.3 provides additional information regarding WTG characteristics and their visibility at long distances.

Additionally, a 0.5-mile (0.8-km) Project Study Area was used for assessing visual effects for aboveground onshore facilities (i.e., Switch Cabinets, Interconnection Station, and preferred and alternative Onshore Interconnection Cable and Fiber Optic Cable routes). The 0.5-mile buffer was determined based upon the scale of the onshore components and the wooded vegetation coverage of the surrounding landscape.

Project Study Areas established for the onshore and offshore Project sites were submitted to BOEM and the Virginia Department of Historic Resources (VDHR) for review and comment prior to the commencement of the visual inventory and assessment.

4.1.1 Inventory Components

The inventory for visual resources considered the existing landscape and scenery, and the viewers and key observation points (KOPs) within the Project Study Area. These visual components are described below.

4.1.1.1 Landscape Scenery

Scenery is the aggregate feature that gives character to the landscape (BLM 1984). Typically, every landscape comprises varying levels of landform, vegetation, existence of water, color, scarcity, adjacent scenery, and cultural modifications; all of which combine to exhibit landscape character (BLM 1986a).

Existing conditions were evaluated by means of aerial photography and field reconnaissance (*see* Section 4.1.1) to determine where modifications have affected natural settings. Existing conditions observed during the inventory processes are described in subsequent sections (*see* Sections 4.2.1 and 4.2.2).

4.1.1.2 Sensitive Viewers/KOPs

The term "sensitive viewers" refers to specific user groups associated with various land uses that have a sensitivity to landscape change, and therefore could be adversely affected by the construction and operation of the proposed Project. In this regard, viewing locations are typically associated with key travel routes, recreation areas, and residential areas. KOPs represent critical or typical viewpoints within, or along, an identified viewing location and are used to assess visual impacts of a proposed project. The sensitivity of viewers at each KOP is based on the following criteria: type of use, volume of use, duration of use, expected concern for aesthetics, and special status or designation. Identifying groups of individuals that will likely be sensitive to visual changes is an important part of the visual assessment process and helps to define specific locations from which to assess changes to the visual character of the landscape. The 25-mile Project Study Area falls just offshore of the Virginia Beach coastline. Although it is not anticipated that the WTGs would be noticeable to the casual observer at a distance greater than 25 miles, some important viewing locations outside the Project Study Area were nevertheless inventoried. The inventory considered: 1) the most critical viewpoints (i.e., views from communities, residential areas, or recreational areas); 2) views from specific scenic areas specifically identified in county and local planning documents; and 3) views that best represent the general area or landscape setting. Potential viewing locations were initially identified during a desktop study, which was based on review of aerial photographs and planning documents. Specific locations were then refined and KOPs selected from observations made during the field visit (*see* Section 4.1.2). Descriptions of the KOPs and their associated existing viewing conditions are provided in Section 4.2.

4.1.2 Field Visit

In an effort to properly assess the existing visual character of the landscape, a field visit to the Project Study Area and eastern coastline near Virginia Beach was conducted on October 16 and 17, 2013, by Tetra Tech staff. Photographs were taken in and near the Project Study Area between 9:00 a.m. and 7:30 p.m. on October 16, and between 8:00 a.m. and 10:00 p.m. on October 17. The weather was generally overcast.

During this site visit, the following locales were visited and photographed:

- Locations in representative landscapes in the Project Area where the Project may be seen
- Sensitive viewing areas where the Project may be seen

Sensitive viewing areas can include the following:

- Residential areas
- Community facilities, such as community centers or schools
- Recreational facilities, such as parks, trails, open space areas, fairgrounds, or playgrounds
- Highways or well-traveled roads
- Designated scenic roads/highways

A Nikon D90 digital single lens reflex camera (dSLR) equipped with a 35-millimeter (mm) lens was used to take the photographs. When used with a 1.5x cropped-sensor camera such as the D90, a 35-mm lens is considered a “52-mm equivalent lens.” A 52-mm equivalent lens is considered a “normal lens” that most closely approximates the field of vision of the human eye. In photos taken using the combination of the D90 and a 35-mm lens, the size and scale objects in the background and foreground are depicted realistically, and are not distorted.

Each location where photographs were taken is referred to as a "photo point" in this report. At each photo point, a panorama, or an overlapping series of photos, is captured. After the conclusion of the field visit, each of these panoramas was created using a program called PTGui. These panoramas were then added to a Google Earth Pro .kmz file.

Photographs toward the proposed Project Area (offshore components) were taken at points at or along Virginia Beach, Croatan Beach, Cape Henry Lighthouse, First Landing State Park, Camp Pendleton, the Chesapeake Bay Bridge Tunnel (CBBT), and residential areas along the coast.

Photo points were also captured of the proposed Project Area (onshore components) from Camp Pendleton, Croatan Beach, and residential areas near Camp Pendleton and Lake Christine.

Table 1 in Attachment A provides locational details for photographs taken during the field visit, and selected KOP and simulation locations.

4.2 Summary of Inventory Results

4.2.1 Landscape Setting/Existing Conditions

The offshore Project Study Area is located entirely within the Atlantic Ocean. The onshore Project Study Area is located within the Atlantic Coastal Plain Physiographic Region. The Coastal Plain Province is comprised of the coastal plain, which is relatively level terrain exposed above sea level, and the continental shelf, which is submerged below sea level offshore to the end of the North American continent (approximately 50 to 75 miles offshore) [VDCR 2013].

The topographic character within the onshore Project Study Area and along the eastern coastline of Virginia Beach can be described as relatively flat, with low terraces, dunes and beaches along the coast. There are many streams and rivers that traverse the area and form estuaries where they discharge into the Atlantic Ocean. There are also swamps, coastal marshes and a few inland lakes within the Project Area [Wiken et. al. 2011]. The vegetation within the onshore Project Study Area includes loblolly and shortleaf pine, oak, sweetgum, and cypress near major streams. Cordgrass, saltgrass, and rushes are found in coastal marshes, and beach grass and sea oats are found along coastal dunes (Wiken et. al. 2011).

Cultural modifications that have locally altered the Project setting include urban development associated with Virginia Beach, including hotels, restaurants, and shops along the Virginia Beach shoreline, and military development within Camp Pendleton. Local infrastructure modifications present in both jurisdictions include roadways and electric distribution lines.

4.2.2 Project Area

The offshore Project Area is located entirely within the Atlantic Ocean. This area is characterized by broad expanses of open water. The surface of the water varies from smooth, and relatively level during calmer weather to undulating and choppy during more turbulent weather conditions. Also varying with weather conditions, is the color of the water's surface which can range from blue to silver to dark gray. Cultural modifications that are evident near this portion of the Project Area include commercial and recreational fishing, commercial shipping, recreational boating, and ferry transportation. In addition, buoys, channel markers and warning lights are also located within the Project Area.

The onshore Project Area is located primarily in the eastern portion of Camp Pendleton. The Export Cable landfall/Switch Cabinet alternatives are located adjacent to Camp Pendleton Beach and Croatan Beach, and the Interconnection Station is located in the southern portion of Camp Pendleton near South Birdneck Road. The topographic character of the Project Area can be described as relatively flat and ranges in elevation from approximately 9 feet above MSL on the western boundary of the site (near the Interconnection Station) to 1 foot MSL on the eastern boundary (near the switch cabinets). Sand ridges and dunes parallel the Atlantic Ocean along the entire beach front on Camp Pendleton property. The dominant sand ridge is approximately 20 feet above MSL and extends south beyond the Camp Pendleton property (VDMA 2013). A forested area is located in the central portion of the Project site between the alternative locations of the Switch Cabinet and the Interconnection Station. Lake Christine is located north of the forested area and Coastal dunes, and Croatan Beach and the Atlantic Ocean border the eastern portion of the Project site. Vegetation within the Project site includes loblolly pine, sweet gum, white oak, laurel oak, red maple, American beech, tulip poplar and mockernut hickory (VDMA 2013). Red maple, black gum, sweet gum and understory species indicative of wetland plant communities are located along the eastern edges of Lake Christine (VDMA 2013). Vegetation along the dunes includes primarily a maritime dune grassland complex, with some woody shrubs and vines present. Tree species along the dunes include southern live oak, big-headed rush, and sea oats (VDMA 2013).

Much of the landscape within the onshore Project Area has been altered by military and urbanized uses in and near Camp Pendleton. Development associated with Camp Pendleton includes military housing, buildings associated with military activities, roadways and parking lots. Grass fields, cultivated planting beds and hedgerows have also been implemented throughout the military facility. Wooded lands interspersed with residential and commercial development are located adjacent to the Project Area and Camp Pendleton to the north and west. The Redwing Lake Golf Course is located approximately 0.5 mile south of the Project Area.

4.2.3 Sensitive Viewers/KOPs

4.2.3.1 Key Travel Routes

Scenic/Historic Routes

The Chesapeake Bay Bridge Tunnel/U.S. 13 (CBBT) is a four-lane, 20-mile-long bridge/tunnel crossing the Chesapeake Bay. This travel route is considered to have high sensitivity based on the formal scenic designation by the state of Virginia. The CBBT carries U.S. 13, which is the main north-south highway along Virginia's eastern shore (Chesapeake Bay Bridge and Tunnel Commission 2013). The CBBT and

U.S. 13 south of the bridge are designated as a scenic road; U.S. 13 north of the CBBT is designated as a state scenic byway. The CBBT is located approximately 35 miles west of the offshore Project site. Viewers along this route just outside the Project Area have level views of the Atlantic Ocean and toward the offshore Project site to the east.

Local Travel Routes

Local travel routes throughout the onshore Project Study Area and along the coast provide access to the beach, residential areas, and commercial areas along the shoreline. Examples include Atlantic Avenue, General Booth Boulevard, and South Birdneck Road. For local routes, the majority of viewers travel at a slower rate of speed, and concern for aesthetics is secondary to commuting; therefore, these viewers are considered to have moderate sensitivity. Within the Project Study Area, travelers along these routes typically have enclosed views where sight is limited to short distances as the landscape is surrounded by residential and commercial development and vegetation.

Recreation Areas

In general, parks and other public recreation areas are destinations for visitors (viewers) who are considered to have a high sensitivity for aesthetics.

First Landing State Park

First Landing State Park is the site of the first landing of the Jamestown colonists in 1607 (VDCR n.d). The park is considered to have high sensitivity based on recreational use and its designation as a National Natural Landmark and Natural Historic Landmark (VDCR n.d). Today the park is used for hiking, camping, boating, fishing, picnicking, and for educational purposes. The park falls outside of the 25 mile Project Study Area for the offshore Project Area, and the eastern boundary of the park is located approximately 0.3 miles west of the Virginia Beach coast. Views from within the park toward the offshore Project Area are completely screened by vegetation.

Cape Henry Lighthouse

The Cape Henry Lighthouse is located on the south side of Chesapeake Bay on the Fort Story military base. The lighthouse was built in 1792 and is maintained by Preservation Virginia (Virginia Tourism Corporation). The lighthouse is considered a high sensitivity viewing location based on its recreational use and national historic designation. Today, visitors can climb to the top of the lighthouse and view Chesapeake Bay and the Atlantic Ocean. The lighthouse falls outside of the 25 mile Project Study Area for the offshore Project Area. Viewers from the lighthouse have superior, unscreened views toward the offshore Project Area approximately 30 miles away. Views toward the onshore Project site, located approximately 7.5 miles to the south, are screened by development and vegetation.

Virginia Beach

Virginia Beach, as defined for the inventory, is the approximately 3-mile-long Atlantic beachfront area between Cape Henry/Fort Story and Rudee Inlet. The area is considered to have high sensitivity, because it is a popular destination for local residents and tourists. The beach falls outside of the 25-mile Project Study Area for the offshore Project Area. Recreational viewers along the beach have level, unobstructed views toward the offshore Project Area.

Croatan Beach

Croatan Beach, located in the City of Virginia Beach and south of Rudee Inlet, was inventoried as high sensitivity, because it is a popular destination for local residents and tourists. The beach falls outside of the 25-mile Project Study Area for the offshore Project Area. Recreational viewers along the beach have level, unobstructed views toward the offshore Project Area, and slightly inferior views toward the onshore Project Area. The onshore Project Area is located less than 0.5 mile from the beach; however, views are partially screened by the dunes located along the beach.

Camp Pendleton Beach

Camp Pendleton Beach, located at the end of Rifle Range Road in the Camp Pendleton facility, was inventoried as high sensitivity, because it is a popular recreational area for residents and visitors of the Camp Pendleton facility. The beach is located just south of Croatan Beach, but it is not accessible to the general public. The beach falls outside of the 25-mile Project Study Area for the offshore Project Area. Recreational viewers along the beach have level, unobstructed views toward the offshore Project Area, and slightly inferior views toward the onshore Project Area. The onshore Project Area is located less than 0.1 mile from the beach; however, views are partially screened by the dunes located along the beach.

Lake Christine

Lake Christine is located approximately 0.25 mile west of Croatan Beach and Camp Pendleton Beach and partially within the Camp Pendleton facility. The lake offers recreational opportunities to military personnel and their families, and to residents located along the lake's northern edge. In addition, there are camp grounds along the eastern side of the lake that are used by the Boy Scouts for overnight trips. Due to the residential area along the northern edge of the lake, there is a concern for aesthetics and long duration views of the surrounding landscape and the area was inventoried as high sensitivity. Views toward the offshore Project Area are completely screened by vegetation along the banks of the lake, as are some views toward the onshore Project Area.

Residential Areas

Residents are considered to have high sensitivity, because of their long viewing duration and presumed strong concern for aesthetics. Residential development in the onshore Project Study Area and along the eastern coastline is primarily associated with the City of Virginia Beach and Camp Pendleton.

Residents along the Virginia Beach coastline have level, unobstructed views of the Atlantic Ocean and toward the offshore Project Area, which is located approximately 27 miles to the northeast. Residents along South Birdneck Road in the Wadsworth Shore neighborhood near the onshore Project Area have level, generally unobstructed views toward the Interconnection Station location within 0.2 mile.

5 VISUAL IMPACT METHODOLOGY AND ANALYSIS

The purpose of the visual impact assessment is to identify and characterize the level of visual change to the landscape that would result from the construction and operation of the proposed Project, and the expected reaction from sensitive viewers. Modification of the landscape is described in levels of visual contrast, which affects scenic quality and is perceived by sensitive viewers. The BLM's visual contrast

rating process (Handbook 8431-1 Visual Resource Contrast Rating) was used as the basis for reviewing potential impacts to visual resources resulting from the proposed Project. A form adapted from the BLM's Visual Contrast Rating Worksheet (BLM Form 8400-4) was used to assess the degree of contrast the proposed Project will introduce to the existing landscape.

5.1 Visual Contrast Rating

The level of visual contrast is based upon the level of modification to the existing landscape features. In the context of the Project, existing landscape scenery is defined by the visual characteristics (form, line, color, and texture) associated with the landform (including water), vegetation, and existing facilities within and adjacent to the Project. The visual contrast rating worksheet uses these visual character elements and viewing distance to describe the landscape and assess potential changes. Descriptions of each visual character element are listed below:

- Form – The shape and mass of landforms or structures
- Line – The edge of shapes or masses, silhouettes, or bands
- Color – The property of reflecting light of a particular intensity of wavelength that the eye can see
- Texture – The nature of the surface of landforms, vegetation, or structures

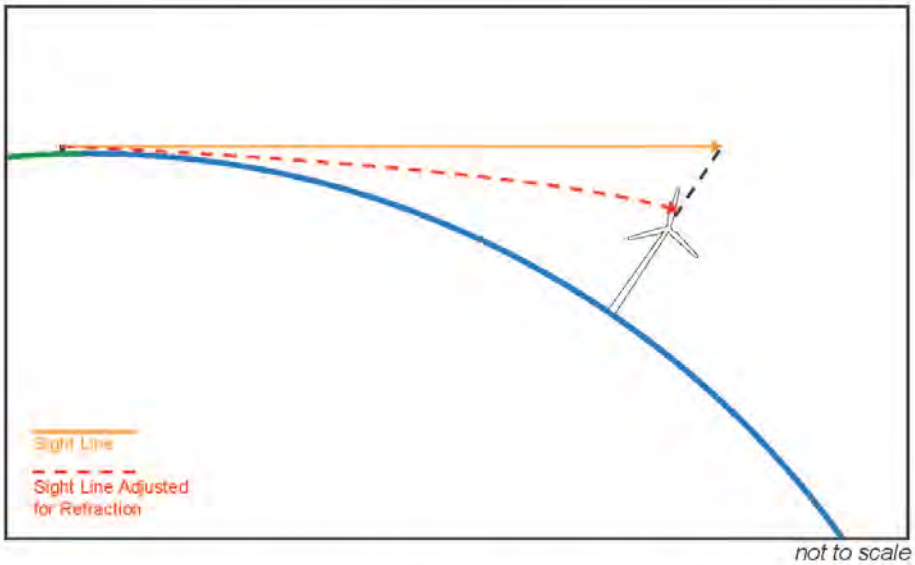
The level of visual contrast introduced by an action is measured by changes in form, line, color, and texture. The greater the difference between these character elements found within the landscape and the proposed Project components, the level of visual contrast becomes more apparent, which typically increases perceived contrast.

In general, objects or features that are closer to a viewer's location will appear more detailed and more dominant. In the case of offshore wind projects where turbines are often located miles offshore, objects viewed on the horizon are often not seen in their entirety because they begin to fall below the visible horizon due the curvature of the earth's surface. As distance from the viewing location to the object continues to increase, less of the object will be visible. The effects of the curvature of the earth and atmospheric refraction on the apparent height of objects is further described and illustrated in Figure 5.

Another aspect that is considered when assessing contrast rating is the angle of observation. Angle of observation refers to the angle between the viewer's line of sight and an object's location. Angles of observation are typically described as inferior (in which viewers are situated at a lower elevation than the object), level (in which viewers are at the same elevation as the object), and superior (in which viewers are situated at a higher elevation than the object). Angle of observation influences the perception of visual contrast. Viewers at higher elevations (superior views) tend to see larger portions of a project. In the context of offshore wind projects, from an elevated viewpoint at a distance, viewers would be able to see more of the project components above the horizon line than from a level viewing location.

Offshore wind projects introduce vertical lines of the turbines into the generally horizontal landscape of the open ocean. In addition, turbines located out on the horizon would typically be "skylined". When a project is skylined, portions of it will appear above the horizon line seen in the context of typically blue sky. The structures would potentially produce visual contrasts by virtue of their design attributes (form, color and line) and the reflectivity of their surfaces (USDI 2013).

The Effects of the Curvature of the Earth and Atmospheric Refraction on the Apparent Height of Objects



Due to the curvature of the earth's surface, objects viewed on the horizon are not seen in their entirety because they begin to fall below the visible horizon. As the distance from the viewing location to the object continues to increase, less of the object will be visible. In addition, our line of sight curves downward at large distances because of the refraction of light in the Earth's atmosphere. This effectively lessons the impact of the earth's curvature on the relative height of an object, as shown in the figure above. To calculate this, we use formulas commonly used for surveying work and what is considered a reasonable average for the amount of refraction in the atmosphere.

Equation: $h_a = \frac{c^2(1-2k)}{2r}$

h_a = height adjustment
c =distance
k =refraction coefficient
r =radius of earth

Figure 5. The Effects of the Curvature of the Earth and Atmospheric Refraction on the Apparent Height of Objects

Contrast ratings were completed from each KOP using a form adapted from the BLMs Visual Contrast Rating Worksheet (Form 8400-4). The rating is completed by determining the degree of contrast for each element (i.e., landform/water features, vegetation features, and structural features). The following general criteria are used by the BLM when rating the degree of contrast:

- None—The element contrast is not visible or perceived
- Weak—The element contrast can be seen but does not attract attention
- Moderate—The element contrast begins to attract attention and begins to dominate the characteristic landscape
- Strong—The element contrast demands attention, will not be overlooked, and is dominant in the landscape

5.2 Photographic Simulations

Photographic simulations were created to depict the proposed Project components and their potential changes to the existing landscape. The simulations were used to determine the level of contrast between the existing landscape and the expected landscape after the proposed Project is implemented. The simulations were created using a combination of GIS and current 3D software to provide accuracy in the locations of the proposed Project components.

Five photographic simulations were created for this assessment that represent potentially sensitive viewers from recreation areas (four simulations) and residences (one simulation) within the Project Study Areas (Figures 2 and 3). Photographs of existing conditions and post-construction simulations are provided in Attachment B. Photographs were taken from the following locations:

- Simulation 1 (Recreation Area; Camp Pendleton Picnic Area – Offshore components)
- Simulation 2 (Recreation Area; Cape Henry Lighthouse)
- Simulation 3 (Recreation Area; Camp Pendleton Picnic Area – Onshore components)
- Simulation 4 (Residential; South of Camp Pendleton on South Birdneck Road)
- Simulation 5 (Recreation Area; Virginia Beach – Nighttime)

5.3 Project Visibility and Contrast from Key Viewing Locations

Following are the characterizations of potential changes to scenic quality and how they would likely be perceived by sensitive viewers.

Potential viewers located along the Virginia Beach coastline (which is outside of the 25 mile Project Study Area) would have limited visibility of the WTGs. Due to the curvature of the earth's surface, objects viewed on the horizon are not seen in their entirety, because they begin to fall below the visible horizon; as the distance from the viewing location to the object continues to increase, less of the object will be visible. The impact the earth's curvature has on views of objects on the horizon are lessened by the refraction of light in the earth's atmosphere, which at long distances, curves our line of sight downwards (*see* Figure 5). For viewers associated with Virginia Beach, Croatan Beach, and the Camp Pendleton Beach, at a distance of 27 miles from the WTGs, 167 feet of the 574 foot (MSL to tip of blades) turbines (or 29 percent of the total height of the WTGs) would be above the visible horizon. In the photographic simulation from the picnic area at Camp Pendleton Beach (*see* Simulation 1, Attachment B), the simulation was created so that it is true to scale when viewed at a distance of 18 inches. Under those conditions, the theoretically visible portion of the turbine would amount to 0.02 inches when measured on the simulation graphic. For viewers associated with the CBBT, at a distance of 35 miles from the offshore Project Area, the WTGs would be completely below the horizon line and would not be visible. Sensitive viewers located away from the coast, including residents, recreational users associated with First Landing State Park, and along local travel routes, would not have views of the offshore Project Area, because they would be completely screened by urban development and vegetation (*see* Photograph 12, Attachment A).

Viewers with a superior viewing position, such as recreational visitors at the Cape Henry Lighthouse, would have unobstructed views toward the offshore Project Area. The WTGs would create weak contrast, because at a distance of 29 miles from the WTGs, 491 feet of the 574 foot turbines (or 85 percent of the total height of the WTGs) would be above the visible horizon. In the photographic simulation from the

Cape Henry Lighthouse (*see* Simulation 2, Attachment C), the simulation was created so that it is true to scale when viewed at a distance of 18 inches. Under those conditions, the theoretically visible portion of the turbine would amount to 0.05 inches when measured on the simulation graphic. The resulting size of the turbine that is visible in the simulation is due to the superior viewing location at the top of the lighthouse (approximately 134 feet above MSL). In addition, visible portions of the WTGs would be seen in the context of existing vessels within the bay and along the coast. The WTGs may potentially attract a viewer's attention but would not dominate the characteristic landscape. Superior viewing locations are not common along the Virginia Beach coastline.

5.3.1 Key Travel Routes

5.3.1.1 Local Routes

Views along local routes toward the proposed onshore Project Area would typically be completely screened by existing topography, vegetation, and/or commercial and residential development. However, travelers along South Birdneck Road would be able to view the onshore Interconnection Station at approximately 0.1 mile or less. Weak contrast would be created by the portions of the facility that would be visible. This facility would be seen in the context of the existing utility cabinets (located on the southern side of South Birdneck Road) that are similar in form, line, color, and texture. In addition, the proposed 8 foot high chain link fence around the facility would be similar to the fence along the northern side of South Birdneck Road. The facility will also be partially screened by existing vegetation just south of the facility along South Birdneck Road and from vegetation that will be planted along the facilities southern boundary. At distances greater than 0.1 mile, the facility would be completely screened by vegetation along the northern side of South Birdneck Road.

5.3.2 Recreation Areas

5.3.2.1 Croatan Beach

Weak contrast would be created by onshore Project components associated with the cable landing. The Alternative 2 Export Cable landfall site is located in the southeast portion of the Croatan Beach public parking lot. Views from the beach toward the Switch Cabinet would be completely screened by the dunes along the coastline. The Switch Cabinet would be visible to recreational users heading from the parking lot toward the beach or from the beach to the parking lot. Views of the Switch Cabinet would be seen in the context of existing cultural modifications, such as a restroom/changing facility that is similar in form, line and texture. The Switch Cabinet would be smaller than the restroom facility that is near the edge of the parking lot.

5.3.2.2 Camp Pendleton Beach

Weak contrast would be created by onshore Project components associated with the cable landing. The Alternative 1 Export Cable landfall site is located in the southwest corner of the gravel parking lot south of the Camp Pendleton Rifle Range. Views from the Camp Pendleton Beach picnic area, located in between the gravel parking lot and the beach, would have views ranging from unobstructed to partially screened by dunes along the coast. In addition, viewers from this area would also have partially to

completely screened views of the HDD Work Area located in the southeast portion of the parking lot. Vegetation would be planted around the Switch Cabinet that would partially screen the structure. Portions of the Switch Cabinet that would be visible would be a small object seen in the context of existing cultural modifications, such as portable toilets and waste receptacles that are similar in form, line and texture (*see* Simulation 3, Attachment B). The HDD Work Area would contain construction equipment and would have an 8 ft fence around it; however the HDD Work Area would also be seen in the context of existing cultural modifications, including an existing fence along the southern side of Rifle Range Road, similar in line, form, color and texture. The HDD Work Area would be temporary as the fence and equipment would be removed after construction is complete and the area restored to pre-construction conditions. Views from the beach toward the switch cabinet and HDD area would be completely screened by the dunes along the coastline.

5.3.2.3 Lake Christine

Weak contrast would be created by onshore Project components associated with the Interconnection Station. Viewers along the southwestern arm of Lake Christine would have partial views of the Interconnection Station located along the entry drive into the Camp Pendleton facility of off South Birdneck Road. Portions of the Interconnection Station that would be visible would be seen in the context of existing cultural modifications, such as residential homes that are similar in form and line. Painting the structures within the Interconnection Station green will help to reduce visual contrast by blending the structures into the surrounding environment (see Attachment C, Contrast Rating Worksheet 1). Viewers along the northern or eastern side of Lake Christine are not expected to have views of onshore Project facilities, because the Onshore Interconnection Cable would be buried and its location would be completely screened by existing vegetation along the shore of the lake, as would the Switch Cabinet and Interconnection Station.

5.3.2.4 Residences

Weak contrast would be created by onshore Project components located along South Birdneck Road, south of Camp Pendleton. The onshore Project Area is located in the immediate foreground for high sensitivity residential viewers, where views of the Interconnection Station would be partially to completely screened by existing vegetation along the northern side of South Birdneck Road. Portions of the Interconnection Station that are visible would be seen in the context of the existing utility cabinets (located on the southern side of South Birdneck Road) that are similar in form, line, color and texture. In addition, the proposed 8 foot high chain link fence around the facility would be similar to the fence along the northern side of South Birdneck Road (*see* Simulation 4, Attachment B; and Contrast Rating Worksheet 2, Attachment C).

Views from residents within the Camp Pendleton towards the proposed onshore Project Area would typically be partially to completely screened by existing vegetation along the driveway leading into Camp Pendleton from South Birdneck Road. Weak contrast would be created by the portions of the Interconnection Station that would be visible. This facility would be seen in the context of existing cultural modifications such as residential buildings, bleachers, and chain link fences. The facility would also be painted green similar to the surrounding vegetation; thus further reducing contrast.

Weak contrast would be created by onshore Project components located in the Croatan Beach parking lot north of the Camp Pendleton Rifle Range. The onshore Project Area (Alternative 2 Export Cable landfall site) is located in the foreground for high sensitivity residential viewers north of the parking lot. Views of the Switch Cabinet would be partially to completely screened by existing vegetation, topography (i.e., sand dunes), and/or an existing restroom structure located just north of the Switch Cabinet which has already introduced vertical elements into the landscape setting (*see* Contrast Rating Worksheet 3, Attachment C). Portions of the Switch Cabinet that would be visible would be seen in the context of the existing restroom facility which is similar in form and line.

5.4 Nighttime Lighting

FAA lighting would be located atop each turbine on the nacelle. USCG lighting would be located on the foundation of each turbine. These lights would be situated below the horizon line and, therefore, would not be visible to viewers along the shoreline and would create no change in nighttime viewing conditions (*see* Simulation 5, Attachment B).

No proposed lighting is associated with the onshore Project components; therefore, these components would not be an additional source of nighttime lighting within the area.

5.5 Conclusions

Overall, the proposed Project would result in minimal change to landscape conditions for viewers along the Virginia Beach coastline and associated with Camp Pendleton.

On a short-term basis during the construction period for offshore Project components, viewers onshore would be able to observe marine traffic associated with the Project. Based on the small volume of Project-related vessel traffic relative to baseline marine traffic, it is not likely that many viewers would perceive a change. On a long-term basis, during operation of the Project, viewers along the Virginia Beach coastline may have limited visibility of the WTGs, but the WTGs would likely not be noticeable to the casual observer.

On a short-term basis during the construction period for onshore Project components, viewers would be able to observe construction equipment, construction laydown areas and crews. Varying degrees of visual contrast would occur when equipment and construction crews are present; however, contrast would be short-term since equipment and support facilities will be removed once construction in a specific location is complete. Although both switch cabinet alternative locations would introduce low contrast into the surrounding landscape, Alternative 2 Export Cable landfall site would be located closer to residential and recreational viewers; whereas the Alternative 1 Export Cable landfall site would only be seen by recreational viewers accessing Camp Pendleton Beach. .

The distance of the offshore components from the shore and the undergrounding of many of the onshore components (i.e., Onshore Interconnection Cable and Fiber Optic Cable) has mitigated many of the potential effects of the proposed Project. For onshore aboveground Project components, the following mitigation measures that will minimize visual contrast will be incorporated into the Project design:

Construction Phase:

- A Fugitive Dust Control Plan will be implemented to minimize dust (visual pollution).
- The onshore Project Area will be maintained free of debris, trash, and waste during construction.

Operations Phase:

- The proposed onshore Project components will have exterior colors that blend with their surrounding environment. The Switch Cabinet, located near the beach will be a neutral color and the Interconnection Station will be similar to the existing utility cabinet.
- Vegetative screening will be provided around the southern side of the Interconnection Station to limit views of the facility from residential viewers along South Birdneck Road. Vegetative screening will be similar to existing vegetation in the area, so that it will blend in with the surrounding environment and minimize contrast to viewers.

6 REFERENCES

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Attachment A – Site Photographs

Photo Number	Location	Sensitive Resource(s)	Historic/Scenic Designation	Viewer Group Represented	Time of Day	Viewing distance	View of Orientation	KOP and/or Simulation Created
1	Picnic Area at Camp Pendleton Beach at the end of Rifle Range Road	Camp Pendleton	Historic	Recreation	10:10 AM	300 feet from the Offshore Transmission Cable Landing	Southwest	SIM
2	Picnic Area at Camp Pendleton Beach at the end of Rifle Range Road	Camp Pendleton	Historic	Recreation	10:13 AM	26.8 miles from turbines	Northeast	
3	Intersection of Rifle Range Road and Regulus Avenue	Camp Pendleton	Historic	Travel Route	10:57 AM	Along Transmission Cable Alternative	West	
4	North of Jefferson Avenue, south of Lake Christine	Camp Pendleton	Historic	Resident	11:28 AM	0.2 miles from Interconnection Station site	South	
5	Southwest of Jefferson Avenue/Lake Road intersection	Camp Pendleton	Historic	Resident	11:35 AM	0.2 miles from Interconnection Station site	Southwest	
6	Southwest side of Lake Christine, south of Lake Road	Lake Christine in Camp Pendleton	Historic	Recreation	11:55AM	0.3	Southwest	KOP
7	Southwest of Jefferson Avenue and south of East 9th Street	Camp Pendleton	Historic	Resident	12:02 PM	0.25 miles from Interconnection Station site	Southwest	
8	South of South Birdneck Road in Wadsworth Shores community	Neighborhood	N/A	Resident	12:35 AM	350 feet from Interconnection Station site	Northeast	KOP and SIM
9	North of South Birdneck Road	N/A	N/A	N/A	12:40 AM	N/A	South	
10	South of Atlantic Avenue and north of Cebu Road on Fort Story Military Base	Cape Henry Lighthouse	Historic	Recreation	1:37 PM	29 miles from turbines	Southeast	SIM
11	70th Street, east of Atlantic Avenue		N/A	Residents	2:44 PM	27.5 miles from turbines	East	
12	East entrance to park from 64th Street, west of Atlantic Avenue	First Landing State Park	Historic	Recreation	2:59 PM	27.5 miles from turbines	Southeast	

Photo Number	Location	Sensitive Resource(s)	Historic/Scenic Designation	Viewer Group Represented	Time of Day	Viewing distance	View of Orientation	KOP and/or Simulation Created
13	Vanderbilt Avenue, south of Lockheed Avenue	Croatan Beach	N/A	Residents	3:20 PM	450 feet from Offshore Transmission Cable Landing	Southeast	KOP
14	Croatan Beach, south of Lockheed Avenue	Croatan Beach	N/A	Recreation	9:13 AM	26.8 miles from turbines	Northeast	SIM
15	Virginia Beach		N/A	Recreation	7:00 PM	26.8 miles from turbines	East	SIM
16	Virginia Beach Pedestrian Walkway		N/A	Recreation	4:46 PM	26.8 miles from turbines	East	
17	Pull-off on south side of tunnel	Chesapeake Bay Bridge Tunnel Scenic Byway	Scenic	Travel Route	5:36 PM	35 miles from turbines	Southeast	

Photo 1. View from Camp Pendleton Beach picnic area looking southwest towards the Export Cable Landing Alternative 1.

Photo 2. View from Camp Pendleton Beach picnic area looking northeast towards the offshore Project site.

Photo 3. View looking west along Rifle Range Road and the Onshore Interconnection Cable and Fiber Optic Cable Alternatives route.

Photo 4. View from residence along Jefferson Avenue in Camp Pendleton looking south along the Onshore Interconnection Cable and Fiber Optic Cable Alternatives route and towards the Interconnection Station site.

Photo 5. View from residence south of Jefferson Avenue and Lake Road in Camp Pendleton looking southwest towards the Interconnection Station.

Photo 6. View from the southwest side of Lake Christine along Lake Road within the Camp Pendleton facility, looking southwest towards the Interconnection Station location.

Photo 7. View from residence south of Jefferson Avenue in Camp Pendleton looking southwest towards the Transmission Cable Alternative routes and the Interconnection Station.

Photo 8. View from residences in Wadsworth Shores south of South Birdneck Road, looking northeast towards the Interconnection Station.

Photo 9. View south across South Birdneck Road to Dominion's existing revenue metering cabinet.

Photo 10. View from the top of Cape Henry Lighthouse, looking southeast.

Photo 11. Photograph taken from boardwalk access on 70th Street east of Atlantic Avenue. View looking east across the Virginia Beach front showing sand dunes and vegetation in front of residences.

Photo 12. Photograph taken from the entrance to First Landing State Park off of 64th Street, west of Atlantic Avenue, looking southeast.

Photo 13. View from the entrance to Croatan Beach parking lot off Vanderbilt Avenue looking southeast towards the Export Cable Landing Alternative 2 (Switch Cabinet), adjacent to residences.

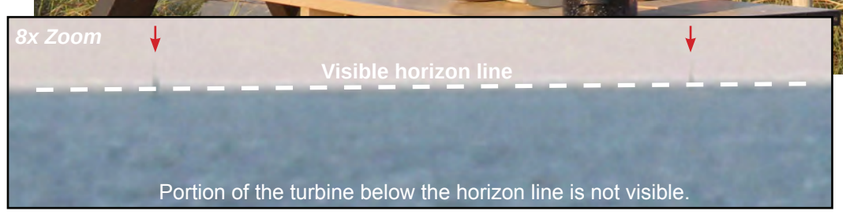
Photo 14. View from Croatan Beach, just east of the Croatan Beach parking lot, looking northeast.

Photo 15. View looking east from Virginia Beach after sunset.

Photo 16. View from Virginia Beach pedestrian walkway south of the Virginia Beach Fishing Pier, looking east.

Photo 17. View from Chesapeake Bay Bridge Tunnel, looking southeast.

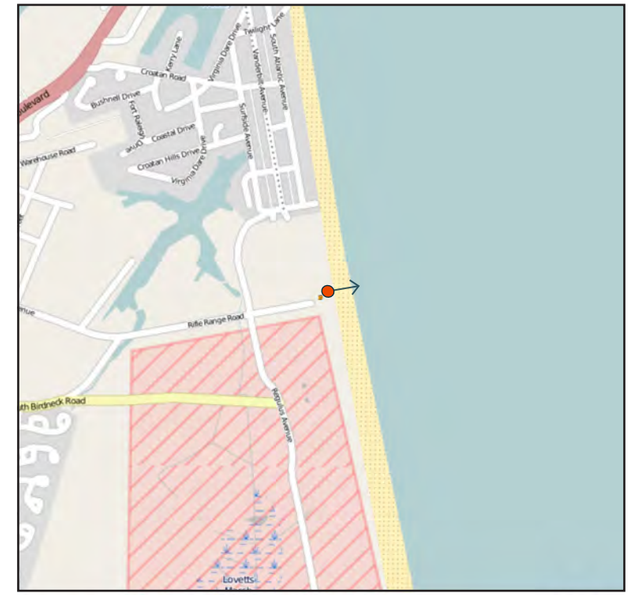
Attachment B – Simulations



Above photograph is intended to be viewed 18 inches from viewer's eyes when printed on 11"x17" paper. White brackets indicate project area.

Simulation 1

Camp Pendleton Picnic Area - Offshore Components



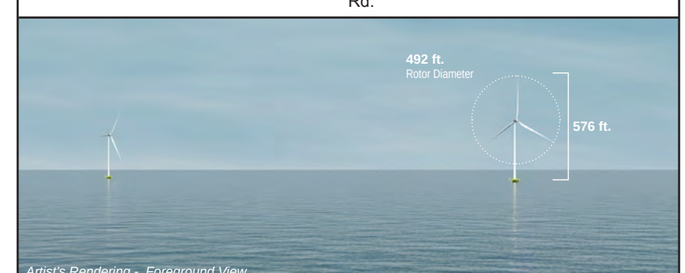
0 0.25 0.5 0.75 Miles

LEGEND

Photo Point Location

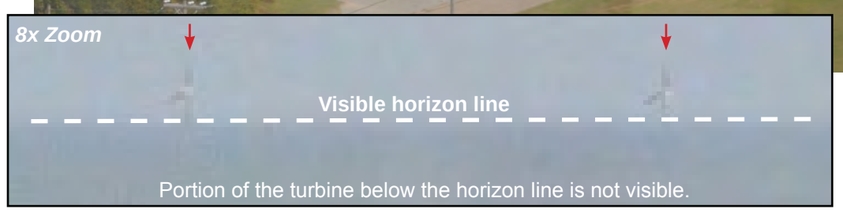
Photograph Information

- Photo Point Number:
- Date of Photograph: 7/30/2013
- Time of Photograph: 08:22 AM
- Weather Condition: Light Overcast
- Viewing Direction: East/northeast
- Distance to Project Site: 26.79 miles
- Latitude: 36°48'56.182"N
- Longitude: 75°58'1.241"W
- Photo Location: View from Camp Pendleton Beach at the end of Rifle Range Rd.



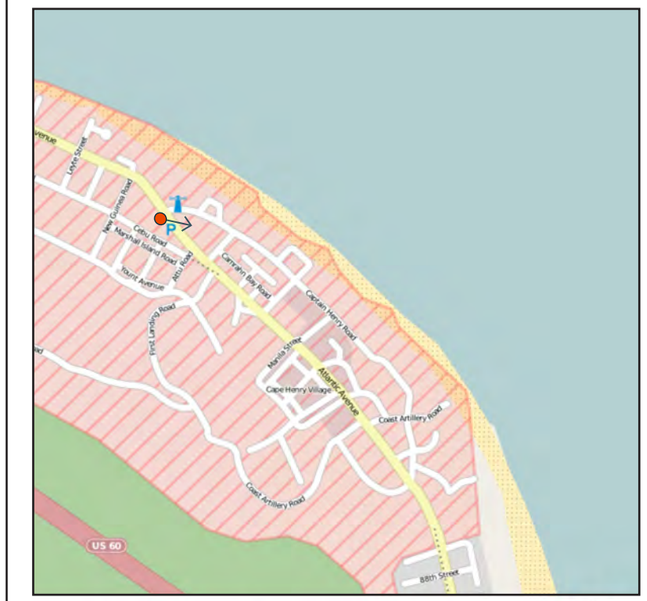
VIRGINIA OFFSHORE WIND TECHNOLOGY ADVANCEMENT PROJECT

TETRA TECH



Above photograph is intended to be viewed 18 inches from viewer's eyes when printed on 11"x17" paper. White brackets indicate project area.

Simulation 2
Old Cape Henry Lighthouse

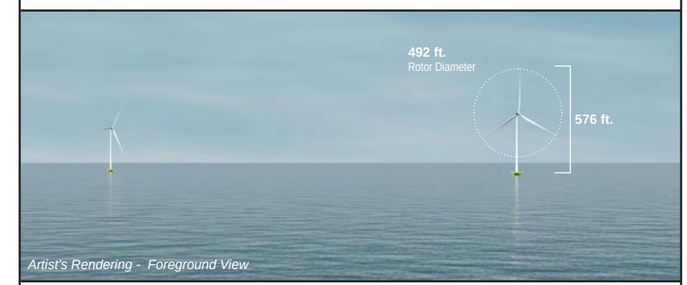


LEGEND

Photo Point Location

Photograph Information

- Photo Point Number: 10
- Date of Photograph: 10/16/2013
- Time of Photograph: 01:37 PM
- Weather Condition: Overcast
- Viewing Direction: East/southeast
- Distance to Project Site: 28.65 miles
- Latitude: 36°55'32.848"N
- Longitude: 76°0'28.724"W
- Photo Location: View from the top of Old Cape Henry Lighthouse



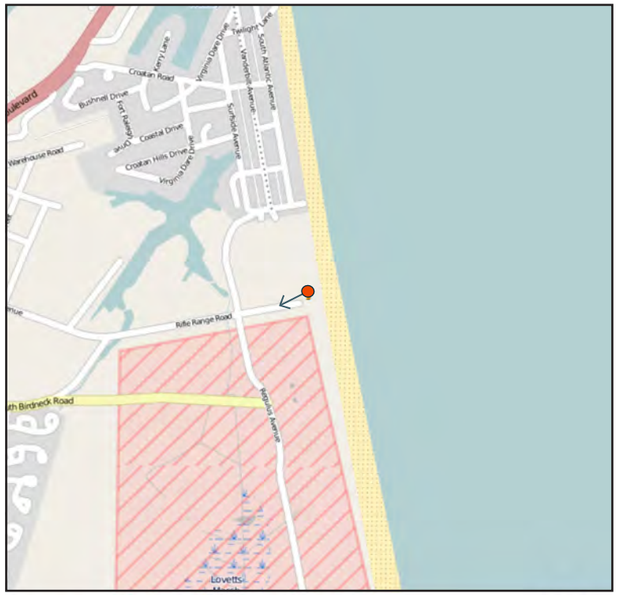
VIRGINIA OFFSHORE WIND TECHNOLOGY ADVANCEMENT PROJECT

TETRA TECH

Above photograph is intended to be viewed 18 inches from viewer's eyes when printed on 11"x17" paper.

Simulation 3

Camp Pendleton Picnic Area - Onshore Components



0 0.25 0.5 0.75 Miles

LEGEND

Photo Point Location

Photograph Information

- Photo Point Number: 02
- Date of Photograph: 10/16/2013
- Time of Photograph: 10:12 AM
- Weather Condition: Cloudy
- Viewing Direction: Southwest
- Distance to Project Site: 315 ft.
- Latitude: 36°48'56.182"N
- Longitude: 75°58'1.241"W
- Photo Location: View from Camp Pendleton Picnic Area at the end of Rifle Range Rd.

Artist's Rendering

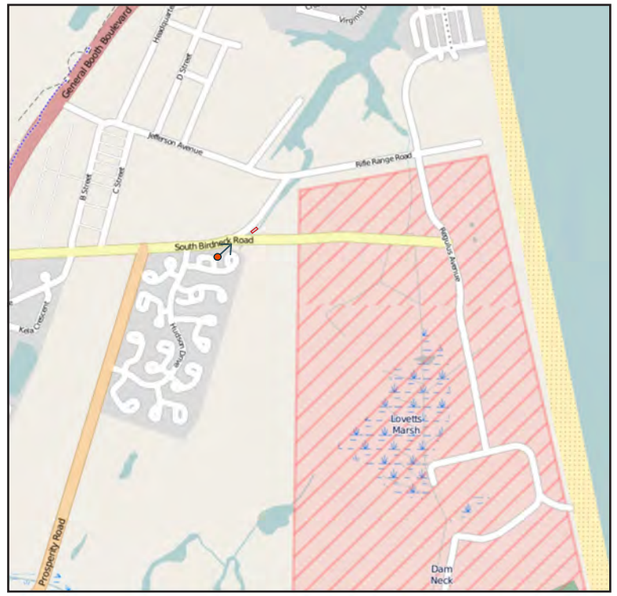
VIRGINIA OFFSHORE WIND TECHNOLOGY ADVANCEMENT PROJECT

TETRA TECH

Above photograph is intended to be viewed 18 inches from viewer's eyes when printed on 11"x17" paper.

Simulation 4

Residences South of Camp Pendelton



0 0.25 0.5 0.75 Miles

LEGEND

Photo Point Location

Interconnect Station Location

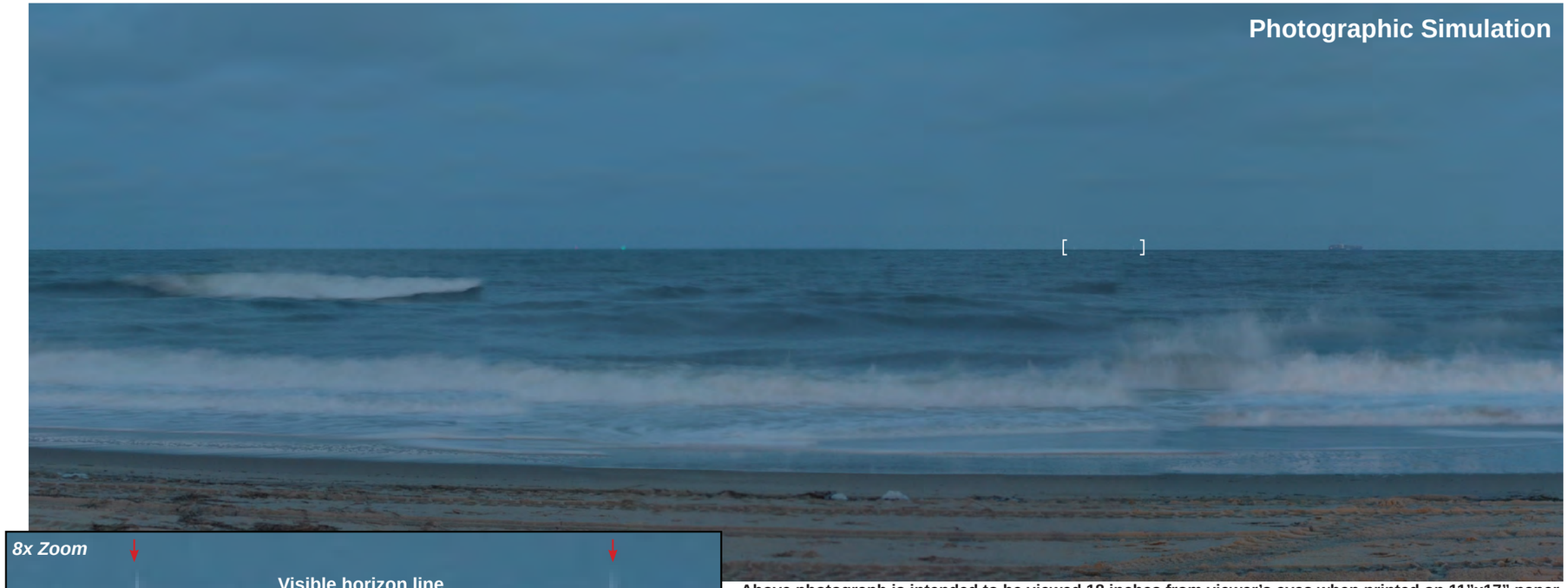
Photograph Information

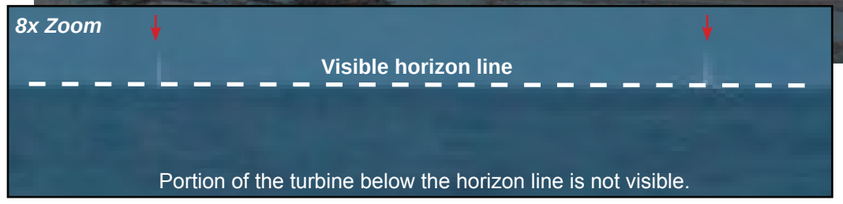
- Photo Point Number: 15
- Date of Photograph: 10/16/2013
- Time of Photograph: 12:35 PM
- Weather Condition: Cloudy
- Viewing Direction: Northeast
- Distance to Project Site: 428 ft.
- Latitude: 36°48'39.756"N
- Longitude: 75°58'45.436"W
- Photo Location: View from the Residences south of Camp Pendelton off South Birdneck Road

Artist's Rendering

VIRGINIA OFFSHORE WIND TECHNOLOGY ADVANCEMENT PROJECT

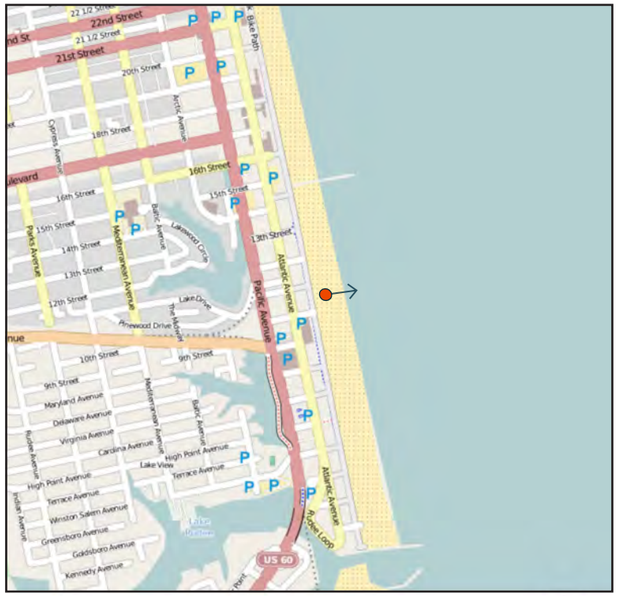
TETRA TECH





Above photograph is intended to be viewed 18 inches from viewer's eyes when printed on 11"x17" paper. White brackets indicate project area.

Simulation 5
Virginia Beach



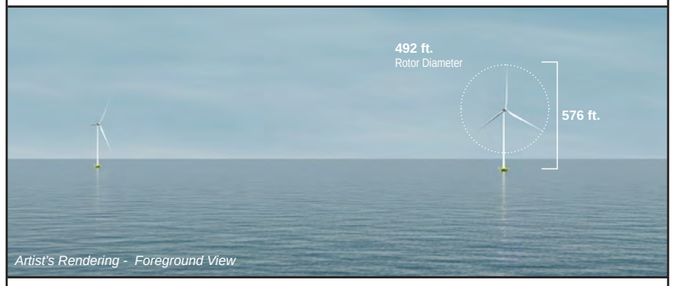
0 0.25 0.5 0.75 Miles

LEGEND

Photo Point Location

Photograph Information

- Photo Point Number: 15
- Date of Photograph: 10/16/2013
- Time of Photograph: 06:59 PM
- Weather Condition: Cloudy
- Viewing Direction: East
- Distance to Project Site: 26.75 miles
- Latitude: 36°50'21.82"N
- Longitude: 75°58'15.51"W
- Photo Location: View from the beach between 10th St and 11th Street in front of the Hampton Inn



VIRGINIA OFFSHORE WIND TECHNOLOGY ADVANCEMENT PROJECT

TETRA TECH

Attachment C – Visual Contrast Rating Worksheets

TETRA TECH

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Key Observation Point	Latitude / Longitude	Notes:
Virginia Offshore Wind Technology Advancement Project	1	36°48'57.00"N 75°58'34.11"W	View from the eastern shore of Lake Christine on Camp Pendleton looking southwest.

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	Foreground (FG): Relatively level, flat to gently curving (land); Flat, level (water)	FG: Large, irregular patches (lawn); Tall, rounded, pyramidal, columnar (trees)	FG: Geometric, square, triangular, rectangular (buildings); Low, flat, geometric (deck/pier); Tall, thin (utility pole)
Line	FG: Straight, horizontal, slightly curving around lake edge (land); Solid, curving (edge of lake)	FG: Straight, horizontal and irregular, curving butt-edge of lawn along lake edge; Rounded, irregular broken (trees)	FG: Straight, horizontal, vertical and angular (buildings); Straight, horizontal, vertical, regular (deck/pier); Thin, narrow (utility pole)
Color	FG: Brown, tan (land); Dark bluish-gray, reflective (water)	FG: Green (lawn); Light and dark green, brown (trees)	FG: White, light gray, gray, green, light blue (buildings); Dark and light brown (deck/pier); Dull brown (utility pole)
Texture	FG: Fine, smooth (land and water)	FG: Fine and smooth (lawn); Rough, course (trees)	FG: Medium to coarse

Section C: Proposed Activity Description

Has Photo Simulation Been Created for KOP? ☐ Yes ☒ No If Yes, Figure Number:

	Land / Water	Vegetation	Structures
Form	Changes not visible from KOP	FG: Trees would be removed; however, changes would be partially screened by existing vegetation. Existing vegetation would also backdrop the facility	Low and tall, geometric
Line	Changes not visible from KOP	FG: Trees would be removed; however, changes would be partially screened by existing vegetation. The irregular line of the tree tops would appear lower exposing the tree line behind the facility.	Straight, horizontal and vertical
Color	Changes not visible from KOP	FG: Trees would be removed, removing green vegetation; however, there would not be much of a lapse in color because there is existing vegetation in front of and behind the facility.	Green
Texture	Changes not visible from KOP	FG: Trees would be removed; removing texture; however, changes would be partially screened by existing vegetation and the texture of the trees behind the facility would be visible.	Fine, smooth

Section D: Contrast Rating

Features

Elements / Degree of Contrast	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				x			x				x	
Line				x			x				x	
Color				x			x				x	
Texture				x			x				x	

Overall Level of Contrast: Weak

Section E: Viewer Sensitivity

Viewer Expectations	Duration of View	Use Volume	Overall Sensitivity
High	Long	Moderate	High

Additional Comments

The proposed Interconnect Station is located approximately 0.3 mile from the KOP and would be partially screened by existing vegetation along the driveway into the Camp Pendleton facility. Painting the cabinets within the Interconnect Station green would help to reduce contrast by blending the structures into the surrounding landscape.

Evaluators Names: Lori Davidson

Date: October 16, 2013

Visual Contrast Rating Worksheet

KOP– Southwest Arm of Lake Christine

View looking south toward the Onshore Transmission Cable route along the southern side of Rifle Range Road and the Interconnect Station, just beyond the southwest arm of Lake Christine. The cable would be buried within the road right-of-way and the Interconnect Station would be partially screened by existing buildings and vegetation.

TETRA TECH

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Key Observation Point	Latitude / Longitude	Notes:
Virginia Offshore Wind Technology Advancement Project	2	36°48'39.75"N 75°58'45.45"W	View from residents in Wadsworth Shore development south of Birdneck Road, looking northeast.

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	Foreground (FG): Flat, level	FG: Large patches (lawn); Tall, irregular, loosely formed (trees)	FG: Tall, geometric (buildings); Short, geometric (utility cabinets); Long, horizontal, narrow , solid and transparent (fences); Long, narrow, strip (road/sidewalk)
Line	FG: Straight, horizontal	FG: Straight and curving, butt-edge along sidewalks and road (lawn); Tall, straight, loosely round and pyramidal (trees)	FG: Straight, horizontal, vertical and angular (building); Straight, short horizontal and vertical (utility cabinets); Rectangular, diagonal, horizontal, regular (fences); Straight and curving bands (road/sidewalk)
Color	FG: Brown, tan	FG: Green (lawn); Green to dark green	FG: Reddish brown, cream, white, gray (buildings); White, reddish-brown and black , gray (fences); Dark green (utility cabinet); Light tan and light gray (road/sidewalk)
Texture	FG: Fine	FG: Fine and smooth (lawn); Medium to coarse, rough (trees)	FG: Medium (buildings); Smooth, fine, regular, uniform (fences); Smooth, fine (utility cabinets); Fine (road/sidewalk)

Section C: Proposed Activity Description

Has Photo Simulation Been Created for KOP? ☒ Yes ☐ No If Yes, Figure Number: Simulation 4

	Land / Water	Vegetation	Structures
Form	Changes not visible from KOP	FG: Grass and trees would be removed; however, changes would not be visible due to screening from existing vegetation.	FG: Tall and short, geometric; Long, horizontal, narrow, and transparent (fence).
Line	Changes not visible from KOP	FG: Grass would be removed creating straight, horizontal and diagonal lines; and trees would be removed; however, changes would not be visible due to screening from existing vegetation.	Straight, horizontal and vertical (utility cabinets); Rectangular, diagonal, horizontal, regular (fences)
Color	Changes not visible from KOP	FG: Grass and trees would be removed, removing green vegetation; however, changes would not be visible due to screening from existing vegetation.	Green and gray (project components); gray, matted (fence); Light gray (concrete foundations and gravel base)
Texture	Changes not visible from KOP	FG: Changes created by the removal of grass would not be visible due to Project components	Fine, smooth; Smooth, fine, regular, uniform (fence)

Section D: Contrast Rating

Features

Elements / Degree of Contrast	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form				x			x				x	
Line				x			x				x	
Color				x			x				x	
Texture				x			x				x	

Overall Level of Contrast: Weak

Section E: Viewer Sensitivity

Viewer Expectations	Duration of View	Use Volume	Overall Sensitivity
High	Long	Moderate	High

Additional Comments

Portions of the Interconnect Station that will be visible will be seen in the context of similar existing utility cabinets and fencing with the same form, line, color and texture. In addition, much of the Interconnect Station will be screened by existing and proposed vegetation along South Birdneck Road.

Evaluators Names: Lori Davidson

Date: October 16, 2013

Visual Contrast Rating Worksheet

KOP– Residents south of Birdneck Road

View looking northeast from the Wadsworth Shores neighborhood located south of the Camp Pendleton facility and South Birdneck Road, towards the Interconnect Station. The Interconnect Station will be located on the north side of South Birdneck Road, east of the unnamed entrance into the Camp Pendleton facility. Residential viewers along Birdneck Road would have partially to completely obstructed views of the Interconnect Station.

TETRA TECH

Visual Contrast Rating Worksheet

Section A: Project Information

Project Name	Key Observation Point	Latitude / Longitude	Notes:
Virginia Offshore Wind Technology Advancement Project	3	36°49'5.79"N 75°58'7.20"W	View from residents north of the Croatan Beach parking lot, looking southeast.

Section B: Characteristic Landscape Description

	Land / Water	Vegetation	Structures
Form	Foreground (FG): Flat, level to gently rolling	FG: Low rounded, tall, narrow, conical (shrubs); Irregular, loosely formed (grasses); Low, patches (ground cover)	FG: Tall, geometric (buildings); Short, geometric (utility cabinets); Long, horizontal, narrow , solid and transparent (fences); Long, narrow, strip (road/sidewalk)
Line	FG: Straight, horizontal to slightly curving	FG: Circular, angular (shrubs); Soft, curving and straight (grasses); Horizontal, irregular (ground cover)	FG: Straight, horizontal, vertical and angular (building); Straight, short horizontal and vertical (utility cabinets); Rectangular, diagonal, horizontal, regular (fences); Straight and curving bands (road/sidewalk)
Color	FG: Brown, light tan	FG: Dark green, light green, green, bluish-green, golden tan	FG: Reddish brown, cream, white, gray (buildings); White, reddish-brown and black , gray (fences); Dark green (utility cabinet); Light tan and light gray (road/sidewalk)
Texture	FG: Fine	FG: Fine to coarse, clumped	FG: Medium (buildings); Smooth, Fine, regular, uniform (fences); Smooth, fine (utility cabinets); Fine (road/sidewalk)

Section C: Proposed Activity Description

Has Photo Simulation Been Created for KOP? ☐ Yes ☒ No If Yes, Figure Number:

	Land / Water	Vegetation	Structures
Form	Changes not visible from KOP	FG: Grass would be removed creating a rectangular form; however, change would not be visible due to Project components	FG: Short, rectangular
Line	Changes not visible from KOP	FG: Grass would be removed creating straight, horizontal and diagonal lines; however, changes would not be visible due to Project components	FG: Straight, horizontal and vertical
Color	Changes not visible from KOP	FG: Grass would be removed, removing green vegetation; however, changes would not be visible due to Project components	FG: Beige
Texture	Changes not visible from KOP	FG: Changes created by the removal of grass would not be visible due to Project components	FG: Fine, simple, smooth

Section D: Contrast Rating

Features

Elements / Degree of Contrast	Land/Water				Vegetation				Structures			
	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None	Strong	Moderate	Weak	None
Form			x				x				x	
Line			x				x				x	
Color			x				x				x	
Texture			x				x				x	

Overall Level of Contrast: Weak

Section E: Viewer Sensitivity

Viewer Expectations	Duration of View	Use Volume	Overall Sensitivity
High	Long	Low	High

Additional Comments

The proposed Switch Cabinet would be located in the southeast corner of the Croatan Beach parking lot behind an existing restroom building. Views from residences adjacent to the parking lot would be mostly to completely screened by the restroom building and existing vegetation.

Evaluators Names: Lori Davidson

Date: October 16, 2013

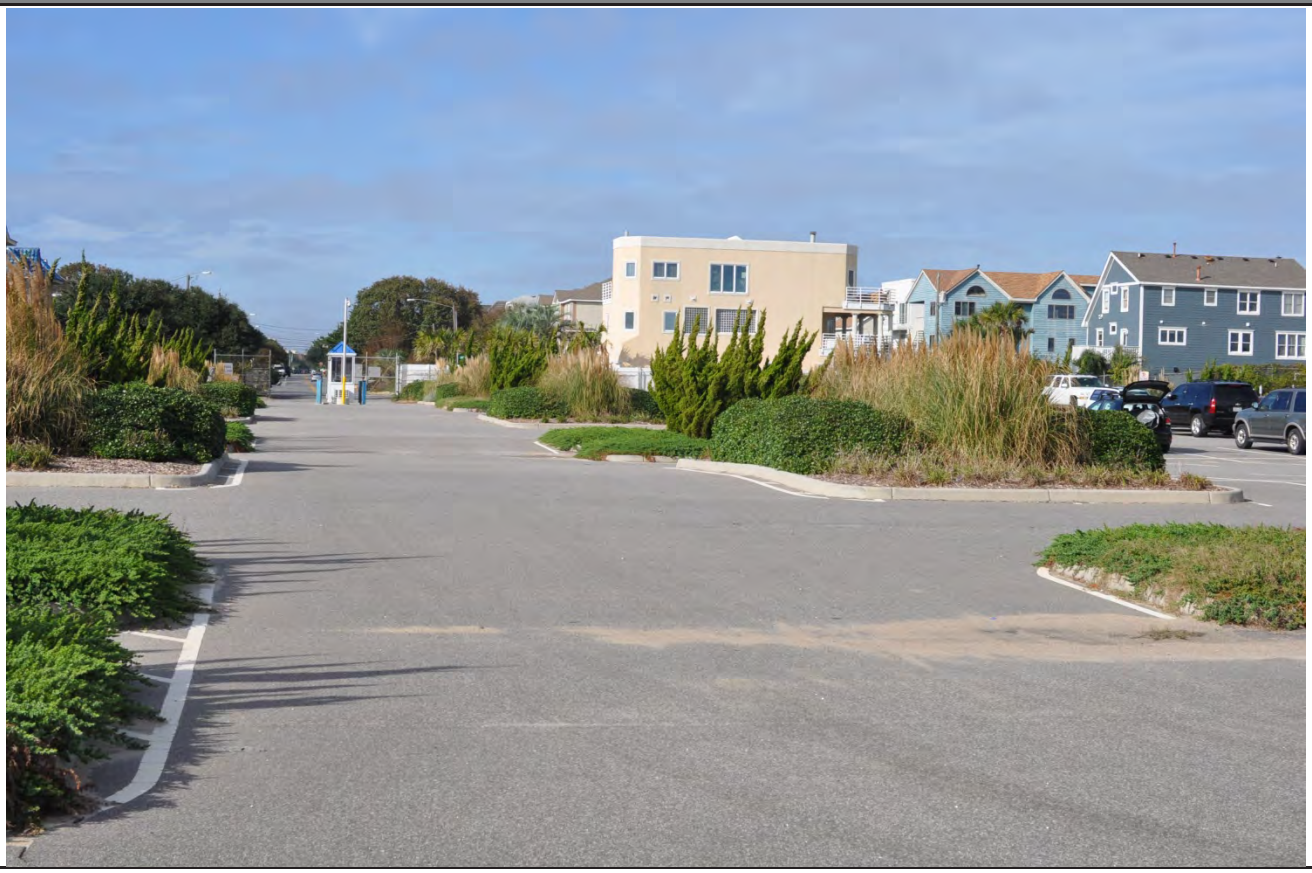
Visual Contrast Rating Worksheet

KOP– Residents north of Croatan Beach Parking Lot

View looking southeast from the entrance of the Croatan Beech parking lot towards the Alternative 2 Offshore Cable Landing location. Viewers on the first level of residential homes would most likely have partially to completely obstructed views of the switch cabinet due to along the and within the parking lot and the existing restroom facility. Portions of the switch cabinet that are visible would be seen in the context of the restroom facility which is similar in form, line and texture.

Visual Contrast Rating Worksheet

KOP– Residents north of Croatan Beach



View looking north from the south end of the Croatan Beach parking lot. The first levels of residential structures would be obstructed by existing vegetation along the northern edge of the parking lot and within the parking lot, cars and the restroom facility (located just out of the photo to the right). Viewers on the second or third story of residential homes would most likely have completely or partially obstructed views as the restroom facility is located immediately north of Alternative 2 Transmission Cable landing switch cabinet.