Draft

TIERED ENVIRONMENTAL ASSESSMENT

United States Marine Corps Forces Reserve Wind Energy Program Site: Marine Forces Reserve Center, Brooklyn, New York

United States Marine Corps
Forces Reserve

February 2013

Acronyms

APE	Area of Potential Effect
AQCR	Air Quality Control Region
AWEA	American Wind Energy Association
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dBA	A-weighted decibel
DoD	Department of Defense
DoN	Department of the Navy
EA	Environmental Assessment
EMI	Electromagnetic Interference
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FICON	Federal Interagency Committee on Noise
FM	frequency modulation
FONSI	Finding of No Significant Impact
ft	foot (feet)
FY	Fiscal Year
GCM	general conservation measure
GHG	greenhouse gas
GRAMP	grassland restoration and management project
GWP	Global Warming Potential
HHM	Hardy-Heck-Moore, Inc.
INRMP	Integrated Natural Resources Management Plan
JFK	John F. Kennedy International Airport
KOP	Key Observation Point
kW	kilowatt
L_{dn}	Day-Night Average Sound Level
MARFORRES	Marine Forces Reserve
MBTA	Migratory Bird Treaty Act
MCO	Marine Corps Order
mph	miles per hour
MW	megawatt
MWh/yr	megawatt-hours per year
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAVFAC	Naval Facilities Engineering Command
NAVFAC ESC	Naval Facilities Engineering Service Center
NEPA	National Environmental Policy Act
NGO	non-governmental organizations
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
NY	New York
NYCDEP	New York City Department of Environmental Protection
NYNHP	New York Natural Heritage Program
NYSDEC	New York State Department of Environmental Conservation
O_3	ozone
Pb	lead
PM_{10}	particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PSD	Prevention of Significant Deterioration
RONA	Record of Non-Applicability
RPS	Renewable Energy Standard
rpm	revolutions per minute
SHPO	State Historic Preservation Office(r)
SIP	State Implementation Plan
SO_2	sulfur dioxide
SO_x	sulfur oxides
SPDES	State Pollutant Discharge Elimination System
SWPPP	Stormwater Pollution Prevention Plan
TCP	Traditional Cultural Properties
TDWR	Terminal Doppler Weather Radar
U.S.	United States
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USMC	United States Marine Corps
VOC	volatile organic compound
WNS	white-nose syndrome

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TIERED ENVIRONMENTAL ASSESSMENT

Lead Agency for the EA: United States Marine Corps Forces Reserve

Title of Proposed Action: United States Marine Corps Forces Reserve Wind Energy Program Site: Marine Forces Reserve Center, Brooklyn, NY

Designation: Tiered Environmental Assessment

Abstract

The Department of the Navy (DoN) has prepared this Environmental Assessment (EA) for the United States Marine Corps (USMC) Forces Reserve (MARFORRES) in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [USC] §§ 4321-4370h), as implemented by the Council on Environmental Quality (CEQ) (40 Code of Federal Regulations [CFR] Parts 1500-1508); DoN NEPA regulations (32 CFR Part 775); and USMC NEPA directives (Marine Corps Order [MCO] P5090.2A, change 2). This EA is tiered from the Programmatic EA for the *MARFORRES Wind Energy Program*. The program was officially established when a Finding of No Significant Impact (FONSI) was signed on 18 May 2011. The proposed action is to develop wind energy at MARFORRES Center, Brooklyn, New York (NY) under the *MARFORRES Wind Energy Program*. Implementation of the proposed action would involve the installation and operation of up to three 50-kilowatt (kW) wind turbines consistent with the program criteria specified in the Programmatic EA for the *MARFORRES Wind Energy Program*. This Tiered EA analyzes the site-specific impacts of the proposed installation and operation of up to three 50-kW wind turbine. The following resource areas have been analyzed: land use, noise, geological resources, water resources, biological resources, cultural resources, visual resources, socioeconomics, air quality, utilities, airspace, health and safety, hazardous materials, and transportation. This Tiered EA finds that the proposed action would not have a significant impact on the environment.

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EXECUTIVE SUMMARY

This Environmental Assessment (EA) has been prepared by the Department of the Navy (DoN) for the United States Marine Corps (USMC) Forces Reserve (MARFORRES) in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [USC] 4321, as amended), regulations implemented by the Council on Environmental Quality (CEQ) (Title 40 Code of Federal Regulations [CFR] Parts 1500-1508), DoN Procedures for Implementing NEPA (32 CFR Part 775), and USMC NEPA directives (Marine Corps Order [MCO] P5090.2A, change 2). This EA is tiered from the Programmatic EA for the *MARFORRES Wind Energy Program* (MARFORRES 2011). The program was officially established when a Finding of No Significant Impact (FONSI) was signed on 18 May 2011. This Tiered EA analyzes the site-specific impacts of the proposed installation and operation of up to three 50-kilowatt (kW) (*note*: 50 kW = 0.05 megawatt [MW]) wind turbines at the MARFORRES Center, Brooklyn, New York (NY).

Purpose and Need for Proposed Action

The purpose of the proposed action is to develop wind as an energy source at MARFORRES Center, Brooklyn in support of the *MARFORRES Wind Energy Program*. The purpose of the *MARFORRES Wind Energy Program* is to reduce dependency on fossil fuels and increase energy security and efficiency through development of wind energy projects at MARFORRES facilities across the U.S. (MARFORRES 2011). MARFORRES Center, Brooklyn has been identified as a facility with a wind resource that is readily available and economically feasible to develop as a renewable energy source.

The proposed action is needed to enable MARFORRES to achieve specific goals regarding energy production and usage. These goals have been set by Executive Orders (EOs), legislative acts, and agencies like the U.S. Environmental Protection Agency (USEPA), the Department of Defense (DoD), and the DoN. These energy goals seek to increase the efficiency of energy production, delivery and usage, reduce greenhouse gas (GHG) emissions, and expand the use of renewable energy.

Proposed Action

The proposed action is to develop wind energy at MARFORRES Center, Brooklyn under the *MARFORRES Wind Energy Program* and would entail the installation of up to three 50-kW wind turbines. These turbines would be less than 100 feet (ft) high and are within the "small" size range that was evaluated in the Programmatic EA. Implementation of the proposed action would conform to the program criteria (i.e., siting and design criteria [see Section 2.2 of this EA], best management practices [BMPs], and general conservation measures [GCMs]) that were adopted in the Programmatic EA. A project consisting of three relatively small (50-kW) wind turbines was identified as suited to (1) the energy requirements of this small MARFORRES facility; and (2) land available for a small wind energy facility.

The three proposed turbine sites are located to the southwest of the Reserve Center Offices and west of the Reserve Center Motor Pool (parking lot). The wind turbines would be tied in to the main switchgear room located in the Reserve Center Offices. When the wind is blowing with corresponding production of electricity, the wind turbines would augment the power supply for the Reserve Center, reducing the need for power from the grid. Any electrical power in excess of the Reserve Center's needs would be diverted to the electricity grid.

It is estimated that the construction phase would last one to three months and would commence in fiscal year (FY) 2012. The total permanent footprint (foundations, transformers, and underground cable) for each wind turbine would be approximately 0.27 acre and the total construction footprint (both permanent

and temporary) would be 1.34 acre. All construction activities would be conducted in accordance with BMPs provided in the Programmatic EA.

No-Action Alternative

Under the no-action alternative, MARFORRES would not pursue the installation of up to three 50-kW wind turbines at MARFORRES Center, Brooklyn, and would continue to rely on the electrical grid for purchase of all electricity needs at this facility. MARFORRES would seek to develop other types of renewable energy (e.g., solar) at this facility and/or develop wind energy at other MARFORRES facilities to achieve specific goals regarding energy production and usage. Analysis of the no-action alternative is required under CEQ regulations (40 CFR § 1502.14[d]). The no-action alternative for this Tiered EA represents the continuation of baseline conditions for each resource as described under *Existing Conditions* in Chapter 3.

Environmental Consequences

This EA evaluates the potential environmental consequences of the proposed action on the following: land use, noise, geological resources, water resources, biological resources, cultural resources, visual resources, socioeconomics, air quality, utilities, airspace, health and safety, hazardous materials, and transportation. Table ES-1 summarizes environmental consequences of the alternatives described above.

Based on the analyses presented in this EA, the proposed 50-kW wind turbines would have minor or no significant impacts. In addition, the program would reduce the MARFORRES facility's need to draw upon the mix of energy resources provided by the local utility, and would lessen the indirect impacts associated with the use of those resources. The no-action alternative would continue the status quo at the MARFORRES facility.

Table ES-1. Summary of Environmental Consequences

Resource Area	Proposed Action	No-Action Alternative
Land Use	○	○
Noise	○	○
Geology and Soils	○	○
Water Resources	○	○
Biological Resources	◑	○
Cultural Resources	○	○
Visual Resources	◑	○
Socioeconomics	○	○
Air Quality	○/+	○
Utilities	○	○
Airspace	○	○
Health and Safety	○	○
Hazardous Materials	○	○
Transportation	○	○

Notes: ○ = Negligible or no adverse impacts; ◑ = Adverse but less than significant impacts; + = Beneficial impacts; ● = Significant impacts.

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TIERED ENVIRONMENTAL ASSESSMENT

UNITED STATES MARINE CORPS FORCES RESERVE WIND ENERGY PROGRAM SITE: MARINE FORCES RESERVE CENTER, BROOKLYN, NY

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CHAPTER 1
PURPOSE AND NEED FOR PROPOSED ACTION

1.1 INTRODUCTION

This Environmental Assessment (EA) has been prepared by the Department of the Navy (DoN) for the United States Marine Corps (USMC) Forces Reserve (MARFORRES) in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [USC] 4321, as amended), regulations implemented by the Council on Environmental Quality (CEQ) (Title 40 Code of Federal Regulations [CFR] Parts 1500-1508), DoN Procedures for Implementing NEPA (32 CFR Part 775), and USMC NEPA directives (Marine Corps Order [MCO] P5090.2A, change 2). This EA is tiered from the Programmatic EA for the *MARFORRES Wind Energy Program* (MARFORRES 2011). The program was officially established when a Finding of No Significant Impact (FONSI) was signed on 18 May 2011. This Tiered EA analyzes the site-specific impacts of the proposed installation and operation of up to three 50-kilowatt (kW) (note: 50 kW = 0.05 megawatt [MW]) wind turbines at MARFORRES Center, Brooklyn, New York (NY). It is estimated that the construction phase would last three months and would occur in fiscal year (FY) 2013.

1.2 PROJECT BACKGROUND

The *MARFORRES Wind Energy Program* supports Department of Defense (DoD) long-range goals to increase energy self-sufficiency through the use of renewable energy sources. The program is to develop small-scale wind energy projects at MARFORRES facilities where (a) wind has been identified as a readily available and economically feasible source for renewable energy production; and (b) a project can occur without having a significant environmental impact. Projects may consist of one to four wind turbines ranging in size (nameplate rating) from less than 100 kW to 2.5 MW. In the Programmatic EA (MARFORRES 2011), MARFORRES adopted siting and design criteria (refer to Section 2.2), best management practices (BMPs), and general conservation measures (GCMs), collectively referred to as program criteria, that would avoid and/or eliminate potentially significant environmental impacts. The proposed action and the analyses herein conform to the program criteria. The proposed turbines are less than 100 feet (ft) tall and are within the "small" size range that was evaluated in the Programmatic EA.

1.3 PROJECT AREA

The proposed action would be implemented at the MARFORRES Center, Brooklyn, NY (Figure 1-1), located on Barren Island at Floyd Bennett Field south of New York City. The Reserve Center is bordered to the north and the west by Floyd Bennett Field, which is located within the Gateway National Recreation Area, and to the south by Rockaway Inlet, which connects to Jamaica Bay (Figure 1-2).

Figure 1-1
Location of MARFORRES Center
Brooklyn, NY

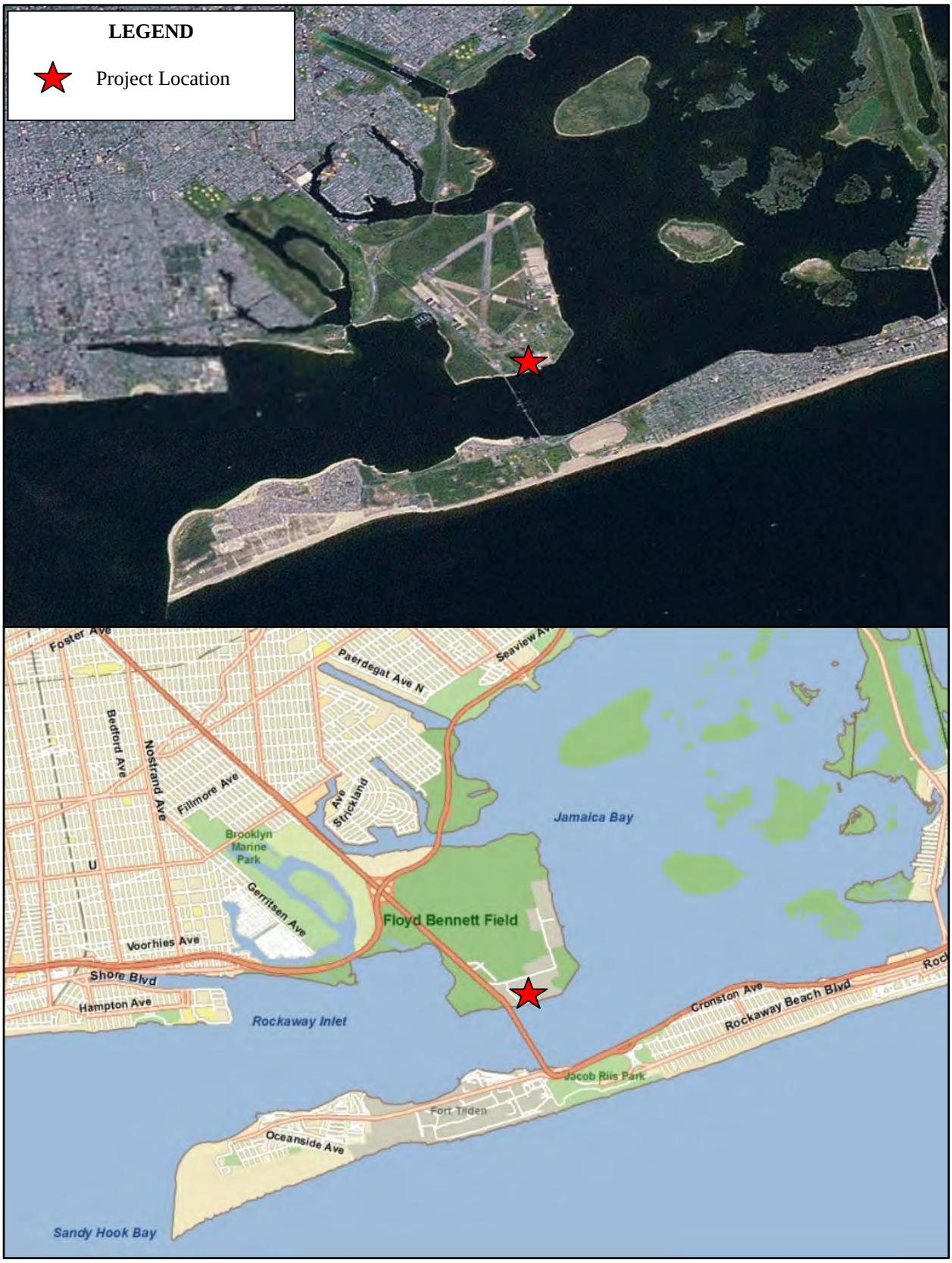


Figure 1-2
Vicinity Map: Brooklyn Wind Energy Project

1.4 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action is to develop wind as an energy source at MARFORRES Center, Brooklyn in support of the *MARFORRES Wind Energy Program*. The purpose of the *MARFORRES Wind Energy Program* is to reduce dependency on fossil fuels and increase energy security and efficiency through development of wind energy projects at MARFORRES facilities across the U.S. (MARFORRES 2011). MARFORRES Center, Brooklyn has been identified as a facility with a wind resource that is readily available and economically feasible to develop as a renewable energy source.

The proposed action is needed to enable MARFORRES to achieve specific goals regarding energy production and usage. These goals have been set by Executive Orders (EOs), legislative acts, and agencies like the U.S. Environmental Protection Agency (USEPA), the DoD, and the DoN. These energy goals seek to increase the efficiency of energy production, delivery and usage, reduce greenhouse gas (GHG) emissions, and expand the use of renewable energy. The following relevant energy policies have shaped the need for the proposed action:

- Energy Independence and Security Act of 2007;
- Energy Policy Act of 2005;
- EO 13423 - Strengthening Federal Environmental, Energy, and Transportation Management; and
- EO 13514 - Federal Leadership in Environmental, Energy, and Economic Performance.

1.5 REGULATORY REQUIREMENTS

This Tiered EA has been prepared to address the following statutory/regulatory requirements as described in the Programmatic EA (MARFORRES 2011):

- Endangered Species Act (ESA) (16 USC §§ 1531-1544);
- Migratory Bird Treaty Act (MBTA) (16 USC §§ 703-712);
- Bald and Golden Eagle Protection Act (BGEPA) (16 USC §§ 668-668c);
- Sikes Act and Sikes Act Improvement Act (16 USC §§ 670a to 670o), Conservation Programs on Government Lands;
- Coastal Zone Management Act (CZMA) (16 USC §§ 1451-1466);
- Clean Air Act (CAA) (42 USC §§ 7401-7671q);
- Clean Water Act (CWA), Sections 401, 402, and 404 (33 USC §§ 1251-1387);
- National Historic Preservation Act (NHPA) of 1966 (16 USC §§ 470-470x-6);
- Archaeological Resources Protection Act of 1979 (16 USC §§ 470aa-470mm);
- Federal Aviation Regulations Part 77 – Obstructions Affecting Navigable Airspace;
- EO 13186 - Responsibilities of Federal Agencies to Protect Migratory Birds;
- EO 11990 - Protection of Wetlands;
- EO 11988 - Floodplain Management;
- EO 13148 - Greening the Government through Leadership in Environmental Management;

- EO 12898 - Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations; and
- EO 13045 - Protection of Children from Environmental Health Risks and Safety Risks.

1.6 PERMITS AND CONSULTATIONS/CONCURRENCES

The following permit and consultations are completed; all correspondence is provided in Appendix B, *Correspondence*.

- MARFORRES would obtain permit coverage under the National Pollutant Discharge Elimination System (NPDES) program, for which the State of New York is the permitting authority under the State Pollutant Discharge Elimination System (SPDES). Permit coverage under the State's General Permit for Stormwater Discharges from Construction Activities (GP-0-10-001) would be obtained by preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP) and filing a Notice of Intent as required prior to construction.
- The U.S. Fish and Wildlife Service (USFWS) has been consulted to clarify and address requirements of the ESA, MBTA, and BGEPA, as well as concerns over bat mortality. The USFWS (Appendix B) has concurred with MARFORRES' determination that the proposed action is not likely to adversely affect ESA-listed species, agreed with conservation measures that minimize the likelihood of bird collisions, and provided initial input to a post-construction monitoring plan, which MARFORRES will finalize (with further input from USFWS) and implement. Since eagles are very unlikely to occur at the project site, no action is required under BGEPA.
- Section 106 NHPA consultation has been concluded with the New York State Historic Preservation Office (SHPO). A letter of concurrence finding "no historic properties affected" was received from the New York SHPO (Appendix B).
- The Federal Aviation Administration (FAA) has issued a Determination of No Hazard (DNH) to air navigation regarding the proposed turbines (Appendix B); no further action is required.
- MARFORRES submitted a Coastal Consistency Determination to the New York Department of State, Office of Coastal, Local Government and Community Sustainability. A letter of concurrence was received from the New York Department of State (Appendix B).

1.7 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

As part of the NEPA process, MARFORRES developed a list of stakeholders including government agencies and non-governmental organizations (NGOs) or other interested parties in an attempt to solicit input on the proposed action (Table 1-1). The coordination with and/or input from the stakeholders will inform a decision on the proposed action. Opportunity for public input will occur in conjunction with publication of the Notice of Availability of the EA and Draft FONSI in a local newspaper. Comments received will be considered prior to implementing the action.

1.8 DOCUMENT ORGANIZATION

The organization of this Tiered EA is as follows: Chapter 1 defines the purpose of and need for the proposed action; Chapter 2 describes the proposed action, alternatives considered but eliminated, and the no-action alternative; Chapter 3 describes the existing conditions and environmental consequences of the proposed action; Chapter 4 describes the potential cumulative environmental impacts associated with the proposed action; Chapter 5 addresses other considerations required by NEPA; Chapter 6 lists all

references cited in this EA; Chapter 7 provides agencies and persons contacted; and Chapter 8 provides the list of preparers.

Table 1-1. Stakeholder List for Brooklyn

Agency/ Organization Name	*Potential Role/Interest In Project*
Federal Agencies	
USFWS: (Long Island Field Office and Cortland Ecological Services Office, NY)	Key regulatory and natural resource trustee responsibilities under the ESA, MBTA, and BGEPA.
FAA	The FAA has oversight of any object that could have an impact on the navigable airspace or communications/navigation technology of aviation (commercial or military) or DoD operations, undertakes an initial aeronautical study within the relevant FAA region, and issues either a Determination of No Hazard to air navigation or a Notice of Presumed Hazard.
National Park Service (NPS)	The NPS has facilities and operates the historical park at Floyd Bennett Field, which is part of Gateway National Recreational Area. Other nearby parks within Gateway National Recreational Area include Jamaica Bay Wildlife Refuge, Plumb Beach, Rockaway Point, and Jacob Rills Park.
State and Local Government Agencies	
New York State Department of Environmental Conservation (NYSDEC): Bureau of Habitat	Department responsible for conserving, improving, and protecting New York's natural resources and environment and preventing, abating, and controlling water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well-being.
New York Department of State: Division of Coastal Resources	The Division of Coastal Resources is involved in a wide variety of programs and initiatives that help revitalize, promote and protect New York's communities and waterfronts. Reviews consistency with New York State Coastal Zone Management Plan as required under the CZMA.
New York SHPO	Responsible for the listing and protection of historic properties under the NHPA and related statutes.
New York City Parks and Recreation District	The parks department operates several parks within the view of the proposed wind turbines.
New York City Department of Planning	Promotes strategic growth and development in the City, in part, by initiating comprehensive, consensus-based planning and zoning changes for individual neighborhoods and business districts.
The Port Authority of New York and New Jersey	Operates and maintains infrastructure critical to the New York/New Jersey region's trade and transportation network.
JFK Airport	Operator of JFK Terminal Doppler Weather Radar.
NGOs and Other Interested Parties	

CHAPTER 2
PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter describes the proposed action, alternatives considered but eliminated from further analysis, and the no-action alternative. The proposed action is to develop wind energy at MARFORRES Center, Brooklyn, NY, under the *MARFORRES Wind Energy Program* and would entail the installation of up to three 50-kW wind turbines. Implementation of the proposed action would conform to the program criteria (i.e., siting and design criteria, BMPs, and GCMs) that were adopted in the Programmatic EA (MARFORRES 2011).

2.2 SITING AND DESIGN CRITERIA

The Programmatic EA for the *MARFORRES Wind Energy Program* (MARFORRES 2011) identified siting and design criteria that would be applied to select and evaluate alternative sites and designs (including number and size of turbine[s]) at a specific MARFORRES facility. Siting and design criteria can be either exclusionary or evaluative. Exclusionary criteria define conditions that would exclude a site and/or design from further consideration because of an adverse impact. Evaluative criteria are based on desirable conditions that reduce potential impacts and favor the selection of one alternative over another. The proposed turbines are less than 100 ft high and are within the "small" size range of turbines evaluated in the Programmatic EA. The Programmatic EA identified smaller turbines as a means of reducing several types of potential impacts or conflicts.

2.2.1 Exclusionary Criteria

1. Site locations and designs whose impact on wetlands or Waters of the U.S. would exceed the threshold or could not meet the terms and conditions for a Section 404 Nationwide Permit would be excluded.

2. Site locations that result in a turbine being placed within 500 ft of USFWS-recognized habitat for noise-sensitive wildlife species would be excluded unless consultation with USFWS confirms that the species and its habitat would not be adversely affected.

3. Site locations and designs that are *likely to adversely affect* an ESA-listed species or its critical habitat would be excluded unless all required terms and conditions and, to the extent feasible, recommended conservation measures that are specified in a Section 7 Biological Opinion are incorporated into the project.

4. Areas where wind turbine development has been restricted by another federal agency or by a state regulatory agency because of the proximity of sensitive bird or bat species (e.g., New Jersey Department of Environmental Protection 2009) would be excluded. Any corresponding species-specific buffer distances for sensitive species would be incorporated as siting and design criteria.

5. Site locations and designs that would alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places (NRHP) in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association, would be excluded. Site locations and designs would also avoid impacts to resources of cultural, traditional, or religious significance to Native American tribes.

6. Site locations and designs for which predicted noise levels at sensitive non-DoD receptor locations (e.g., residences, parks) would exceed federal noise standards would be excluded.

7. Site locations and designs for which construction emissions would exceed *de minimis* thresholds, and for which a Conformity Determination indicates that the project would not conform to the applicable SIP would be excluded.

8. Site locations and designs must be compatible with DoD air/ground operations and training requirements.

9. Site locations and designs must meet FAA requirements to avoid height obstructions to aircraft. The FAA would be notified early in the planning process to identify siting and design requirements.

10. Site locations and designs for which turbine operations would be within line of sight, cause unavoidable electromagnetic interference (EMI), and substantially interfere with civilian or military radars would be excluded. Civilian and military radar operators in the general area of a turbine location would be contacted as necessary in the planning process to determine if radar interference may be a problem, in which case MARFORRES would coordinate with the operators to determine if there are feasible technological solutions.

2.2.2 Evaluative Criteria

1. As much as possible, projects would be located on previously disturbed or altered landscapes, avoiding less disturbed, relatively natural areas (*Note*: land with previous underground disturbance may not be suitable for wind turbine foundation installation).

2. Projects would consolidate infrastructure requirements (e.g., transmission lines or roads) and temporary construction areas (e.g., use the same crane pads or staging/laydown areas at a project site for multiple turbines) for efficient use of land.

3. Where there are potential noise, visual, shadow flicker, or safety concerns associated with the proximity of non-DoD lands to potential wind turbine locations, projects would consider reducing the number/size of wind turbines or relocating wind turbine sites further within the MARFORRES facility boundaries and/or away from the affected non-DoD areas.

4. Site locations and designs should (a) provide a minimum setback from any residence, public highway, or area of concentrated public use (such as a park or shopping area) outside of the MARFORRES facility that is consistent with local ordinances, plans, or policies regarding minimum setbacks of wind turbines from such areas; and (b) avoid conflicts with local ordinances, plans or policies regarding maximum heights of wind turbines.

5. Site locations and designs that *may affect* an ESA-listed species or its critical habitat would be less preferred unless, through informal consultation with USFWS, necessary and sufficient measures to ensure that the action is *not likely to adversely affect* the species or its designated critical habitat have been identified and incorporated into the action.

6. Locations and designs of small-scale wind energy projects should avoid overlap with, and, where practicable and effective in reducing potential impacts, maximize distance from, the following circumstances:

   - Locations with valuable mineral deposits, paleontological resources, or within the viewshed of unique geological features.
   - Wetlands and other Waters of the U.S.

- Areas within a 100-year floodplain or otherwise subject to flooding.
- Habitats that are protected under an installation's Integrated Natural Resources Management Plan (INRMP) or that support ESA-listed species.
- Locations with federally or state-listed, or otherwise designated sensitive species, including migratory birds of conservation concern.
- Breeding and wintering bald or golden eagle use areas.
- Daily or seasonal flight patterns of migratory birds and bats.
- Areas near known bat hibernacula, breeding, and maternity/nursery colonies.
- Landscape features such as native (undisturbed) grasslands, scrub, woodlands, or wetlands that are known to be attractive to migratory birds.
- Scenic views associated with an NRHP-eligible historic property or recreation site, or where a turbine would alter the unique visual character of the landscape.
- Locations with soil contamination present in amounts and concentration levels of which make wind energy projects incompatible under prevailing governmental and industry standards.

2.2.3 Design Criteria

1. In order to minimize impacts to bird and bat populations, the following design features should be implemented:

   - Use tubular supports with pointed nacelle tops, rather than lattice supports, and avoid placing external ladders and platforms on tubular towers to minimize bird perching and nesting opportunities.
   - If turbines are taller than 200 ft (including the rotor swept area), use the minimum amount of pilot warning and obstruction avoidance lighting required by the FAA. All lights within the turbine facility should light synchronously. Use only the minimum number of strobe, strobe-like, or blinking red incandescent lights, with the minimum required intensity. Preferably install dual strobe lights per nacelle. No steady burning lights should be used on turbines or facility infrastructures.
   - Safety lighting on buildings or other infrastructure should be focused downward to reduce skyward illumination. Lights should also be equipped with motion detectors to reduce continuous illumination.
   - Where feasible, bury electric power lines or place insulated, shielded lines on the surface to avoid electrocution risks to birds.
   - Above-ground lines, transformers, and conductors should follow the Avian Power Line Interaction Committee 1994 and 2006 guidance. Aboveground lines should not be placed in wetlands or over canyons.
   - Reduce motion smear by using blades with staggered stripes or incorporating a black blade with two white blades to aid in reducing collisions. Since the effectiveness of this measure is unknown, it is not part of the proposed action.

2. Implement measures to reduce noise levels below noise guidelines for an affected land use. Measures could include, but are not limited to:

   - reduce number of wind turbines;
   - modify design (e.g., blade design, tower height, orientation) or operations (i.e., reduce or eliminate nighttime operations or change to a different sound level power curve, if available);
   - provide vegetative (trees) or other screening in between wind turbines and sensitive receptors; or

- locate wind turbine sites sufficiently far away from sensitive receptors.

3. If initial analysis indicates a potential visual impact on a historic property or scenic view, the following should be implemented:

- reduce the size of the turbine(s);
- select a location that shield(s) the turbine(s) from view and minimizes contrast between the turbine(s) and the property or viewshed of concern; or
- if feasible and approved by the FAA, modify the color or lighting of the turbine(s) to lessen contrast with the surrounding landscape.

2.3 PROPOSED ACTION

2.3.1 Project Location

The three proposed turbine sites are located to the southwest of the Reserve Center Offices and west of the Reserve Center Motor Pool (parking lot) (Figure 2-1). The area is previously disturbed, being composed of dredged fill material (Columbia University 2007), but portions of the area are wooded with shrubs and small trees.

2.3.2 Project Design

Through an investigation of energy needs, wind turbine construction requirements, and land availability, a project consisting of up to three 50-kW wind turbines was identified as suited to (1) the energy requirements of the small MARFORRES facility and (2) land available for a small wind energy facility. Three wind turbines of this size can be tied in behind the facility's electricity meter and, when the wind is blowing with corresponding production of electricity, the wind turbines would augment the power supply for the use of the facility, reducing the need for power from the grid. The scale and location of the proposed project are environmentally favorable, minimizing potential impacts consistent with the siting and design criteria of the Programmatic EA (MARFORRES 2011). Figure 2-2 shows details for the proposed project design.

Source: GoogleEarth 2011.

0 Feet 1,,100

Figure 2-1
Brooklyn Wind Energy Project Location

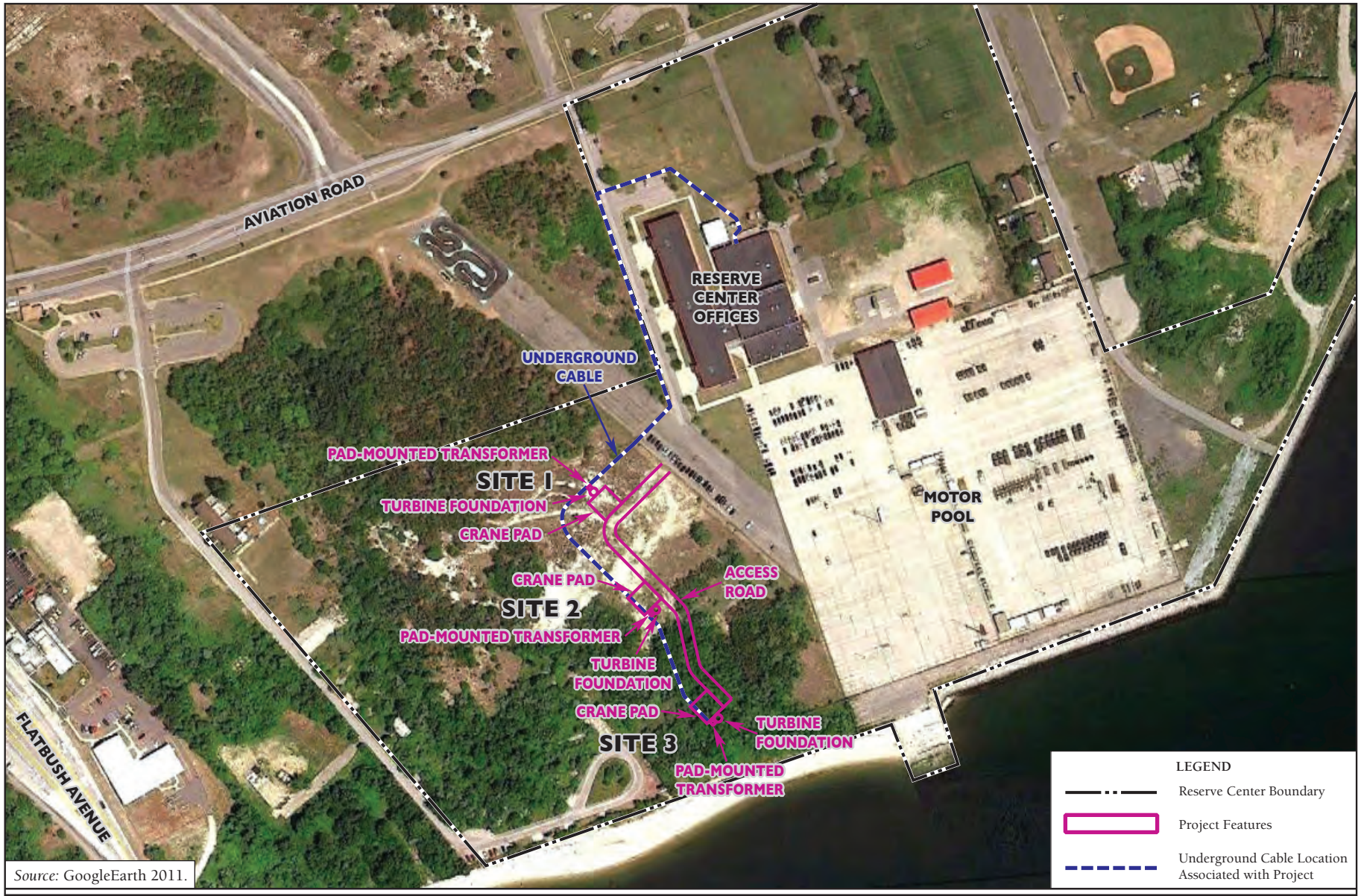


Figure 2-2
Brooklyn Wind Energy Project Design

The proposed 50-kW turbines would have a hub height of approximately 60 ft and rotor diameter of approximately 60 ft for a combined height of approximately 93 ft (Figure 2-3). The initial project design height for the turbine was 155 ft; however, consistent with the *Exclusionary Criteria* in Section 2.2.1 of this EA, turbine height was reduced to comply with the maximum hub height of 64 ft identified through communications with the operators of the JFK Terminal Doppler Weather Radar (TDWR) (TDWR 2012). FAA approval allows for a combined maximum height of up to 97 ft (Appendix B).

The minimum (cut-in) and maximum (cut-out) wind speeds at which the turbine generates usable power are approximately 5.6 miles per hour (mph) and 56 mph, respectively; the maximum survivable wind speed is 132 mph (Polaris America, LLC 2012).

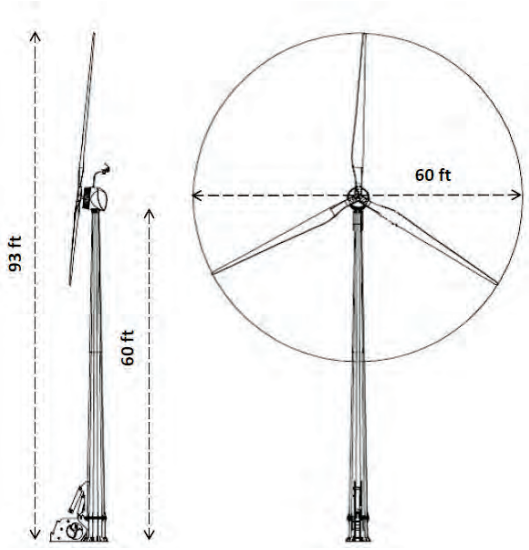


Figure 2-3. 50 kW Wind Turbine Design (approximate).

2.3.3 Site Preparation and Turbine Installation

The proposed turbines would be located in a previously disturbed area that would require some vegetation clearing and minimal grading for site preparations (refer to Figure 2-2 for locations of alternative components). The base of the turbine would be anchored to a spread foot foundation, an octagonal, concrete foundation 10 ft deep and fitting within a 57-ft by 57-ft square. Excavation of the foundation would be done by backhoe. Most of the foundation would be buried, with only the pedestal, to which the turbine base would be attached, being above ground. In addition to the concrete foundation, a 20-ft wide gravel area would surround the base of the turbine and would be connected to existing nearby road or parking area via a gravel road to provide access for maintenance vehicles. Areas adjacent to the proposed turbine foundation would be used for a crane pad and staging/laydown area (Figure 2-2). At present, a hydraulic tilt-up design is under consideration, which would eliminate the need for a crane pad. All major turbine components for each turbine, including the tower, generator, and blades, would be delivered via two 48-ft flatbed trucks.

The proposed wind turbines would each be connected to a new dedicated transformer mounted on a new 8-ft by 8-ft concrete pad located adjacent to the turbine access area (Figure 2-2). The new transformers would then be connected to an existing switchgear located in the main Reserve Center Office Buildings via a new underground cable (Figure 2-2) installed in an excavated trench approximately 1,600 ft long, 2.5 ft wide, and 4 ft deep. A “ditch-witch” (trenching machine) would be used to excavate the trench. The spoils would be mounded temporarily along the edges of the trench while the digging progresses, and would be pushed back and compacted over the cable as soon as it is installed. No above ground power poles would be required.

The total permanent footprint (foundation, gravel access area/road, connection to transformer) would be approximately 0.81 acre and the total construction footprint (both permanent and temporary) would be 1.34 acres.

Construction activities would be conducted in accordance with the applicable BMPs from the Programmatic EA (MARFORRES 2011) or as otherwise determined appropriate to minimize

environmental impacts (see below). The program was officially established when a FONSI was signed on 18 May 2011.

Construction BMPs

1. Current Wind Energy Standards of the International Electrotechnical Commission would be followed in the design, construction, and operation of the proposed wind turbine.
2. All mechanized clearing and grading, vehicle traffic, equipment staging, and the deposition of soil would be confined to the temporary and/or permanent project footprint or to other disturbed or developed land.
3. At least 7 days before project initiation, the project boundary (including temporary features such as staging/laydown areas and access roads) would be clearly marked with flagging, fencing, or signposts. All project-related activities would occur within the project boundary.
4. Heavy equipment and construction activities would be restricted to existing roads and disturbed areas to the maximum extent practicable. Staging/laydown areas would be located in disturbed habitats and would be delineated on the grading plans. Vehicle operation and staging/laydown areas would be defined by staking and flagging between stakes to prevent operations outside these areas.
5. Construction trucks would carry water and shovels or fire extinguishers in the field. The use of shields, protective mats, or other fire prevention equipment would be used during grinding and welding to prevent or minimize the potential for fire, and vehicles would not be driven or parked in areas where catalytic converters could ignite dry vegetation. No smoking or disposal of cigarette butts would take place within vegetated areas.
6. Since the area of construction exceeds one acre, MARFORRES would obtain permit coverage under the NPDES program, for which the State of New York is the permitting authority. Permit coverage under the State's Construction Stormwater General Permit (GP-0-10-001) would be obtained by preparation and implementation of a SWPPP and filing a Notice of Intent as required prior to construction. Under the SWPPP, the contractor will be required to implement BMPs for erosion and sedimentation controls to prevent the erosive loss of sediment from the construction area and subsequent deposition into a nearby irrigation ditch. BMPs could include sandbags, silt fences, earthen berms, fiber rolls, sediment traps, erosion control blankets, check dams in medium-sized channels, or straw bale dikes in smaller drain channels.
7. Onsite containment and cleanup capabilities would be provided, as necessary, to prevent the release of hazardous materials.
8. If evidence of contaminated soils is uncovered during construction, construction would be halted and cleanup procedures would be initiated, as required.
9. All fill material brought to the construction site from off base would be checked to ensure that it is clean – specifically, that it is free from contaminants and does not contain any seeds or plant materials from non-native or invasive species.
10. The action proponent, or their contractor, would ensure that construction and solid waste (including asphalt or concrete) resulting from construction activities is disposed of properly and not discarded onsite.
11. All trash would be disposed of properly. All food-related trash would be placed in sealed bins and removed from the site regularly. All equipment and waste would be removed from the site.

12. No off-road construction vehicle operations would occur outside of the project boundary.
13. If night work and consequent lighting are required, light fixtures would be shielded downward.
14. If sanitary facilities are not available at MARFORRES, construction workers would use portable chemical toilets, with secondary containment basins to prevent spillage. Chemical toilets would not be placed within 100 ft of surface water.
15. In the event of an inadvertent discovery of a potential cultural resource during site construction, construction activity at that location will cease until the potential resource is evaluated by a qualified archaeologist and/or Tribal representative(s), as appropriate. Construction may proceed once the discovery is determined to have no potential significance, subject to the completion of documentation and consultation with the SHPO, if required. If applicable, procedures required under the Native American Graves and Repatriation Act (43 CFR Part 10) will be followed.
16. Vegetation clearing would not occur during the breeding season of migratory birds (April 1 to October 1 [http://www.dec.ny.gov/docs/wildlife_pdf/brddate.pdf]) unless a survey by qualified biologist within 3 days prior to the proposed clearing confirms the absence of active nests within 100 ft of the activity.

2.3.4 Turbine Operations and Maintenance

The amount of energy generated from the operation of the turbine is determined by the nominal power output (nameplate capacity) of the turbine and the naturally varying wind conditions at the site. The average annual wind speed for the Brooklyn project site is approximately 11 mph at 80 ft above ground (New York State Energy Research and Development Authority 2012a), which would produce approximately 10% of the nameplate capacity for the proposed 50-kW turbine (Plaris America, LLC 2012). This equates to an energy output of approximately 100 megawatt-hours per year (MWh/yr) per turbine or 300 MWh/yr for the three proposed turbines (Polaris America LLC 2012). For the three proposed turbines, this is roughly the amount of electricity that would be used by 32 households per year in this region (Department of Energy 2006).

Turbine operations and maintenance would be as described in the Programmatic EA. Applicable BMPs and GCMs, either from the Programmatic EA (MARFORRES 2011) or as otherwise determined appropriate to minimize environmental impacts are listed below.

Operations BMPs

1. Avoid creating or maintaining habitat features that attract birds and bats. Examples include removing carrion, maintaining vegetation to heights to reduce prey availability, minimizing water ponding, and avoiding the creation of situations where prey base would increase (e.g., rock piles or eroded turbine pads with openings underneath that are suitable for rodents will attract raptors).
2. If a turbine becomes permanently non-operational, it will be removed.
3. The turbines would have the minimal amount of lighting required by FAA for pilot warning, using only red, or dual red and white strobe, strobe-like, or flashing lights, not steady-burning lights on the turbine. Lighting on other project infrastructure for security purposes would be minimized, focused downward, and motion or heat activated, thereby operating only when needed.

2.4 ALTERNATIVES TO THE PROPOSED ACTION

NEPA and the USMC Environmental Compliance and Protection Manual (MCO 5090.2A) require the exploration of a reasonable range of alternatives to a proposed action, as well as analysis of a no-action

alternative. The range of alternatives includes alternative locations for the action as well as alternative means to accomplish the same objectives.

2.4.1 Alternatives Considered but Eliminated

The alternatives listed below are limited to those that fall within the scope (i.e., size, number, location, and design) of proposed action for the *MARFORRES Wind Energy Program* as described in the Programmatic EA. Additional *Alternatives Considered but Eliminated* are provided in Chapter 2 of the Programmatic EA (MARFORRES 2011).

2.4.1.1 Alternative Turbine Locations

The project purpose and need require a location where wind energy could be economically developed with minimal environmental effects to serve the needs of the MARFORRES facility. In addition to the three proposed locations, additional potential locations to the west of Site 2 and to the east and north of the Reserve Center motor pool were considered in detail. However, these sites were not carried forward due to incompatibility with current land uses.

2.4.1.2 Installation of Multiple and/or Larger Wind Turbines

Under the *MARFORRES Wind Energy Program*, the installation and operation of up to four wind turbines ranging in size up to 2.5 MW was considered for MARFORRES facilities. However, energy produced by multiple and/or larger wind turbines would exceed the energy consumption for the Reserve Center, requiring a more complicated metering arrangement through the Interconnect Agreement with the local utility provider. In addition, multiple and/or larger wind turbines would place a greater strain on the limited available land at the Reserve Center and could have proportionately greater environmental effects. A single 100-kw turbine was also considered but determined to be exceed height limitations identified through communications with the operators of the JFK TDWR. Therefore, three 50-kW wind turbines were considered for MARFORRES Center, Brooklyn.

2.4.2 No-Action Alternative

Under the no-action alternative, MARFORRES would not pursue the installation of up to three 50-kW wind turbines at MARFORRES Center, Brooklyn and would continue to rely on the electrical grid for purchase of all electricity needs at this facility. MARFORRES would seek to develop other types of renewable energy (e.g., solar) at this facility and/or develop wind energy at other MARFORRES facilities to achieve specific goals regarding energy production and usage. Analysis of the no-action alternative is required under CEQ regulations (40 CFR § 1502.14[d]). The no-action alternative for this Tiered EA represents the continuation of baseline conditions for each resource as described under *Existing Conditions* in Chapter 3.

CHAPTER 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION

This chapter includes the definition of resource and describes the existing conditions and environmental consequences of the proposed action for each environmental resource and issue area that would be potentially affected by the proposed implementation of the *MARFORRES Wind Energy Program* at MARFORRES Center, Brooklyn. The definition of resource summarizes the definition provided for each resource in the Programmatic EA (MARFORRES 2011). The existing conditions and environmental consequences sections focus on aspects of the following resources potentially subject to impacts: land use, noise, geological resources, water resources, biological resources, cultural resources, visual resources, socioeconomics, air quality, utilities, airspace, health and safety, hazardous materials, and transportation. In addition, the level of impact analysis is commensurate with the anticipated level of impact. The analysis is structured by the key "analysis items" identified for each resource in the Programmatic EA (MARFORRES 2011). The analysis items are coded with a one or two-letter abbreviation for the resource to which they apply (LU for Land Use, N for Noise, etc.). The program was officially established when a FONSI was signed on 18 May 2011.

3.2 LAND USE

3.2.1 Definition of Resource

The attributes of land use considered in this analysis include general land use patterns, land ownership, special use areas, local ordinances, regulating activities, type and intensity of development on non-DoD land adjacent to the Reserve Center, and land management plans that guide the region's growth. General land use patterns that characterize the types of uses within a particular area can include urban, agricultural, residential, commercial, industrial, military, scenic, natural, or recreational. Land ownership is a categorization of land according to type of owner. The major land ownership categories include private, federal, and state. Land management plans include those documents prepared by agencies to establish appropriate goals for future use and development. As part of this process, sensitive land use areas are often identified by agencies as being worthy of more rigorous or protective management. In an urban or suburban context, land use goals and controls are defined in General, Master, Comprehensive, or Five-Year Plans and are implemented through zoning or local ordinances.

3.2.2 Existing Conditions

The proposed project site is located on MARFORRES Center, Brooklyn land at the southeast edge of Barren Island, which is located at the southeast edge of the intensely developed New York City borough of Brooklyn. The proposed turbine locations are on the southwest corner of the Reserve Center on previously disturbed land that includes barren, grassy, and moderately forested areas. A portion of the Reserve Center's parking area and the Reserve Center's main administration building are respectively located approximately 140 ft and 300 ft to the northeast of Site 1. Five National Park Service staff residences and an office building are respectively located approximately 740 ft and 1,000 ft to the west and southwest of Site 1. A go-kart track exists approximately 450 ft to the northwest of Site 1 and a publicly accessible beach is located approximately 100 ft to the southeast of Site 3. The Marine Parkway Bridge is located approximately 1,200 ft to the southwest of the project area. The nearest publicly

accessible area is a portion of the Reserve Center's fenceline located approximately 70 ft to the northwest of Site 1.

Floyd Bennett Field is zoned as M1-1 (light manufacturing). New York City's Zoning Resolution §62-341(b)(4) limits the maximum height of free-standing wind energy systems in M1-1 districts to 85 ft.

3.2.3 Environmental Consequences

- *Analysis Item LU-1: Would construction or operations result in adverse impacts to land use on the installation?*

The proposed location chosen for construction of the wind turbine at the Reserve Center is compatible with the mission of the facility. The permanent and total (including both permanent and temporary) footprints would respectively impact 0.15 and 0.32 acres of barren, grassy, or moderately forested area. There is no potential for conflicts with training, operations, or long-range plans. Furthermore, the site is suitable for wind energy development, there is interest at the facility for such development, and the proposed location is appropriate considering land use on the installation. Therefore, construction and operation of the proposed wind turbine would only minimally affect land use on the installation and would not be significant.

- *Analysis Item LU-2: Would the siting, design, construction, or operation of the turbine(s) be in conflict with adjacent land uses, local zoning, or land use planning?*

Although a MARFORRES facility is not required to comply with local planning and zoning for adjacent non-DoD property, a conflict with height, setback requirements, or land use would be considered during siting and design (per criteria identified in the Programmatic EA [MARFORRES 2011]). Importantly, an inconsistency with local zoning does not create a significant impact without additional factors.

The proposed wind turbines would meet all but one of the City of New York's requirements for small wind energy systems in M1-1 zoned areas. Specifically, the tower height would slightly exceed (by 8.9 ft) the maximum height of 85 ft allowed under §62-341(b)(4). Importantly, however, only Site 1 would be located less than 100 ft from a fence separating the public from the Reserve Center's property, and there is little, if anything, in the vicinity that would attract members of the public to this relatively inaccessible area. Furthermore, the proposed action would not affect adjacent land uses, including the various commercial, residential, and recreational uses adjacent to the Reserve Center. As such, construction and operation of the proposed turbines under the proposed action would not have a significant impact on adjacent land uses, local zoning, or land use planning.

3.3 NOISE

3.3.1 Definition of Resource

Noise is generally defined as any sound that interferes with communication, is intense enough to damage hearing, or is otherwise annoying (Federal Interagency Committee on Noise [FICON] 1992). Noise can be intermittent or continuous, steady or impulsive, as well as stationary or transient. Stationary noise sources are typically associated with specific land uses (e.g., schools or industrial facilities). Transient noise sources move through the environment, either along relatively established paths (e.g., highways, railroads, and aircraft flight tracks around airports) or randomly. There are a wide range of responses to noise depending on the type of noise and the characteristics of the sound source, as well as the sensitivity and expectations of the receptor, the time of day, and the distance between the noise source and the receptor (e.g., a person or animal).

3.3.2 Existing Conditions

The Reserve Center is located on the southeast edge of Barren Island, which is located at the southeast edge of the intensely developed New York City borough of Brooklyn. Existing sources of noise that would affect the project site include operations at the go-kart track approximately 450 ft northwest of Site 1; traffic on the Marine Parkway Bridge approximately 1,200 ft southwest of the project area; vessel traffic in Jamaica Bay, Dead Horse Bay, and the Rockaway Inlet surrounding Barren Island; and aircraft at the John F. Kennedy International Airport located 5.8 miles to the northeast of the project area.

The nearest sensitive receptors include the Reserve Center's main administration building, five National Park Service staff residences, and an office building respectively located approximately 300 ft to the northeast, 740 ft to the west, and 1,000 ft to the southwest of Site 1. An infrequently used public-access beach is also located approximately 100 ft to the southeast of Site 3. As indicated in Figure 3.3-1 of the Programmatic EA (MARFORRES 2011), the maximum normally acceptable Day-Night Average Sound Level (L_{dn}) level for office buildings is 75 A-weighted decibels (dBA) while the maximum normally acceptable level for the nearest residential areas and neighborhood parks is 65 dBA.

3.3.3 Environmental Consequences

Noise impacts associated with the proposed wind turbines would include short-term noise generated by construction activities and long-term noise due to operation of the wind turbines.

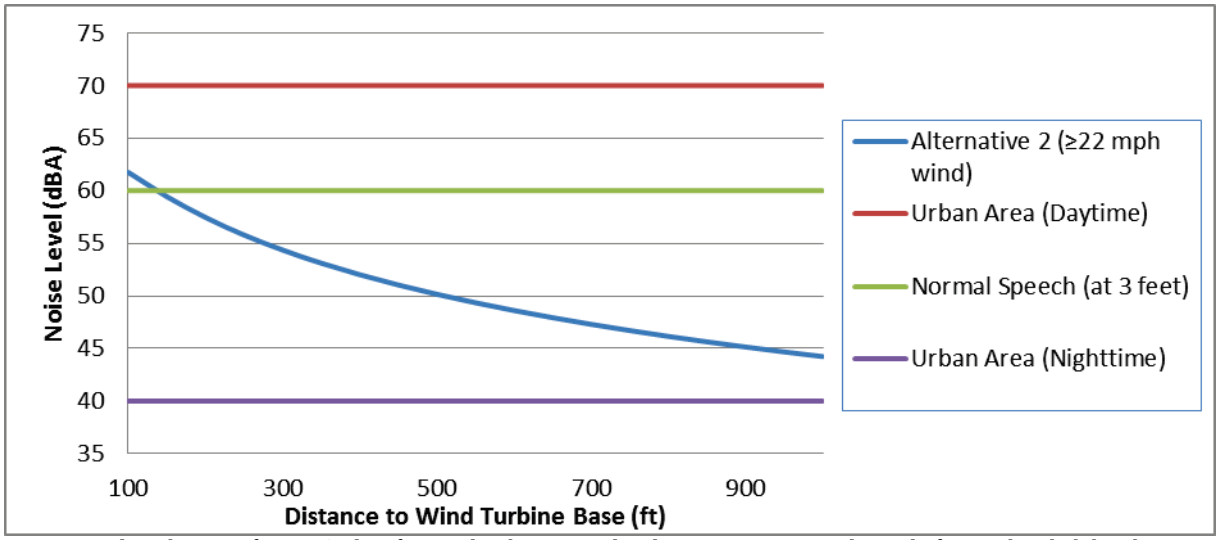
- *Analysis Item N-1: Would construction activities result in noise impacts to surrounding land uses or sensitive receptors?*

Construction would consist of delivering the materials (e.g., construction equipment and turbine components) to the project site, preparing the site (involving minor grading as well as excavating and pouring the foundations), and then erecting and assembling the turbines with a crane. Construction of wind turbines under the proposed action has the potential to increase noise levels near construction activities. However, noise associated with construction would be intermittent and of relatively limited duration of one to three months. Furthermore, construction would occur only during daytime hours, when noise impacts are generally less severe than at night. Finally, construction noise at the sensitive receptors is expected to be less than the noise generated by ongoing use of the go-kart track, traffic on the Marine Parkway Bridge, adjacent marine vessel traffic, and aircraft at the John F. Kennedy International Airport. As such, noise impacts from construction activities would be short-term and minor. Therefore, noise-related impacts from the construction of the proposed action would not be significant.

- *Analysis Item N-2: Would operations result in noise impacts to surrounding land uses or sensitive receptors?*

Under the proposed action, according to the manufacturer's specifications, the noise level at 100 ft from a single Polaris turbine with a wind speed of 22 mph (10 m/s) would be 55 dBA. If all three turbines were co-located at Site 3, the noise level at the nearest edge of the beach, approximately 100 ft southeast of Site 3, would be 59 dBA. At 300 ft, 740 ft, and 1,000 ft, the noise level would respectively be reduced to 54 dBA at the nearest corner of the Reserve Center's administration building, 47 dBA at the National Park Service staff residences west of Site 1, and 44 dBA at the office building southwest of Site 1 (Figure 3.3-1). The reported sound levels conservatively assume that the trees surrounding Site 3 do not provide any noise screening and that all sensitive receptors are simultaneously equidistant to all three wind turbines. As such, the noise level would be well below the maximum normally acceptable L_{dn} of 75 dBA for office buildings and 65 dBA for residential areas (Figure 3.3-1 in MARFORRES 2011). Additionally, since operational noise levels rise in tandem with ambient noise levels as wind speed

increases (Danish Wind Turbine Manufactures Association 2002 cited in Rogers *et al.* 2006), turbine-generated noise is expected to be indistinguishable from background noise at approximately 300 to 400 ft regardless of wind speed. Therefore, operational noise impacts under the proposed action would be minor and would not be significant.



Note: Based on the manufacturer's data for wind turbine noise levels at an average wind speed of 25 mph at hub height.

Figure 3.3-1. Proposed Action Noise Levels

3.4 GEOLOGICAL RESOURCES

3.4.1 Definition of Resource

Geological resources are defined as the topography, geology, and geological hazards of a given area. Refer to Section 3.4, *Geological Resources*, on page 3-7 of the Programmatic EA (MARFORRES 2011) for more details.

3.4.2 Existing Conditions

The proposed site is located along the western shore of Jamaica Bay and the Atlantic Ocean, in the Atlantic and Gulf coastal plains geologic region (refer to Figure 1-2). Although severe earthquakes have historically occurred in this region (Missouri, 1811/1812), the potential for seismic and faulting hazards is classified as minor in this region. Prior to development, the project area was comprised of numerous small islands, bays, and other waterways as part of the Jamaica Bay tidal estuary. The project site now has flat or gently sloping topography, being largely composed of dredged fill material and incinerated landfill material. There are no valuable mineral deposits, paleontological resources, or unique geological features located at the site.

3.4.3 Environmental Consequences

- *Analysis Item GR-1: Would site development result in a substantial alteration of topography or increase in erosion?*

The proposed project area is previously disturbed with flat topography and would require minimal grading. Ground disturbance would be limited to the turbine foundations, the trench dug for the electrical cables, and clearing for construction equipment staging. Because the project site is on flat terrain, the soil erosion risk is low for the project area. The total construction footprint would be 1.34 acres and therefore,

coverage under the SPDES General Permit for Stormwater Discharges from Construction Activities would be required. Under the SWPPP prepared and implemented for the project, erosion from grading and construction activities would be controlled through the use of appropriate erosion control BMPs such as sandbags, silt fences, earthen berms, fiber rolls, sediment traps, erosion control blankets, check dams in medium-sized channels, or straw bale dikes in smaller drain channels. Therefore, there would be no significant impacts to topography or soils.

There would be no impact during operation because there would be no ground disturbance following construction.

- *Analysis Item GR-2: Would construction result in the destruction of valuable mineral deposits, paleontological resources, or unique geological features?*

There are no valuable mineral deposits, paleontological resources, or unique geological features located at or near the project site. Therefore, there would be no impacts to mineral deposits, paleontological resources, or unique geological features.

- *Analysis Item GR-3: What potential impacts from geological hazards would exclude the project from consideration?*

The project site has flat topography and the potential for seismic and faulting hazards is classified as minor. The foundation would be designed to support the wind turbine based on soil boring tests performed at the site. Therefore, there would be no impacts from geological hazards under the proposed action.

3.5 WATER RESOURCES

3.5.1 Definition of Resource

Water resources as defined in this EA are sources of water available for use by humans, flora, or fauna, including surface water, groundwater, nearshore waters, wetlands, and floodplains. Refer to Section 3.5, *Water Resources*, on page 3-8 of the Programmatic EA (MARFORRES 2011) for more details.

3.5.2 Existing Conditions

The proposed wind turbines at the Brooklyn MARFORRES Center would not be located within National Wetlands Inventory (NWI) mapped wetlands. NWI maps and aerial imagery depict estuarine and marine wetlands and estuarine marine deepwater wetlands located near the proposed wind turbine locations, along the Jamaica Bay shore (USFWS 2012). The proposed project area is located within 100-year and 500-year floodplains.

3.5.3 Environmental Consequences

- *Analysis Item WR-1: Would construction or operations substantially degrade surface water quality?*

As noted in the Geological Resources section (Section 3.4), as part of the project's NPDES permit coverage, appropriate BMPs would be implemented at the construction site as part of the proposed action to minimize increased runoff and erosion and subsequent impacts to surface water quality. These BMPs would minimize erosion and sedimentation from grading and construction activities (refer to Section 3.4.3.1 for a list of potential BMPs) and, therefore, minimize sedimentation of adjacent storm drain channels and Jamaica Bay. A subsurface investigation would be performed prior to construction, to verify the locations of any existing water drain grates, drain pipes, and duct banks.

During operations under the proposed action, there would be a low potential to affect surface water quality due to increased runoff associated with impervious areas or from spills or leaks associated with routine maintenance. The permanent project footprint would be 0.27 acre per wind turbine (approximately 0.81 acre total), resulting in only minor increases in storm runoff. Standard procedures on the Reserve Center would be followed to contain, clean up, and report on any spills or leaks of pollutants. The level configuration of the site and surrounding soil and vegetation make it very unlikely that there would be any discharge to the waters of Jamaica Bay. Therefore, there would be no adverse impacts to surface water quality under the proposed action.

- *Analysis Item WR-2: Would construction result in a substantial loss of the acreage or functionality of wetlands or Waters of the U.S.?*

There are no surface water bodies or wetlands overlapped or otherwise potentially affected by the proposed action. Therefore, there would be no impacts to wetlands.

- *Analysis Item WR-3: Would the project be in compliance with EO 11988?*

The proposed project is located within the coastal Special Flood Hazard Area, with portions of the site located within the 100-year coastal flood hazard zone (base flood elevation of 10 feet), where it could be subject to wave run-up during a 100-year event. The proposed turbine foundations, pad-mounted transformers, a portion of the underground cable, and the access road would be located within the 100-year and 500-year floodplains. Although an alternative location outside of the floodplains would be preferable (per siting criteria identified in the Programmatic EA [MARFORRES 2011]), space is limited at the Reserve Center. The proposed turbines and associated facilities could be shifted to the north to be partially out of the 100-year floodplain, but that could result in a greater impact to sensitive cultural resources because the turbines would be next to the Floyd Bennett Field boundary.

For development in a floodplain, the primary concern is that the development would result in an increase in base flood elevation due to decreased flood storage volume. However, the majority of the foundations, access road, and underground cable would not result in a change to topography (or subsequent decrease in storage volume). Only the bases of the turbine towers and the raised transformer pads would contribute to loss in flood storage volume. The wind turbines and supporting elements would be designed to comply with federal regulations for development in flood hazard areas. In particular, the base of each turbine would be installed two feet above the base flood elevation. Therefore, the Proposed Project is consistent with New York City Waterfront Revitalization Program policies regarding flooding.

Insofar as there is no practicable alternative location completely above the base flood elevation, and the project would not have an adverse impact on flooding or the floodplain, the project would be in compliance with EO 11988 and would not have a significant impact.

3.6 BIOLOGICAL RESOURCES

3.6.1 Definition of Resource

Biological resources include native and naturalized plants and animals and the habitats in which they occur. As discussed in the Programmatic EA (MARFORRES 2011), the resources of primary concern with respect to small-scale wind energy projects include: (1) protected habitats and the species they support; (2) ESA-listed, proposed, or candidate species; (3) bald and golden eagles; (4) migratory birds and bats; and (5) other species of conservation concern recognized at the state or federal level. Plants and animals are referred to by common names in this section; the corresponding scientific names can be found in the Integrated Taxonomic Information System (www.itis.gov).

3.6.2 Existing Conditions

The project site for the proposed turbines is in Kings County at the south end of Floyd Bennett Field, adjacent to Rockaway Inlet and the mouth of the Jamaica Bay estuary. The land of the project site was created by fill in Rockaway Inlet in 1941 (Columbia University 2007; National Park Service 2009). The land was built up by the deposition of sand behind steel bulkheads which are still visible on the shoreline. The project site includes areas of subsequently established maritime dune scrub vegetation with juniper and sumac, planted Japanese black pines and open-disturbed areas.

In 1985, the National Park Service and New York City Audubon initiated the grassland restoration and management project (GRAMP) on 130 acres of the former airfield at Floyd Bennett Field, north of the project site. Grassland has been restored through removal of woody vegetation and mowing, and that area now supports nesting grassland bird species and a high diversity of butterflies (New York City Department of Environmental Protection [NYCDEP] 2007).

Jamaica Bay is recognized as a globally Important Bird Area by Audubon (2012) and supports a high diversity and large numbers of migratory and summer-resident birds which are attracted by abundant food and habitat resources. Jamaica Bay is designated by the NYCDEP as a Critical Environmental Area, and by the New York State Department of State as a significant Coastal Fish and Wildlife Habitat under the City's Coastal Zone Management Program. Additional background information on the functions and values of the Jamaica Bay ecosystem can be found, for example, in the Jamaica Bay Watershed Protection Plan (NYCDEP 2007), the Envisioning Gateway project of Columbia University (2007), and in the earlier USFWS (1997) publication on Significant Habitats and Habitat Complexes of the New York Bight Watershed.

Except for occasional transients, no federally listed or proposed endangered or threatened species, or candidate species are known to exist in Kings County (USFWS New York Field Office 2012). Inquiry was made to the New York Natural Heritage Program (NYNHP) for records of rare or state-listed species and significant natural communities or habitats in the vicinity of the project site; the response is provided in Appendix B. For birds, all records of occurrence within a 10-mile radius, which includes all of Jamaica Bay/Rockaway Inlet, were included. NYNHP also identified records that were within close proximity or overlapping the area of proposed turbine installation. These include the following (refer to Appendix B):

- short-eared owl, location unspecified but known to occur in GRAMP area (New York City Audubon 2012);
- northern harrier, location unspecified but known to occur in GRAMP area (New York City Audubon 2012);
- barn owl, nesting in nest boxes and an abandoned building at Floyd Bennett Field, also known to occur in GRAMP area (New York City Audubon 2012);
- red-banded hairstreak (butterfly), in GRAMP area;
- white-m hairstreak (butterfly), in GRAMP; and
- Schweinitz's flatsedge, north of the project site in native grassland.

Based on the foregoing and lack of suitable habitat in the area of the proposed action, the butterflies and flatsedge are considered not to occur; whereas the three bird species may fly through the area and are considered accordingly under the appropriate analysis item below.

During 2010 and 2011, studies were conducted on the Reserve Center and other areas of Floyd Bennett Field to document the spatial and temporal abundance of bird and bat species with respect to the proposed turbines (Tetra Tech 2011). Avian point count surveys were standardized 10-minute surveys repeated multiple times during all four seasons at up to 16 locations (Figure 3.6-1). Point count data are provided in Appendix D and summarized in Table 3.6-1. Point counts yielded 39,071 individuals of 134 species. Atlantic brant, ring-billed gull, herring gull, rock pigeon, and European startling were the most abundant species and accounted for 60% of the total. No federal ESA-listed bird species were observed. State-listed endangered bird species that were observed included peregrine falcon, northern harrier, and common tern. The vast majority of birds sighted were at heights less than 115 ft.

In addition to the point count avian surveys, acoustic surveys for bats were conducted during summer and fall. Avian acoustic surveys for nocturnal migrants were also conducted during the fall 2010 and spring 2011 migrations. Six species of bats, none of which are federal ESA-listed or state species of concern, were identified in the bat acoustic surveys. Avian acoustic surveys detected calls by migrating sparrows, thrushes and wood warblers (species could not be distinguished) (Tetra Tech 2011). Other results from this study are discussed further where applicable below.

3.6.3 Environmental Consequences

- *Analysis Item BR-1: Would the project destroy or substantially degrade a legally or Integrated Natural Resources Management Plan (INRMP)-protected habitat or resource (including protected species)?*

There is no INRMP for the Reserve Center. The project site does not contain legally protected habitats or resources. No federally or state-listed rare, threatened, or endangered plants are known or expected to occur in areas subject to construction. Estuarine wetlands are present along the shoreline (USFWS 2012), which is part of the Jamaica Bay estuary, but no CWA jurisdictional wetlands or other bodies of water occur on the project site, which is comprised of dredged fill material and upland vegetation.

- *Analysis Item BR-2: Would the project result in take of an ESA-listed, proposed, or candidate bird or bat species?*

No ESA-listed, proposed, or candidate bird or bat species were documented on the project site or nearby areas, all of which were intensively surveyed in 2010-2011 (Tetra Tech 2011; Appendix D). Therefore, although some ESA-listed bird species occur in Jamaica Bay, as indicated by the NYNHP data and correspondence from USFWS (Appendix B), they are not expected to occur on the project site. State species of concern are discussed further below. The USFWS has reviewed the project and concurred with MARFORRES' determination that the proposed action is not likely to adversely affect any ESA-listed species (Appendix B).

- *Analysis Item BR-3: Is the project likely to result in injury or mortality to a bald or golden eagle?*

There have been no recent occurrences of bald or golden eagles in the vicinity of the project (NYSDEC 2012a; Nye 2010; Tetra Tech 2011); therefore, no interactions with or effects on eagles would occur.

Figure 3.6-1
Avian Point Counts at Floyd Bennett Field, New York

Table 3.6-1. Avian Point Count Survey Results

Location[2]	Description	Average Number of Birds/Point Count by Season (# of Surveys)[1]						
		Winter 2010 (3)	Spring 2010 (10)	Summer 2010 (3)[4]	Summer 2010 (21)[5]	Fall 2010 (21)	Winter 2010-11 (12)	Average, All Surveys
1	Coastal bulkhead	167	49	42	32	33	444	112
2[3]	**Maritime dune/shrubland**	**125**	**25**		**19**	**12**	**20**	**23**
2b[3]	**Maritime dune/shrubland**			**24**	**4**			**7**
3	Coastal bulkhead	7	56	28	26	24	37	31
4	Maritime dune, Japanese black pine	37	34	29	29	16	10	22
5	Maritime mixed grassland	75	42		18	23	79	35
5b	Maritime mixed grassland			24	4			6
6	Sandy beach	75	73	63	56	51	382	114
7	Maritime shrubland/hardwoods	21	26	30	24	11	30	21
8	Loam beach/maritime shrubland	17	47	48	41	19	39	34
9	Coastal bulkhead		58	52	33	18	225	67
10	Sandy beach		57	23	22	22	88	39
11	Sandy Beach		63	34	35	23	90	45
12	Marshes/hardwood/maritime shrubland		18	24	20	14	11	16
13	Maritime mixed grassland			22	3			6
14	Maritime mixed grassland			19	5			6

Notes: 1. See Appendix D for individual species counts by location and survey. Blanks indicate the location was not surveyed during that period.

2. See Figure 3.6-1.

3. Locations closest to proposed turbine locations.

4. Breeding Season Surveys.

5. Summer Resident Surveys

Source: Tetra Tech 2011

- *Analysis Item BR-4: Is the project site in a known high-use regional migratory flyway for birds, or within a local bird and/or bat high-use movement corridor, breeding, roosting, wintering, hibernacula, or "stop-over" site, resulting in a high likelihood and frequency of collisions?*

Migratory Birds

Generally, the region surrounding and including Floyd Bennett Field and the MARFORRES Center is highly used by migratory birds, as confirmed by the diversity and abundance of birds detected in the point count surveys (Tetra Tech 2011; Table 3.6-1; Appendix D). Jamaica Bay and associated wetland and upland habitats can in general be considered a high-use regional migratory flyway with important breeding, roosting, wintering, and stop-over areas for diverse species of birds. The point count station closest to the proposed turbines (#2, Figure 3.6-1) had fewer birds than most other locations during most survey periods; the exception being the winter 2010 survey when Atlantic brant were especially numerous at that location (Appendix D). Table 3.6-2 compares the relative abundance of the ten most common species at location #2 with their relative abundance overall. The data illustrate the greater abundance of European starlings, house sparrows, and other songbirds; and the lesser abundance of water-associated birds at location #2. Water birds including Canada goose, greater scaup, and laughing gull were among the most abundant species overall but were uncommon or not seen at location #2. Hence although the regional location of the project site suggests a high likelihood and/or frequency of bird mortality from collisions, the project site would have a lower risk of collisions than most other locations.

Table 3.6-2. Comparison of Most Abundant Bird Species at Station #2 vs. Overall Results

Species	Percentage (%) of Total	
	Station #2	Overall
European Starling	14.2%	5.2%
Atlantic Brant	13.5%	23.8%
Ring-Billed Gull	10.8%	13.7%
Herring Gull	5.5%	9.7%
American Robin	5.5%	1.9%
Northern Cardinal	3.4%	0.7%
Northern Mockingbird	3.2%	1.3%
House Sparrow	3.2%	1.1%
Rock Pigeon	3.2%	7.8%
Song Sparrow	2.9%	1.2%

Source: Tetra Tech 2011 (Appendix D)

Based on the greater abundance of birds at coastal sites (Table 3.6-1), of the three proposed turbine locations (Figure 2-1), the one closest to the shoreline (#3 in Figure 2-1) has the greatest likelihood and expected frequency of collisions due to the high abundance and mass flights of water birds along the shore.

All else equal, the risk and frequency of bird fatalities due to collisions should be proportional to the rotor-swept area, which is proportional to energy output. Both the energy output (150 kW) and rotor-swept area of the three small turbines combined would be approximately one tenth that of a single large turbine (MARFORRES 2011). Given the coastal location and abundance of birds in the region, the proposed turbines would be expected to result in bird fatalities at the high end of the spectrum observed at wind turbine sites. Bird fatalities have been commonly calculated as a number of individuals per MW per year, with numbers from medium- to large-turbine sites as reviewed in the Programmatic EA ranging from 0.95 to 11.67 individuals/MW/yr (MARFORRES 2011). During an initial 5-month summer-fall monitoring period, 9 avian fatalities were documented at a 5-turbine, 7.5 MW project on the coast in

Atlantic City, New Jersey (New Jersey Audubon 2008). This would equate to 22 over a 12-month period, which is approximately 2.93/MW/yr. Since some fatalities were undoubtedly not detected, the true number was higher. Even if an exceptionally high fatality rate of 20 birds/MW/yr were assumed, adjusting for the size of the proposed project (0.15 MW), the resulting estimate of mortality for the proposed action would be one bird per turbine, a total of three birds per year. Mortality would most likely be to the commonest species (Table 3.6-2). As such the likelihood of affecting a rare species, much less having any population-level effect, is extremely low, and the impact is considered less than significant.

Bats

Bat acoustic surveys were conducted on the project site in spring, summer, and fall of 2010 (Tetra Tech 2011). Two acoustic bat detectors were deployed in the middle of the project site (approximately at site 2 as shown in Figure 2-2), one on a fence at 6 ft high, and the other on a guy wire for a meteorological tower at 100 ft high. Results are summarized in Table 3.6-3 and 3.6-4.

The bat community at the project site is a mixture of resident (big brown bat, eastern pipistrelle (also known as tri-colored bat), and *Myotis* species) and long-distance migratory species (hoary bat, silver-haired bat, eastern red bat). There are no known bat hibernacula near the project site. Based on the frequency of calls per minute of survey effort, the low detector recorded 6.75 times as much bat activity, with the vast majority of activity occurring in June and July. In contrast, activity at the high detector was greater during late summer-early fall months and consisted of a higher proportion of long-distance migratory species. The substantially larger number of detections at low height presumably reflects the abundance of insects and better foraging conditions (Tetra Tech 2011).

The data in Table 3.6-3 can be used to calculate the number of calls per detector-night, a statistic that has been used to compare relative bat abundances in different locations (Stantec Consulting 2008a-b). It should be noted that due to variability in individual calling rates and detectability, the number of calls per detector-night is only loosely correlated with the number of bats. With this limitation in mind, the data for the low detector site (26.2 calls/detector-night) suggest a relatively high abundance of bats compared to other locations surveyed with similar methods in New England and the mid-Atlantic, while the corresponding value for the high detector site (3.2 calls/detector-night) is near the median of values from many other sites (Stantec Consulting 2008a-b). The combined value (15.7 calls/detector-night) is also relatively high.

The coastal location, habitat features, and data from the bat surveys all suggest a relatively high potential rate of bat fatalities. The small size (considering both height and rotor swept area) of the turbines, however, would suggest a relatively lower risk. By reference to published information on bat fatalities at wind turbines (MARFORRES 2011), it is conservatively assumed that the proposed location would have fatality rates in the upper half of the spectrum observed at wind turbine sites, which would be approximately 20-40 bats/MW/yr. This would correspond to 3-6 bats/yr for proposed three turbines, most likely affecting the more abundant species referred to previously. As for birds, this number is considered less than significant in terms of potential population-level effects.

Table 3.6-3. Summary of Acoustic Monitoring Survey Effort by Detector in the Project Area, 2010

Detector Location	Period of Operation	Detector-Nights	Number of Minutes with Activity	Total Number of Call Sequences	Overall Index of Activity*
Met Tower - High	May 6 - Oct 31, 2010	179	499	575	*280.0*
Fence - Low	April 1 -Oct, 31, 2010	214	4049	5599	*1890.0*
Total		**393**	**4548**	**6174**	***1160.0***

* (# of mins of activity / detector nights *100)

Source: Tetra Tech 2011

Table 3.6-4. Summary of Bat Call Sequences and Species Recorded in the Project Area, 2010

Group	Characteristic Frequencies*	Species	Count of Minutes with Activity	Total Call Sequences
Low Frequency	12 kHz–24 kHz	Hoary bat	392	461
		Unknown low frequency call seq.	52	52
Middle Frequency	24 kHz–38 kHz	Big brown bat	420	602
		Silver-haired bat	565	874
		Silver-haired bat/ Big brown bat	1299	2027
		Unknown middle frequency call seq.	824	946
Eastern red bat	44–45 kHz	Eastern pipistrelle	49	49
		Eastern red bat	349	360
High Frequency (*Myotis* species)	46–52 kHz	Northern myotis	--	--
		Eastern small-footed myotis	--	--
		Little brown myotis	7	7
		Unknown *Myotis* species	15	16
		Unknown high frequency call seq.	576	780

Notes: * Characteristic frequency (Fc) is generally defined as the frequency of the call pulse at the lowest slope, or the lowest frequency of the consistent frequency modulation sweeps. Fc represents the single most useful parameter for species identification.

Source: Tetra Tech 2011

- *Analysis Item BR-5: Would the project result in collisions and mortality to a bird of conservation concern or state species of concern?*

While all migratory birds are protected under the MBTA, species of concern are afforded special consideration. This part of New York is within Bird Conservation Region #30, the "New England/Mid-Atlantic Coast" region, and the USFWS (2008) list of Birds of Conservation Concern for BCR #30 includes 45 species (USFWS 2008; Audubon New York 2009). Thirty-nine of these species are

waterbirds (waterfowl, shorebirds, and wading and diving birds) which would be expected to occur infrequently if at all on the project site. In the point count surveys, the only occurrences of any waterbird species of conservation concern at point 2 or 2a (Figure 3.6-1) was a horned grebe (2 individuals) in the winter 2010 surveys (Appendix D). None of the other species of conservation concern were seen in the point-count surveys. Overall, the likelihood is very low that a species of conservation concern would collide with one of the proposed turbines is very low.

One state-listed endangered species (peregrine falcon) and two state-listed threatened species (northern harrier and common term) were detected in the avian point count surveys (Tetra Tech 2011). However, the only species detected at point 2 or 2a (Figure 3.6-1), the site of the proposed turbines, was a peregrine falcon on two occasions (Appendix D). At the time of the surveys, a larger turbine was under consideration for the site, and the peregrine falcon sightings at point 2 were both noted as being within the rotor-swept zone of that larger turbine (115-426 ft above ground), which is above the maximum height of the proposed turbines. Since the project site does not provide open foraging habitat or large concentrations of prey (waterfowl, shorebirds, pigeons) for peregrine falcons, the species is most likely to occur there on a transient basis, flying over the area as seen in the surveys. Therefore, the likelihood of this species colliding with a turbine is very low. The northern harrier is strongly associated with grassland habitat and has been noted abundantly in recent eBird records and Audubon Christmas Bird Count data (Tetra Tech 2011). Common tern was noted only at shoreline sites (Figure 3.6-1 and Appendix D). Hence northern harriers and common terns would occur infrequently if at all on the project site, and the risk of collisions for these species is also considered very low.

Vegetation clearing as proposed to occur in the non-breeding season (unless the absence of nests is confirmed) would avoid the possibility of impacting active nests of migratory birds, which are protected under the MBTA. As noted in the previous section, the extent of mortality to birds from collisions is expected to be low, and very unlikely to involve a species of concern.

In conclusion, minor adverse, but less than significant, impacts to biological resources would occur with the proposed action.

3.7 CULTURAL RESOURCES

3.7.1 Definition of Resource

As described in the Programmatic EA (MARFORRES 2011), cultural resources can be present within landscapes as districts, sites, buildings, structures, or objects, and also include Traditional Cultural Properties (TCPs), locations with enduring significance to the beliefs, customs, and/or practices of living communities. TCPs are considered eligible for nomination to the NRHP if they are associated with cultural practices or beliefs of a living community that are (a) rooted in the community's history and (b) important in maintaining the continuing cultural identity of the community. Culturally sensitive locations called Areas of Native American Concern which may not be considered eligible for nomination to the NRHP may still be protected under the American Indian Religious Freedom Act.

Cultural resources that are currently listed in or have been determined eligible for listing in the NRHP are termed "historic properties." Historic properties can include both prehistoric (prior to European contact) and historic (post-European contact) objects, sites, buildings, structures, and districts as well as TCPs. All historic properties within a project area constitute the affected environment for cultural resources.

The placement, design, construction, and operation of small wind energy facilities have the potential to affect historic properties lying within the Area of Potential Effects (APE) of the project. Two types of APE's are defined for historic properties. A physical APE is the actual surface area that will be disturbed

and includes the actual footprint of the proposed wind turbine tower foundations and the associated facilities to include access roads/areas, underground utility lines, and transformers as well as any associated temporary work spaces. For the current proposed action, the physical APE amounts to a total of 0.81 acre. A visual APE is the area surrounding a turbine where it would be visible to the casual observer. The New York SHPO requires a 5-mile visual APE for wind farm developments. Given the small size (three 50-kW turbines) of the current project, MARFORRES has determined a visual APE for the current project of 0.5 mile following the guidelines established by the Federal Communications Commission (FCC) for wireless communications towers 100-200 feet in height (the proposed turbines would each be less than 100 feet high). All historic properties within a project's physical and visual APE constitute the Affected Environment for cultural resources. The effects on historic properties can be direct, indirect, and cumulative. Additional information on the definition of this resource can be found in the Programmatic EA for the project (MARFORRES 2011).

3.7.2 Existing Conditions

The MARFORRES Center is bordered to the north and the west by Floyd Bennett Field Historic District. The District occupies 1,450 acres on the southeast end of Barren Island and encompasses the historic boundaries of the Floyd Bennett Field municipal airport (1931-1938) and the Floyd Bennett Field Naval Air Station (1941-1945). Floyd Bennett Air Field was designated in 1931 as New York City's first municipal airport and operated as a civilian air field until 1938 (National Park Service [NPS] 2009). In 1941, the Navy took possession of the entire field and expanded it into Naval Air Station New York, which was one of the largest defense installations on the East Coast during World War II. The Navy transferred most of Floyd Bennett Field Naval Air Station to the NPS in 1972 where it became part of the Jamaica Bay Unit of Gateway National Recreation Area.

The District was originally listed in the NRHP in 1980 and encompassed the 329 acre area of the historic municipal airport from two periods of development (1928-1931 and 1936-1938). The District consisted of 11 contributing buildings and structures, four runways, and one taxiway. Thirteen non-contributing buildings and structures associated with the World War II Naval Air Station period (1941-1945) were located within the boundaries of the District (Greenwood and Torres 1978). In 2010, the boundaries of the District were proposed to be expanded to encompass an additional 1,121 acres of the World War II Naval Air Station. The proposed expansion would include areas along Jamaica Bay and along Rockaway Inlet where the proposed action would occur. The proposed District would be comprised of 27 contributing buildings, 66 contributing structures, and one contributing archaeological site. It would also contain 12 non-contributing buildings, 77 non-contributing structures, and one non-contributing archaeological site. Contributing resources are those that retain integrity and possess significant characteristics that qualify the property for NRHP listing. Non-contributing resources are those that have lost integrity, that were not constructed during the defined period of significance for the district, or that do not possess significant qualities or historical associations for which the District is eligible for listing in the NRHP (Kierstead 2010).

The current boundary of the District lies immediately north and west of the proposed project site. A number of buildings, structures, and roadways that contribute to the District are located in close proximity to the proposed project area. Contributing buildings include married officer's quarters and the entrance guard booth. Contributing portions of several roadways are also present in the area including Floyd Bennett Blvd, Aviation Road, and Independence Lane.

Floyd Bennett Field is now the largest expanse of open land in New York City, with recreational facilities and natural resources that nearly one million visitors enjoy annually. It is divided into three management

zones: a Developed Area, a Natural Area, and the South Administrative Area (National Park Service 1979). The proposed project site is located adjacent to the South Administrative Area, which includes the Park headquarters, main entrance, police station, and World War II era barracks. Also in close proximity to the project site is an area that was historically part of Brooklyn Marine Park. This area west of Flatbush Avenue is administered as part of Floyd Bennett Field, and includes Gateway Marina (NPS 2009). The MARFORRES Center and nearby Federal Aviation Administration Doppler radar facility were also originally part of Floyd Bennett Field.

The MARFORRES Center property at Brooklyn was intensively surveyed (Phase I) for archaeological resources in 2003 in accordance with Section 110 of the National Historic Preservation Act (NHPA). Data from historical maps, nautical charts, soils survey, subsurface testing conducted by the NPS, and a pedestrian survey indicated extensive surface and subsurface disturbance to the MARFORRES Center (HHM 2004a). Extensive changes to the shoreline and marshlands on the island occurred prior to 1899 from natural processes. Infilling of the marshes with incinerated garbage occurred during the late nineteenth and early 20th centuries, and the construction of the Floyd Bennett Field occurred in the 1920s and 1930s. Further, the MARFORRES Center area was believed to have been submerged beneath the Rockaway Inlet as recently as 1935. The potential for intact archaeological deposits at the Center was rated as very low and additional archaeological investigations were not recommended (HHM 2004a). Only one archaeological site has been identified within the District to date. Additional archaeological remains, if present, would be buried under several feet of fill at the proposed project site.

Six buildings and structures at the MARFORRES Center property were also surveyed in accordance with Section 110 of the NHPA. All of the buildings and structures in the survey were constructed between 1977 and 2000. They had not attained the minimum age of 50 years old for historic properties and did not meet any of the NRHP criteria for eligibility (HHM 2004b). The buildings and structures at the Center were also found to not be of "exceptional significance" with regards to the Cold War, and thus did not meet NRHP Criterion Consideration G (HHM 2004b).

There are no known TCPs or Areas of Native American Concern associated with the MARFORRES Center and the immediate area. Floyd Bennett Airfield National Register District, Jacob Riis Park Historic District, and Fort Tilden Historic District are within the 5-mile visual APE. Archaeologically, high sensitivity areas as designated by the New York SHPO are located in Floyd Bennett Airfield.

3.7.3 Environmental Consequences

- *Analysis Item CR-1: Would construction or operations result in adverse effects to a historic property?*

The proposed action is located in an area that has previously been surveyed for cultural resources. No evidence of prehistoric habitation was discovered, and the MARFORRES Center was not considered to be eligible as a listed historic property. Soils have been highly disturbed and have little potential for intact cultural resources. The wind turbines would be located in an area that is partially vegetated and has been previously disturbed, next to a paved parking lot and road. An underground cable to connect the turbines to the MARFORRES Center Offices would be routed across a former taxiway of the Naval Air Station (Taxiway 7), across the existing road, and along an existing path. Taxiway 7 is a non-contributing structure to the eligibility of the Floyd Bennett Field Historic District. Impacts to the structure from the proposed action would not affect the eligibility of the District to the NRHP and would therefore not constitute an adverse effect.

The proposed wind turbine closest to Floyd Bennett Field Historic District (at proposed Site 1) would be less than 300 ft from the District boundary. Visual impacts to the 27 contributing buildings and 66

contributing structures within the existing District are expected to be minor given the now extensive successional woods present around the project area. The low profile of the proposed turbines (less than 100 feet in total height) and the tall dense vegetation currently present in and around the project area would largely screen the turbines from view from most of these resources. In addition, the visual resources of the project area are already impacted by the presence of communications towers and cell towers on the adjacent MARFORRES property. As such, the Proposed Action would have no adverse effect on any known historic property.

3.8 VISUAL RESOURCES

3.8.1 Definition of Resource

Visual resources are the natural and cultural features that make up the landscape of a viewer from a vantage point. The features include the land, water, vegetation, structures, and other features within the viewshed of a casual observer. Impacts to the visual environment are measured by the degree of change that a proposed action causes to the viewshed of a viewer from a vantage point. Wind turbines have the potential to impact the visual environment by introducing a new and highly conspicuous feature to the viewshed of a casual viewer.

The rotating blades of a wind turbine can produce shadow flicker, which is the alternation of light and shadow caused by blade rotation when the turbine is in line of sight between the sun and another object or person. The potential effects of shadow flicker on individuals and land uses, as well as sensitive visual resources in affected areas, need to be considered as part of the visual analysis. Sensitive receptors include residential areas, schools, and office buildings. Sensitive receptors within 10 rotor diameters (500 ft) are considered in this analysis; at greater distances, shadow flicker becomes imperceptible due to the small relative size and low angle of the rotor to the viewer.

Additional information on the definition of this resource can be found in the Programmatic EA for the project (MARFORRES 2011).

3.8.2 Existing Conditions

Utilizing a Visual Contrast Rating system developed by the U.S. Department of the Interior Bureau of Land Management, the existing character of the landscape is described in terms of four basic elements and the contrast with the post-proposed action landscape analyzed. In the analysis, the existing landscape is subdivided into land, vegetation, and structures. Each of these subdivisions of the existing landscape is then characterized in terms of their form, line, color, and texture. The landscape of the site with the new features added is then subdivided and described in terms of the same four elements. The degree of contrast between the two described landscapes are then analyzed and rated as strong, moderate or weak.

Two Key Observation Points (KOPs) were utilized to analyze the degree of contrast. The first KOP is located on the berm above the racetrack north of the proposed project site. This KOP observes the project site to the south from an elevated position. The second KOP is located on the shoreline of Rockaway Inlet adjacent to the proposed project site to the south. This KOP observes the project site to the north from a slightly lower position. The degree of contrast from these two KOPs can be “averaged” to yield a overall contrast rating.

The form of the existing land is generally flat with some raised polygonal shaped berm areas around the go-kart racetrack adjacent to the proposed project area. The race track itself forms a polygonal shaped area on the land as well. The lines of the land are horizontal and the color of the sandy soil is tan and brown. The texture of the land is smooth. The form of the vegetation varies from irregular and indistinct

forms for the deciduous trees to regular, triangular forms of the evergreen trees. The lines of the vegetation are indistinct and weak for the individual trees, but a distinct curved line is formed by edge of the grassed areas. The colors of the vegetation are generally various shades of green and brown. The texture of the vegetation is coarse and rough for the trees but smooth for the grass. Structures on the landscape include the vertical, linear forms of the communications towers, cell towers and street lights; the rectangular, blocky forms of the buildings, and the horizontal, irregular forms of the metal remnants of the historic bulkheads. The lines of the structures are bold, distinct and sharp. The colors of most of the visible structures at the MARFORRES Center are tan and gray. The communications tower adjacent to the project site is red and white. The texture of all the structures is smooth.

The Reserve Center's main administration building is the only potential sensitive shadow receptor within 500 ft of the proposed wind turbines. The nearest portion of this building, the southwestern corner, is approximately 300 ft northeast of Site 1. The southwestern entrance to the administration building is located at this corner.

3.8.3 Environmental Consequences

- *Analysis Item VR-1: Would the wind turbine result in impacts to visual resources?*

The visual contrast of the proposed action with the existing landscape would be moderate as viewed from KOP 1. The changes in the land and vegetation would largely be unobservable to the casual observer. The thick vegetation surrounding the racetrack would screen the changes to both the land and the vegetation at the project site. The addition of three wind turbines with their irregular forms; bold, distinct, straight lines; white color; and smooth texture would have a moderate contrast with the regular linear and blocky forms; bold, distinct straight lines; tan and gray colors; and smooth textures of the existing structures present (Figure 3.8-1).

Figure 3.8-1: Visual simulation from KOP 1 on top of berm adjacent to the racetrack. View is to south.

The visual contrast of the proposed action with the existing landscape would be moderate as viewed from KOP 2. The changes to the land and vegetation of the project site would be only partially blocked from view at this KOP. The rectangular and circular shapes of the project facilities footprints would contrast weakly with the flat, horizontal form of the land. The removal of the vegetation from the site would contrast strongly with the thick vegetation that surrounds the site. Strong, bold, straight and circular lines would be created with the removal of the vegetation from the project site and construction of the facilities. The irregular form; strong, bold, straight lines; white color; and smooth texture of the wind turbines would contrast weakly with the regular form; strong, bold, straight lines; red and white color; and smooth texture of the single communications tower present in this view. Contrasts with the irregular form; strong, bold lines; rust color; and rough texture of the bulkheads would be strong. The cumulative contrast would be moderate (Figure 3.8-2)

Figure 3.8-2: Visual simulation from KOP 2 on shoreline of Rockaway Inlet. View is to north.

The cumulative contrast rating from the two KOPs would be a moderate rating. The cumulative contrast rating of the land, vegetation, and structures with regards to form, lines, color and texture from KOP 1 is moderate. Similarly, the cumulative contrast from KOP 2 is also moderate. The overall cumulative visual contrast rating is thus moderate, and considered adverse but less than significant for the proposed action.

- *Analysis Item VR-2: Would shadow flicker result in impacts to nearby residential or office buildings?*

The implementation of the proposed action could cause a limited amount of shadow flicker to fall on the southwestern entrance of the Reserve Center's main administration building (Appendix C). In the worst-case scenario, in which clouds never obscure the sun, the wind is always blowing, and the wind is in line with the sun throughout the day, the southwest entrance would receive no more than 40 minutes of flicker per day in the middle of the afternoon from November 10 to January 31. The actual occurrence of shadow flicker on the administration building's southwestern entrance, however, is expected to be minimal, if any, because the sun only shines an average of 51% of the time from November through January (National Climate Data Center 2008) and because the wind would have to simultaneously be blowing to or from the southwest or the northeast in the afternoon. Additionally, any flicker received would be limited to this one small area of the relatively large administration building and there are at least four additional entrances available for personnel use that could not possibly any flicker. Therefore, operation of the proposed wind turbines would not result in significant impacts to nearby residential or office buildings.

3.9 SOCIOECONOMICS

3.9.1 Definition of Resource

Socioeconomics is defined as the basic attributes and resources associated with the human environment, particularly population and economic activity. Economic activity typically encompasses employment, personal income, and industrial growth. Impacts on these fundamental socioeconomic components can influence other issues such as housing availability, utility capabilities, and fire and police protection.

Disadvantaged groups within the study area are specifically considered in order to assess the potential for disproportionate occurrence of impacts as part of the environmental justice analysis. Disadvantaged groups include minority, low-income, and youth (under the age of 18) populations.

3.9.2 Existing Conditions

The borough of Brooklyn, New York had a total population of 2,504,700 in 2010 (U.S. Census Bureau 2010a), with 61.6% in the labor force, and a median household income of $43,034 (U.S. Census Bureau 2010b).

Brooklyn has a majority-minority population, meaning that non-Hispanic whites comprise less than 50 percent of the total racial composition. Brooklyn has a "minority" population of 64.3%, a population of 23.7% under the age of 18 (U.S. Census Bureau 2010a), and a population of 22.2% below the poverty level (U.S. Census Bureau 2010b).

3.9.3 Environmental Consequences

- *Analysis Item SO-1: Would the proposed action result in a moderate to severe adverse impact to socioeconomics?*

The proposed action would not impact or would only negligibly impact socioeconomic conditions and impacts would be beneficial such as short-term construction jobs (the construction phase typically is from one to three months) and long-term maintenance needs (the life of the project). Most repairs and maintenance activities would be conducted by operations and maintenance contractor crews which would contribute to income, employment, and possibly housing in the area. Some monitoring and maintenance would be conducted by on-site engineering and maintenance personnel. Apart from the long-term economic benefits of deploying a local renewable energy resource to reduce demand on the grid, the amount of energy conserved and the resulting savings to MARFORRES would be too small to have an impact on the electricity provider, which in any case is able to adjust rates and fees (including interconnect charges) to remain profitable. Therefore, impacts on socioeconomics would be minor.

- *Analysis Item SO-2: Would the proposed action adversely affect children or have a disproportionate adverse effect on a low-income or minority community?*

Because the project location would be within a MARFORRES facility, the proposed action would not impact or would only negligibly impact low-income or minority communities and children. If local low income and/or minority labor forces are used, and impacts would be beneficial such as short-term construction jobs (the construction phase typically is from one to three months) and long-term maintenance needs (the life of the project). Therefore, impacts on children or a low-income or minority community would be minor.

3.10 AIR QUALITY

3.10.1 Definition of Resource

Air quality is defined by ambient air concentrations of specific pollutants determined by the USEPA to be of concern with respect to the health and welfare of the general public. The seven major pollutants of concern under the CAA, called "criteria pollutants," are carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), suspended particulate matter less than or equal to 10 microns in diameter (PM_{10}), fine particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). SO_2 and NO_2 are commonly referred to and reported as oxides of sulfur (SO_x) and oxides of nitrogen (NO_x), respectively. Volatile organic compounds (VOCs) and NO_x do not have established ambient standards but are important as precursors to O_3. The USEPA has established National Ambient Air Quality Standards (NAAQS) for these pollutants. Section 176(c) of the 1990 CAA Amendments contains the General Conformity Rule (40 CFR §§ 51.850-860 and 40 CFR §§ 93.150-160). The General Conformity Rule (updated March 24, 2010) requires any federal agency responsible for an action in a nonattainment or maintenance area to determine that the action conforms to the applicable State Implementation Plan (SIP). Actions would conform to a SIP if their annual direct and indirect emissions remain less than the applicable *de minimis* thresholds. Formal conformity determinations are required for any actions that exceed these thresholds. Emissions of attainment pollutants are exempt from conformity analyses.

GHGs are gases that trap heat in the atmosphere. The most common GHGs emitted from natural processes and human activities include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Each GHG is assigned a global warming potential (GWP). Total GHG emissions from a source are often reported as a CO_2 equivalent (CO_2e). The CO_2e is calculated by multiplying the emission of each GHG by its GWP and adding the results together to produce a single, combined emission rate representing all GHGs.

In the CAA Amendments of 1977, Congress specified the initial classification of lands for Prevention of Significant Deterioration (PSD) purposes. Certain lands, where existing air quality is "good" and is deemed to be of national importance, were designated as Class I and may not be reclassified. These mandatory Class I areas include all international parks, national memorial parks larger than 5,000 acres, and national parks larger than 6,000 acres that were in existence when the Amendments were passed. Locations and managing entities are listed at http://www.epa.gov/visibility/class1.html. There are not any Class I areas in the state of New York.

All other areas to which the PSD provisions apply were classified as Class II. These areas are granted special air quality protections under Section 162(a) of the federal CAA. 40 CFR § 51.307 requires the operator of any new major stationary source or major modification located within 100 kilometers of a Class I area to contact the federal land managers for that area.

3.10.2 Existing Conditions

The borough of Brooklyn boundaries coincides with the boundaries of Kings County, which is also part of Air Quality Control Region (AQCR) 43 for determining conformance with the NAAQS (USEPA 2012a). AQCR 43 comprises New York, northern New Jersey, and Long Island. Kings County is designated a moderate maintenance area for 8-hour O_3 and is a moderate maintenance area for CO. The county was found to be in nonattainment for the $PM_{2.5}$ NAAQS in 1997 and then again in 2006.

The annual de minimis levels for this region are listed in Table 3.10-1. Federal actions may be exempt from conformity determinations if they do not exceed designated de minimis levels (40 CFR Part 1, Section 51.853[b]).

Table 3.10-1. *De minimis* Levels for Criteria Pollutants in the Project Area

Criteria Pollutant	*de minimis Level (tons/year)*
O_3	100 (NO_x or VOCs)
$PM_{2.5}$	100
CO	100

Source: USEPA 2012b.

3.10.3 Environmental Consequences

- *Analysis Item AQ-1: Would construction or operational emissions exceed applicable de minimis thresholds, requiring a Conformity Determination, and if so, would emissions fail to conform to the applicable SIP?*

Emission sources associated with the proposed action would involve construction and operation of up to three relatively small (50-kW) wind turbines. Consistent with the Programmatic EA for the *MARFORRES Wind Energy Program,* the construction footprint for the three 50-kW turbines would be approximately 1.34 acres and the use of heavy equipment during construction would be approximately one month (30 days). Estimated construction emissions due to implementation of the proposed action are shown in Table 3.10-1. Although *de minimis* thresholds do not apply to attainment areas, the estimated construction emissions would be below conformity *de minimis* levels even if the project site was within a nonattainment area. Appendix A includes a Record of Non-Applicability (RONA) for CAA Conformity for this project, which was signed on 8 June 2011 (Appendix A).

Table 3.10-1. Estimated Emissions Resulting from Implementation of the Proposed Action

Estimated Construction Emissions (duration 1 month)	*Emissions (tons/year)*					
	CO	*VOCs*	*NO_x*	*SO_x*	*PM_{10}*	*$PM_{2.5}$*
Three 50-kW Turbines	1.58	0.39	3.41	0.00	0.28	0.17
de minimis threshold[1]	NA	100	100	NA	NA	100
Exceeds *de minimis* threshold?	No	No	No	No	No	No

Note: [1] Kings County is a maintenance area for O_3 and in nonattainment for $PM_{2.5}$ and is in attainment for all other criteria pollutants. *De minimis* thresholds to not apply to attainment areas. NA= not applicable.
Source: USEPA 2012b.

Operations and maintenance of the turbines would typically consist of two to three people who would visit the site approximately six times per year. These visits would consist of maintenance personnel driving a vehicle to and around the site. Emissions associated with these activities would be minimal and short-term and would not result in a major increase in air emissions.

One of the most important benefits of wind energy is that the production of electricity from wind power involves zero direct emissions of air pollutants. The energy output generated from wind turbines, with zero emissions of air pollutants, would displace roughly the same energy output that would otherwise be generated by a fossil fuel-powered plant, which generates GHGs and other harmful air pollutants. Table 3.10-2 includes the typical energy output under the proposed action, which amounts to the

electricity savings per year that would no longer need to be generated by a fossil fuel-powered plant (coal, oil, or natural gas).

Table 3.10-2. Range of Energy Output under the Proposed Action

Proposed Action	*Energy Output (MWh/yr)*
Three 50-kW Turbines	264 – 1320

Therefore, operational activities associated with the proposed action would result in beneficial impacts to air quality by adding wind energy to the utility grid and replacing or reducing the use of fossil fuel-powered plants with more efficient and flexible types of power generation.

- *Analysis Item AQ-2: Would the proposed action contribute to global climate change?*

Currently, there are no formally adopted or published NEPA thresholds for GHG emissions. On 18 February 2010, the CEQ released draft guidance for addressing climate change in NEPA documents (CEQ 2010). The draft guidance recommends quantification of GHG emissions; however, the guidance is being substantively revised in light of comments received. Therefore, formulating significance criteria for GHG emissions is problematic, as it is difficult to determine what level of proposed emissions would substantially contribute to global climate change. In the case of wind energy projects, GHG emissions associated with construction would be expected to be somewhat off-set or reduced by the beneficial effects of adding wind energy to the utility grid; therefore, the wind energy project would likely contribute to an overall beneficial impact to global climate change in the region.

Construction Impacts

Estimated GHG emissions associated with construction activities under the proposed action scenarios are shown in Table 3.10-3.

Table 3.10-3. Estimated GHG Emissions under the Proposed Action

Proposed Action Scenario	*Metric Tons*[1]			
	CO_2	CH_4	N_2O	CO_2e
Three 50-kW Turbines	310.00	0.03	0.29	402

Notes: [1]$CO_2e = (CO_2 * 1) + (CH_4 * 21) + (N_2O * 310)$

Compared with the estimated 6,821.8 million metric tons of GHG emissions from all activities in the U.S. in 2010 (USEPA 2012c), construction associated with the proposed action would be negligible and would not significantly contribute to global climate change.

Operational Impacts

Operational impacts would be the same as those discussed under *Analysis Item AQ-1*. Operation of the wind turbines proposed under the proposed action would result in a reduction in GHG emissions and other harmful air pollutants. Therefore, the proposed action would negligibly contribute to global climate change and beneficial impacts to air quality would occur.

- *Analysis Item AQ-3: Would the proposed action result in impacts to Class 1 areas?*

The Brigantine Wilderness area in New Jersey is the closest Class I area to the proposed project site, but it is more than 62 miles (100 km) away; therefore, the proposed action would not impact any Class 1 areas.

3.11 UTILITIES

3.11.1 Definition of Resource

Utilities are defined as services such as electricity, natural gas, telephone, potable water, and sewage systems, which are typically provided by either public or private service companies (i.e., electricity, natural gas, and telephone) or municipalities (i.e., water and sewer systems). Each type of utility has its own associated infrastructure, such as pipelines, cables, conduits, electrical substations, and pumping stations, which allow for the provision of services to a specific location.

3.11.2 Existing Conditions

The Reserve Center is located on the grounds of Floyd Bennett Field, formerly a municipal airport. The airfield is no longer used for commercial, military, or general aviation. However, the New York City Police Department currently uses the facility as a heliport and the site's existing utility lines have been buried for the safety of aviation.

The existing utilities at this USMC facility are owned by Verizon Communications (telephone lines), Consolidated Edison (electrical lines), KeySpan Energy (natural gas lines), and the New York City Department of Environmental Protection (water and sewer lines). These companies will help locate and identify their utility lines at Floyd Bennett Field. Consolidated Edison would be able to provide information on the capacity and load factors of the electrical utilities.

3.11.3 Environmental Consequences

- *Analysis Item UT-1: Would installation of the wind turbine(s) and associated infrastructure (e.g., new power lines) conflict with existing utility systems (e.g., power lines or buried pipelines)?*

Prior to any construction activities under the proposed action, the local "One-Call Center" would be contacted to obtain detailed information on the location and depth of all existing utility lines in the project area. If existing utilities are identified within the project footprint and would potentially be impacted by construction activities, the project footprint or any trenching/excavation activities would be realigned to avoid impacts to existing utilities. Therefore, with implementation of the procedures discussed above, no impacts to existing utilities infrastructure would occur.

- *Analysis Item UT-2: Would the additional power generated by the new wind turbine(s) require installation of additional power lines?*

Under the proposed action, the power output at full generation capacity would be 50 kW per proposed wind turbine. For this small increase in electricity, existing electrical lines would typically have sufficient capacity. However, prior to any connection to the existing power grid, an Interconnect Agreement would be established between MARFORRES and Consolidated Edison. The Interconnect Agreement would consider the existing capacity and identify any necessary upgrades, modifications, or need for installation of additional power lines to accommodate project electricity generation. The upgrades/modifications identified in the Interconnect Agreement would be implemented as part of the proposed action prior to connection to the area's electricity distribution grid. Therefore, no impacts or minor impacts to electrical utility systems would occur with implementation of the proposed action.

3.12 AIRSPACE

3.12.1 Definition of Resource

The nation's airspace is designed and managed by the FAA to meet both the individual and common needs of all military, commercial, and general aviation interests. Navigable airspace is categorized as

either regulatory or nonregulatory. Within those two categories are four types of airspace: Controlled, Special Use, Uncontrolled, and Other. Airspace is further defined in terms of classifications according to the operating and flight rules that apply to each airspace area. The manner in which airspace is classified depends on (1) the complexity or density of aircraft operations within an airspace area; (2) the nature of those operations; (3) the level of safety required; and (4) national and public interest. Refer to the Programmatic EA (MARFORRES 2011) for detailed descriptions of the different airspace types and classifications. The operation of radars, television, radio, and cellular signals is also considered part of this resource.

3.12.2 Existing Conditions

The MARFORRES Center is within Class B airspace due to the proximity of John F. Kennedy (JFK) International Airport, approximately 5.6 nautical miles to the northeast. The JFK TDWR services both the LaGuardia and JFK airports in one of the busiest air corridors in the United States (TDWR 2012).

3.12.3 Environmental Consequences

- *Analysis Item AS-1: Does the proposed project pose an operational problem for a particular airport resulting in a FAA issued Determination of Hazard?*

The proposed action has been coordinated with the FAA to ensure there would be no conflicts with civilian or military use of airspace (Appendix B). The FAA issued a Determination of No Hazard to Air Navigation for the proposed turbine locations. Therefore, no significant impact would occur.

- *Analysis Item AS-2: Does the proposed project affect Visual Flight Rules or Instrument Flight Rules operations in the navigable airspace?*

The proposed action has been coordinated with the FAA to ensure there would be no conflicts with civilian or military use of airspace (Appendix B). The FAA issued a Determination of No Hazard to Air Navigation for the proposed turbine locations. Therefore, no significant impact would occur.

- *Analysis Item AS-3: Does the proposed project result in EMI (radar, television interference, frequency modulation [FM] radio interference, cellular phone, satellite services)?*

The turbine design minimizes the potential for EMI because the rotor is of non-metallic composition and because power is produced by a brushless, permanent magnet generator. The relatively small size and isolation of the proposed turbines also make it very unlikely that there would be any interference with radar, television, radio, telephone, or satellite services.

In conclusion, the proposed action would not have a significant impact on airspace.

3.13 HEALTH AND SAFETY

3.13.1 Definition of Resource

Any aspect of the project that creates a potential risk to human health and safety requires consideration under NEPA. This includes occupational hazards to workers as well as the exposure of the general public to conditions creating the risk of immediate injury or long-term health hazards. The latter may include indirect effects related to noise, utilities, airspace, and hazardous materials, respectively, which are addressed in separate sections of this chapter.

3.13.2 Existing Conditions

The proposed wind turbine locations are in barren, grassy, or moderately forested areas south of the Reserve Center's main administration building. Site 1, the closest proposed turbine, is approximately 300

ft to the southwest of the administration building. A portion of the administration building's parking lot is located approximately 140 ft to the northeast of Site 1. A fence lines the property boundary, the nearest portion of which is approximately 70 ft to the northwest of Site 1 (Figure 2-2). Except for a portion of the perimeter fence that is approximately 100 ft to the southeast of Site 3, the perimeter fence is well removed from the proposed turbine locations. The nearest residential areas are one mile to the south, across Rockaway Inlet. Children may be present at Floyd Bennett Field, which is part of the Gateway National Recreation Area managed by the NPS. However, no schools or other parks are in the immediate vicinity of the project area.

3.13.3 Environmental Consequences

Given adherence to International Electrotechnical Commission standards for wind turbines and to federal and state requirements for worker safety at each wind energy site, the primary health and safety concern is the exposure of members of the public to accidents during construction or operation of the proposed turbine.

- *Analysis Item HS-1: Would construction or operation of the wind turbine(s) expose members of the general public, especially children, to health and safety hazards?*

Construction hazards would be similar to those existing at a typical construction site and would be related to the operation of large vehicles and pieces of equipment. With the implementation of measures in Section 2.2, as well as those in the Programmatic EA (MARFORRES 2011), construction would not expose members of the general public to health or safety hazards.

Operational hazards are primarily related to blade failure, particularly during a storm. However, members of the public are generally indoors during storm events. Furthermore, the proposed turbine locations are generally well removed from the nearest public access. Site 3 is surrounded by moderate forest, and there is little, if anything, that would attract members of the public to the portion of the perimeter fence located 70 ft to the northwest of Site 1. Moreover, the Polaris wind turbines proposed are equipped with three separate braking systems to prevent catastrophic failure. Therefore, the public would not be exposed to health or safety hazards from the construction or operation of the proposed action.

3.14 HAZARDOUS MATERIALS

3.14.1 Definition of Resource

This section addresses the use, generation, or inadvertent release of hazardous materials by the proposed action. Hazardous materials include all chemicals listed by the USEPA under the Superfund Amendments and Reauthorization Act of 1986 (40 CFR § 355 *et seq*.).

3.14.2 Existing Conditions

A review of the USEPA's Enviromapper does not show any Superfund sites in the vicinity of the project site. The only potential existing facilities near this site that are under USEPA monitoring are the USMC Reserve Center and the Naval Reserve Maintenance Training Facility, both located approximately 0.3 mile north and northwest, respectively and are hazardous waste generators.

3.14.3 Environmental Consequences

- *Analysis Item HM-1: Is there a potential for uncontrolled release of hazardous materials into the environment?*

Construction, operation, and maintenance of the three proposed wind turbines would involve the use of small quantities of hazardous materials (e.g., fuel, oil, solvents, hydraulic fluid, antifreeze, lubricant,

paints) and generation of hazardous wastes. Appropriate procedures for the handling, storage, and disposal of hazardous materials and wastes would be implemented in accordance with the Resource Conservation and Recovery Act and other applicable federal, state, and local regulations. These would include preparation of a site-specific SWPPP for construction activities to include BMPs for spill prevention. In addition, the Spill Prevention Control and Countermeasures plan and Hazardous Waste Management Plan would be updated to include operations of the wind turbines. Given the small amounts of hazardous materials used and hazardous wastes generated, impacts would be minor.

- *Analysis Item HM-2: Is there pre-existing contamination on the project site?*

There are no Installation Restoration Program sites at the Reserve Center. During construction, procedures would be established in the event that previously unidentified contamination is encountered. These procedures would include immediately stopping construction activities in the general vicinity and contacting the installation hazardous materials point of contact. Procedures would then be implemented, as necessary, to ensure that any contamination is properly identified, evaluated, and remediated to acceptable levels prior to the continuation of construction activities. Therefore, impacts from hazardous materials would be minor.

3.15 TRANSPORTATION

3.15.1 Definition of Resource

Transportation refers to the use of roads or waterways as affected by the proposed action. The only potential impacts are associated with the transport of equipment to and from the site for construction.

3.15.2 Existing Conditions

The road network located near the project site consists of small roads used to access the military facilities located at the site as well as other small roads used to access the adjacent recreational areas. The nearest major thoroughfare is Flatbush Avenue, approximately 0.3 mile from the reserve center, which connects to Shore Parkway, one of the major thoroughfares that circumnavigate Brooklyn. The Marine Parkway Bridge also connects to Flatbush Avenue near the Reserve Center. Such major thoroughfares are likely to receive moderate to heavy traffic volumes and would likely be the main routes used to deliver construction equipment and turbine components to the site. The wide entrance to the Reserve Center, and the roads within the Reserve Center, provide easy access to the project site through which multiple vehicles regularly transit.

3.15.3 Environmental Consequences

- *Analysis Item TR-1: Would the proposed action result in conflict with public use of roads or waterways?*

Under the proposed action, all major turbine components, including the tower, generator, and blades, would be delivered via truck. Based on the larger Northwind 100 wind turbine, which provides 100 kW of power and only requires two 48-ft flatbed trucks per turbine delivery, no conflicts are expected with the use of public roads. Therefore, there would be no significant impacts to transportation.

3.16 NO-ACTION ALTERNATIVE

For all resources, the no-action alternative would represent the continuation of existing conditions in the near term, resulting in no impacts. MARFORRES would seek to develop other types of renewable energy (e.g., solar) at this facility and/or develop wind energy at other MARFORRES facilities to achieve

specific goals regarding energy production and usage. Separate NEPA documentation would be prepared for these separate MARFORRES renewable energy projects, as applicable.

CHAPTER 4
CUMULATIVE IMPACTS

4.1 INTRODUCTION

Cumulative impacts refer to the incremental effects of a project when combined with the similar effects of past, present, and future actions. Cumulative impacts were considered at both the national level and the local level in the Programmatic EA for the *MARFORRES Wind Energy Program* (MARFORRES 2011). This Tiered EA analyzes the potential for cumulative impacts of the proposed installation and operation of up to three 50-kW wind turbines at MARFORRES Center, Brooklyn in Kings County, NY on a resource and site-specific level. Section 4.2 presents the cumulative setting upon which each of the site-specific, resource-based analyses is based; Section 4.3 presents the site-specific, resource-based analyses.

4.2 CUMULATIVE SETTING

The cumulative setting is described in three ways: the regional setting (Section 4.2.1); other existing, under construction, approved, or proposed projects at MARFORRES Center, Brooklyn (Section 4.2.2), and the existing, under construction, approved, or proposed wind energy projects within the state, neighboring counties, and Kings County (Section 4.2.3).

4.2.1 Regional Setting

The proposed project site at MARFORRES Center, Brooklyn, is located near the southeastern-most portion of the New York borough of Brooklyn. Brooklyn is highly developed and is the City of New York's most populous borough, with more than 2.5 million people living within its 71 square miles. The project site is on the southeast corner of Barren Island. The majority of Barren Island and much of the nearby area lies within the Gateway National Recreation Area, including the historic Floyd Bennett Field (0.5 mi to the northwest), Brooklyn's Marine Park (1.1 mi to the northwest), Fort Tilden (0.9 mi to the south), Jacob Riis Park (0.9 mi to the southeast), and the Jamaica Bay Wildlife Refuge (1.6 mi to the northeast). The Gateway National Recreation Area also includes the waters surrounding Barren Island.

Barren Island has a long history of development and disturbance. During the 17th century, Dutch settlers built mills to utilize power derived from changing tides to grind wheat into flour. The nearby Dead Horse Bay received its name from the thousands of dead horses and other animals that were processed into glue and fertilizer on the island annually, from the 1850s through the 1920s. During this time, Barren Island was also a destination for refuse from Manhattan, Brooklyn, and the Bronx. In 1926, Barren Island was connected to the Brooklyn mainland when a series of marsh islands were filled using refuse and sand, upon which Floyd Bennett Field was later built. In the 1950s, a landfill cap burst, allowing the refuse contained within the landfill to escape. Today, Barren Island, Marine Park, Fort Tilden, Jacob Riis Park, the Jamaica Bay Wildlife Refuge, and the parks surrounding the Jamaica Bay Wildlife Refuge provide the majority of undeveloped land within a 7-mile radius of the Reserve Center.

4.2.2 Other Projects at MARFORRES Center and Surrounding Areas

Other projects are currently planned at the MARFORRES Center include the construction of a cellular tower and an additional vehicle maintenance facility. The Marine Infantry Battalion at Garden City, NY will also be moved to the MARFORRES Center which would involve additional construction, although construction details are unspecified at this time.

The surrounding Gateway National Recreation Area is the subject of multiple-agency planning, conservation, restoration, and recreation-enhancing activities (NYCDEP 2007; NPS 2012). Among many proposals under consideration is the establishment of the Jamaica Bay Science and Resilience Center, possibly at Floyd Bennett Field. In general, these planning efforts maximize the protection and enhancement of existing natural areas while improving public access and enjoyment.

4.2.3 Other Wind Energy Projects within New York

New York State ranks 12th in the country in terms of installed wind energy capacity and 15th in terms of potential capacity. Currently, more than 800 turbines within the state produce a total of 1,418 MW of electricity (AWEA 2010, 2012).

Table 4-1 presents a summary of existing, proposed, and under-construction wind farms in New York State. Within New York state, the closest existing wind energy development is the 66-MW Moresville Energy Center located near the town of Roxbury, more than 120 mi from the proposed project; there are no existing or proposed onshore wind energy projects within Kings County or its neighboring counties (NYSDEC 2012b). The proposed Long Island-New York City Offshore Wind Energy project (http://www.linycoffshorewind.com/faq.html) would be directionally aligned southwest of the Rockaway Peninsula with its westerly most point approximately 14 nautical miles (13 to 15 standard miles) due south of Nassau County. If approved, 70 turbines producing up to 300 MW would be installed, with the ability to expand the project to 700 MW. In addition to the projects identified in Table 4-1, MARFORRES Center, Brooklyn, located approximately 200 miles to the southeast, is also investigating the construction of three 50-kW wind turbines under the MARFORRES Wind Energy Program.

In 2004, the New York Public Service Commission (NYPSC) adopted a Renewable Portfolio Standard (RPS) that would increase the percentage of renewable energy generated in New York state from 19.3% of total electricity produced to 25% by 2013. In January of 2010, the NYPSC expanded and extended the RPS to 30% by 2015. At present, New York obtains approximately 24% of its electricity from renewable resources (New York State Energy Research and Development Authority 2012b). As such, development of wind resources is likely to continue throughout the state.

Table 4-1. Summary of Wind Energy Projects in New York State

Development Stage	*Number of Projects*	*Total MW*
Existing	21	1,418
Under Review	12	1,236.2
Under Construction	1	216
Construction on Hold	8	621.5
Total	**42**	**3,491.7**

Sources: AWEA 2012, NYSDEC 2012b, Long Island-New York City Offshore Wind Project 2012.

4.3 RESOURCE SPECIFIC IMPACTS

4.3.1 Land Use

Land use impacts from the proposed action would be relatively small (approximately 0.81 acre permanent and 1.34 acres total [both permanent and temporary]) within the boundaries of the Reserve Center, would not adversely impact the facility's mission or essential activities, and would be insignificant. Furthermore, development of the site would not affect adjacent public or private lands or activities, including the residential area to the west. Past, present, and reasonably foreseeable projects are or would be separated geographically or temporally from the proposed project. As a result, there would be no potential cumulative impact for land use.

4.3.2 Noise

Based on the minimal impacts of the proposed action on noise (Section 3.3), the previous level of development at and around the Reserve Center, and the minimal other actions within the vicinity, there would be little to no potential for the project to add to the cumulative effects that may occur elsewhere, and cumulative impacts would not be significant.

4.3.3 Geological Resources

Impacts on geology and soils would be localized to the immediate area of a site and would be controlled through application of BMPs. As a result, the effect on local geological resources outside of the project site footprint would be negligible or minor, and there would be no potential for cumulative impacts.

4.3.4 Water Resources

Similar to the situation for geology and soils, any impact on water resources would be localized to the immediate area of a site and would be controlled through the application of BMPs. As a result, the effect on local water resources would be negligible or minor, with minor cumulative impacts.

4.3.5 Biological Resources

Since most birds and bats that would occur at the project site are migratory, individuals as well as the population of a given species may be affected by multiple actions in different locations at different times. Hence the potential exists for cumulative impacts.

The proposed action would entail a small loss of habitat which would not contribute to a significant cumulative impact given the protection and enhancement of habitat in the surrounding Gateway National Recreation Area. The level of bird mortality anticipated would be to common species and is so low that no cumulative effects due to surrounding land uses or regional wind energy development would be anticipated.

Mortality from white-nose syndrome (WNS) has decimated populations of several hibernating bat species in the Northeast making them more vulnerable to incremental, cumulative impacts. Long-term population trends and the likelihood of persistence or future declines leading to extinction differ markedly between species. Among the species found at the project site, those suffering the largest population declines and/or having the greatest vulnerability are little brown bat, tri-colored bat (eastern pipistrelle), and northern long-eared myotis (Langwig et al. 2012); none of these species was common in the acoustic surveys. As for birds, the level of mortality associated with the proposed action, affecting common species, would be so low as to make combined cumulative effects with surrounding land uses and regional wind energy development very unlikely.

4.3.6 Cultural Resources

The proposed action would not have significant impacts on the cultural resources of the region or the local area. As there are no known archaeological sites within the APE of the proposed turbines and their associated facilities, the proposed action would have no effect on the archaeological record of the region. The proposed wind turbines would also have no significant indirect or cumulative impact to any historic property within the APE. The New York SHPO's conclusion that there would be no effect on historic properties is included in Appendix B. Given the use of the site and previous investigations summarized in Section 3.7, the potential for intact cultural deposits is extremely low, and the provision for incidental discovery provides further assurance that in the unlikely event of a discovery, any impact would be minor. Hence there is little or no potential for a cumulative impact to cultural resources.

4.3.7 Visual Resources

Being relatively small and located within the interior of the MARFORRES Center, the proposed turbines would have minor visual impacts. Views from surrounding areas are limited by the mix of trees and structures, and manmade features (buildings, utilities, etc.) are already prominent. Hence cumulative visual effects from the proposed action in combination with other tall structures associated with past, present, or future projects in the region are unlikely to occur.

4.3.8 Socioeconomics

The socioeconomic impacts of small-scale wind energy projects would be small, but beneficial in terms of local employment. No adverse socioeconomic impacts on disadvantaged groups, neighborhoods, or children are anticipated. As a result, no cumulative socioeconomic impacts would occur

4.3.9 Air Quality

Air quality impacts from the proposed wind energy site would be negligible. Potential cumulative impacts on air quality would be beneficial as net GHG emissions would be reduced. Cumulative air quality benefits include reducing the rate of climate change and reducing the emissions associated with the extraction, importation, and burning of fossil fuels for power generation. As a result, there would be a slight beneficial cumulative impact for air quality.

4.3.10 Utilities

Potential cumulative impacts on utilities would be addressed through implementation of an Interconnect Agreement between MARFORRES and Consolidated Edison. This coordination with the local utility and implementation of its requirements for new wind power connections to the grid would ensure that adverse cumulative impacts do not occur.

4.3.11 Airspace

As discussed in Section 3.12, the project action would not affect air traffic and is not expected to have any effect on radar and other transmission or reception of electromagnetic signals. Hence, there are no potential cumulative impacts.

4.3.12 Health and Safety

Based on the minimal impacts of the proposed action on Health and Safety (Section 3.13) and the minimal other actions within the vicinity, there would be little to no potential for the project to add to the cumulative effects that may occur elsewhere, and cumulative impacts would not be significant.

4.3.13 Hazardous Materials

Construction, operation, and maintenance of wind turbines would involve the use of small quantities of hazardous materials and generation of hazardous wastes. However, appropriate procedures for the handling, storage, and disposal of hazardous materials and wastes would be implemented under the proposed action in accordance with Resource Conservation and Recovery Act and other applicable federal, state, and local regulations. As a result, the impacts from hazardous materials would be negligible or minor at each site and there would be little to no potential cumulative impacts.

4.3.14 Transportation

Based on the minimal impacts of the proposed action on Transportation (Section 3.15) and the minimal other actions within the vicinity, there would be little to no potential for the project to add to the cumulative effects that may occur elsewhere, and cumulative impacts would not be significant.

CHAPTER 5
OTHER CONSIDERATIONS REQUIRED BY NEPA

5.1 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF NATURAL OR FINITE RESOURCES

The proposed action would involve a relatively small commitment of land which is already developed, raw materials used in the manufacture of the turbine, and fuel consumed during construction. Operation of the turbine would reduce demand on the local utility grid which in turn would lessen the consumption of natural resources used in generating power, as well as incrementally reducing the need for expanded or new sources of energy in this rapidly growing region. The proposed action would not entail irreversible/irretrievable commitments of natural or cultural resources.

5.2 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE OF THE HUMAN ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM NATURAL RESOURCE PRODUCTIVITY

The siting and design process and the consideration of alternatives for the proposed action resulted in a project location and design that would have minimal impacts on the human and natural environment or future uses of the land and resources, and would not diminish long-term natural resource productivity. By reducing the consumption of natural resources used in power generation, the proposed action would contribute to the maintenance and enhancement of natural resource productivity.

5.3 MEANS TO MITIGATE AND/OR MONITOR ADVERSE ENVIRONMENTAL IMPACTS

The siting and design of the proposed action, specifically the placement of three small (50-kW) turbines within the already developed area of the MARFORRES facilities minimizes the potential for impacts consistent with the Programmatic EA (MARFORRES 2011). BMPs as presented in Section 2.3.2 further reduce the potential short-term impacts of construction. Mortality to birds and bats is expected to be on the order of approximately one individual bird and bat per year, which would be very difficult to detect except with a very labor-intensive monitoring program, which the impact does not warrant.

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CHAPTER 7
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APPENDIX A
AIR QUALITY CALCULATIONS AND RECORD OF NON-APPLICABILITY (RONA)

RECORD OF NON-APPLICABILITY (RONA) FOR CLEAN AIR ACT CONFORMITY

United States Marine Corps Forces Reserve Wind Energy Program Site: Marine Forces Reserve Center, Brooklyn, NY

INTRODUCTION

The U.S. Environmental Protection Agency (USEPA) published *Determining Conformity of General Federal Actions to State or Federal Implementation Plans; Final Rule*, in the 30 November 1993, Federal Register (40 CFR Parts 6, 51, and 93). The U.S. Navy published *Interim Guidance on Compliance with the Clean Air Act General Conformity Rule* in Appendix F, OPNAVINST 5090.1C, dated 30 October 2007. These publications provide implementing guidance to document Clean Air Act Conformity Determination requirements.

Federal regulations state that no department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license to permit, or approve any activity that does not conform to an applicable implementation plan. It is the responsibility of the Federal agency to determine whether a Federal action conforms to the applicable implementation plan, before the action is taken (40 CFR Part 1 51.850[a]).

The general conformity rule applies to federal actions proposed within areas which are designated as either nonattainment or maintenance areas for a National Ambient Air Quality Standard (NAAQS) for any of the criteria pollutants. Former nonattainment areas that have attained a NAAQS are designated as maintenance areas. Emissions of pollutants for which an area is in attainment are exempt from conformity analyses.

Brooklyn, NY is located within Kings County, and which is part of the New York - northern New Jersey – Long Island area for determining conformance with the NAAQS (US EPA 2012a). Kings County was designated a moderate maintenance area for 8-hour O_3 in 1997 and redesignated as a marginal maintenance area for 8-hour O_3 in 2008. The county was found to be in nonattainment for the $PM_{2.5}$ NAAQS in 1997 and then again in 2006.

The annual *de minimis* levels for this region are listed in Table 1. Federal actions may be exempt from conformity determinations if they do not exceed designated *de minimis* levels (40 CFR Part 1, Section 51.853[b]).

Table 1. *De minimis* Levels for Criteria Pollutants in the Project Area

Criteria Pollutant	*de minimis* Level (tons/year)
O_3	100 (NO_x or VOCs)
$PM_{2.5}$	100
CO	100

PROPOSED ACTION

Action Proponent: United States Marine Corps Forces Reserve

Location: Marine Forces Reserve Center, Brooklyn, NY

Proposed Action Name: United States Marine Corps Forces Reserve Wind Energy Program Site: Marine Forces Reserve Center, Brooklyn, NY

Proposed Action Summary: This project is tiered from the Programmatic EA for the Marine Forces Reserve (*MARFORRES) Wind Energy Program*. The proposed action is to develop wind energy at MARFORRES Center, Brooklyn, NY under the *MARFORRES Wind Energy Program*. Implementation of the proposed action would involve the installation and operation of three 50-kilowatt (kW) wind turbines consistent with the program criteria specified in the Programmatic EA.

Air Emissions Summary: Emission sources associated with the proposed action would involve construction and operation of the three 50-kW wind turbines. Consistent with the Programmatic EA for the *MARFORRES Wind Energy Program,* the construction footprint for three small turbines would be approximately 0.32 acre and the use of heavy equipment during construction would be approximately 1 month (30 days). Estimated construction emissions due to implementation of the proposed action are shown in Table 2. Based on the air quality analysis for the proposed action, the maximum estimated construction emissions would be below conformity *de minimis* levels (Table 2).

Table 2. Estimated Emissions Resulting from Implementation of the Proposed Action

Estimated Construction Emissions (duration 1 month)	***Emissions (tons/year)***					
	CO	***VOCs***	***NO_x***	***SO_x***	***PM_{10}***	***$PM_{2.5}$***
Three Small (50-kV) Turbines	1.58	0.39	3.41	0.00	0.28	0.17
de minimis threshold	100	100	100	NA	NA	100
Exceeds *de minimis* threshold?	No	No	No	No	No	No

Note: [1] Kings County is a maintenance area for O_3, is a moderate maintenance area for CO, is in nonattainment for $PM_{2.5}$, and is in attainment for all other criteria pollutants. *De minimis* thresholds to not apply to attainment areas. NA= not applicable.

Source: USEPA 2012b.

Operations and maintenance of the turbine would typically consist of two to three people who would visit the site approximately six times per year. These visits would consist of maintenance personnel driving a vehicle to and around the site. Emissions associated with these activities would be minimal and short-term and would not result in a major increase in air emissions.

One of the most important benefits of wind energy is that the production of electricity from wind power involves zero direct emissions of air pollutants. The energy output generated from wind turbines, with zero emissions of air pollutants, would displace roughly the same energy output that would otherwise be generated by a fossil fuel-powered plant, which generates greenhouse gases and other harmful air pollutants. Table 3 includes the typical energy output under the proposed action, which amounts to the electricity savings per year that would no longer need to be generated by a fossil fuel-powered plant (coal, oil, or natural gas).

Table 3. Range of Energy Output under the Proposed Action

Proposed Action	*Energy Output (MWh/yr)*
Three 50-kW Turbines	264 – 1320

Therefore, operational activities associated with the proposed action would result in beneficial impacts to air quality by adding wind energy to the utility grid and replacing or reducing the use of fossil fuel-powered plants with more efficient and flexible types of power generation.

Affected Air Basin: AQCR 43 – New York-Northern New Jersey-Long Island Air Quality Control Region

Date RONA prepared: 3 September 2012

RONA Prepared By: United States Marine Corps Forces Reserve with direct support from Cardno TEC, Inc.

ATTAINMENT AREA STATUS AND EMISSIONS EVALUATION CONCLUSION

Kings County is considered a moderate maintenance area for the O_3, is a moderate maintenance area for CO, is in nonattainment for the $PM_{2.5}$ NAAQS, and attains the NAAQS for all other criteria pollutants.

The United States Marine Corps Forces Reserve concludes that *de minimis* thresholds for applicable criteria pollutants would not be exceeded as a result of implementation of the proposed action. The emissions data supporting that conclusion is shown in Table 2, which is a summary of the calculations, methodology, and data provided in Attachment A. Therefore, the United States Marine Corps Forces Reserve concludes that further formal Conformity Determination procedures are not required, resulting in this Record of Non-Applicability (RONA) for Clean Air Act Conformity.

RONA APPROVAL

To the best of my knowledge, the information presented in this RONA is correct and accurate, and I concur in the finding that the proposed action does not require a formal Clean Air Act Conformity Determination.

_____ _____

NAME Date

REFERENCES

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SMALL TURBINE: CONSTRUCTION EMISSIONS SUMMARY

Emissions	Emissions (tons)							
	CO	**VOC**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**	**CH_4**
Three Small Turbines	1.58	0.39	3.41	0.00	0.28	0.17	341.72	0.03

SMALL TURBINE: GHG EMISSIONS SUMMARY

Emissions	Emissions (Metric tons/year)			
	CO_2	**CH_4**	**N_20**	**CO_{2e}**
Three Small Turbines	310.00	0.03	0.29	402

Notes:

Conversion to Metrix Tons = 1 short ton = 0.90718474 metric tons

$N_20 = NOx * 0.095$

$CO_{2e} = (CO_2*1)+ (CH_4*21)+(N_2O*310)$

Small Turbine

Construction duration is assumed to be 1 month per small turbine

Construction	Fuel	HP	Load Factor	Emission Factors, g/bhp-hr								No of Equipment	Hrs/day	Months	Emissions, lbs/day								Emissions, tons/year							
Equipment				**CO**	**VOC**	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO2**	**CH4**				**CO**	**VOC**	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO2**	**CH4**	**CO**	**VOC**	**NOx**	**SOx**	**PM10**	**PM2.5**	**CO2**	**CH4**
Tractor/Loader/Backhoe	Diesel	108	55	4.07	1.19	7.16	0.007	0.654	0.58206	568.3	0.108	6	4	1	12.79	3.74	22.50	0.02	2.06	1.83	1786.13	0.34	0.17	0.05	0.29	0.00	0.03	0.02	23.22	0.00
Dump Truck	Diesel	479	57	1.82	0.57	5.55	0.006	0.295	0.26255	568.3	0.051	3	4	1	13.15	4.12	40.09	0.04	2.13	1.90	4104.93	0.37	0.17	0.05	0.52	0.00	0.03	0.02	53.36	0.00
Water Truck	Diesel	250	50	1.82	0.57	5.55	0.006	0.295	0.26255	568.3	0.051	3	4	1	6.02	1.88	18.35	0.02	0.98	0.87	1879.34	0.17	0.08	0.02	0.24	0.00	0.01	0.01	24.43	0.00
Crane	Diesel	399	43	2.44	0.63	6.27	0.006	0.243	0.21627	568.3	0.053	3	4	1	11.08	2.86	28.46	0.03	1.10	0.98	2579.51	0.24	0.14	0.04	0.37	0.00	0.01	0.01	33.53	0.00
Rough Terrain Forklift	Diesel	93	60	4.14	1.28	7.55	0.007	0.69	0.6141	568.3	0.115	3	4	1	6.11	1.89	11.15	0.01	1.02	0.91	838.94	0.17	0.08	0.02	0.14	0.00	0.01	0.01	10.91	0.00
Excavator	Diesel	168	57	2.19	0.59	6.15	0.006	0.229	0.20381	568.3	0.053	3	4	1	5.55	1.49	15.58	0.02	0.58	0.52	1439.73	0.13	0.07	0.02	0.20	0.00	0.01	0.01	18.72	0.00
Crawler	Diesel	157	57.5	2.19	0.59	6.15	0.006	0.229	0.20381	568.3	0.053	3	4	1	5.23	1.41	14.69	0.01	0.55	0.49	1357.26	0.13	0.07	0.02	0.19	0.00	0.01	0.01	17.64	0.00
Bobcat	Diesel	44	55	6.07	2.25	5.68	0.007	0.578	0.51442	568.3	0.203	3	4	1	3.89	1.44	3.64	0.00	0.37	0.33	363.84	0.13	0.05	0.02	0.05	0.00	0.00	0.00	4.73	0.00
Drill Rig	Diesel	291	75	3.16	0.7	6.71	0.006	0.271	0.24119	568.3	0.063	3	4	1	18.25	4.04	38.74	0.03	1.56	1.39	3281.33	0.36	0.24	0.05	0.50	0.00	0.02	0.02	42.66	0.00
Trencher	Diesel	63	75	4.35	1.47	8.72	0.007	0.734	0.65326	568.3	0.133	3	2	1	2.72	0.92	5.45	0.00	0.46	0.41	355.20	0.08	0.04	0.01	0.07	0.00	0.01	0.01	4.62	0.00
Compactor	Diesel	8	43	3.47	0.68	4.33	0.009	0.274	0.24386	568.3	0.061	3	2	1	0.16	0.03	0.20	0.00	0.01	0.01	25.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.00
Compressor	Diesel	106	48	4.08	1.32	7.76	0.007	0.686	0.61054	568.3	0.119	3	4	1	5.49	1.78	10.45	0.01	0.92	0.82	764.97	0.16	0.07	0.02	0.14	0.00	0.01	0.01	9.94	0.00
Concrete Truck/Pump Truck	Diesel	210	20	1.82	0.57	5.55	0.006	0.295	0.26255	568.3	0.051	3	4	1	2.02	0.63	6.17	0.01	0.33	0.29	631.46	0.06	0.03	0.01	0.08	0.00	0.00	0.00	8.21	0.00
												TOTAL for 3 Small Turbines			**92.44**	**26.24**	**215.46**	**0.21**	**12.07**	**10.74**	**19408.47**	**2.34**	**1.20**	**0.34**	**2.80**	**0.00**	**0.16**	**0.14**	**252.31**	**0.03**

Small Turbine

Proj. Construction Trucks	No. of Trucks	Speed (mph)	VMT (mi/vehicle-day)	CO Running Exhaust (g/mi)	NO_X Running Exhaust (g/mi)	VOC Running Exhaust (g/mi)	SOx Running Exhaust (g/mi)	PM10 Running Exhaust (g/mi)	PM10 Tire Wear (g/mi)	PM10 Brake Wear (g/mi)	PM2.5 Running Exhaust (g/mi)	PM2.5 Tire Wear (g/mi)	PM2.5 Brake Wear (g/mi)	CO2 Running Exhaust (g/mi)	CH4 Running Exhaust (g/mi)
Heavy-duty diesel trucks	30	27	40	6.303	17.209	1.262	0.019	0.713	0.036	0.028	0.656	0.009	0.012	1992.669	0.059
			Emissions, lbs/day											**Emissions, tons/year**	
CO	NOx	VOCs	SOx	PM10	PM2.5	CO2	CH4	CO	NOx	VOCs	SOx	PM10	PM2.5	CO2	CH4
16.67	**45.53**	**3.34**	**0.05**	**2.06**	**1.79**	**5271.73**	**0.16**	**0.22**	**0.59**	**0.04**	**0.00**	**0.03**	**0.02**	**68.53**	**0.00**
						Total 3 Small Turbines =		**0.22**	**0.59**	**0.04**	**0.00**	**0.03**	**0.02**	**68.53**	**0.00**

Unpaved Road Emissions		**PM10**	**PM2.5**
E = k(s/12)^a(W/3)^b	k	1.5	0.15
Assume s = 8.5	a	0.9	0.9
Assume W = 10	b	0.45	0.45
Assume 5 miles of travel per vehicle per day			
Emission Factor		1.8906	0.189060415
Control Efficiency		61%	61%
Emissions, lbs/day		7.5783	0.660300553
1 Small Turbine (emissions, tons/year) =		**0.10**	**0.01**

Small Turbine

Vehicle Class	No. POVs	Speed (mph)	VMT (mi/vehicle-day)	CO		NO_X		VOCs					
				Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Hot-Soak (g/trip)	Resting Loss (g/hr)	Running Evaporative (g/mi)	Diurnal Evaporative (g/hr)
Light-duty truck, catalyst	45	33	40	2.924	11.289	0.284	0.56	0.055	0.816	0.183	0.024	0.047	0.054

Vehicle Class	SOx		PM10				PM2.5				CO2		CH4	
	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Tire Wear (g/mi)	Brake Wear (g/mi)	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Tire Wear (g/mi)	Brake Wear (g/mi)	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]
Light-duty truck, catalyst	0.004	0.002	0.013	0.016	0.008	0.013	0.011	0.014	0.002	0.005	399.538	203.967	0.027	0.046

Emissions, lbs/day								Emissions, tons/year							
CO	NOx	VOCs	SOx	PM10	PM2.5	CO2	CH4	CO	NOx	VOCs	SOx	PM10	PM2.5	CO2	CH4
12.72	1.18	0.59	0.02	0.14	0.07	1605.7	0.11	0.17	0.02	0.01	0.00	0.00	0.00	20.87	0.00
Total 3 Small Turbines =								0.17	0.02	0.01	0.00	0.00	0.00	20.87	0.00

Energy Output (MWh/yr)	Low Range	High Range
Small (0.1-MW)	264	1320

APPENDIX B
CORRESPONDENCE

U.S. Fish and Wildlife Service

New York State Office of Parks, Recreation and Historic Preservation, Division for Historic Preservation

New York State Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources

Federal Aviation Administration

New York State Department of State, Office of Coastal, Local Government and Community Sustainability

United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

January 24, 2013

Mr. Edward Maguire
United States Marine Corps
Marine Forces Reserve
2000 Opelousas Avenue
New Orleans, LA 70146-5400

Attention: Alain Flexer

Dear Mr. Maguire:

This is the report submitted by the U.S. Fish and Wildlife Service (Service) Service pursuant to, and in accordance with, provisions of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*). The Service has reviewed your United States Marine Corps (USMC) letter dated September 12, 2012, regarding the proposed construction of three wind turbines located at the Marine Corps Reserve Center at Floyd Bennett Field in Brooklyn, New York. The USMC requested Service concurrence with their determination in the above-referenced correspondence that the proposed construction and operation of three wind turbines on the subject property may affect, but is not likely to adversely affect, the federally-listed as threatened piping plover (*Charadrius melodus*), the federally-listed as endangered roseate tern (*Sterna dougallii*), and the federal candidate for listing, the red knot (*Calidris canutus rufa*).

Proposed Action

The USMC has proposed to construct and operate up to three wind turbines on their property located at Floyd Bennett Field. The proposed Polaris 50-kw turbines would have a hub height of approximately 70 feet (ft) (21.3 m) and rotor diameter of approximately 49 ft (15 m) for a combined height of approximately 98 ft (29.7 m). The minimum (cut-in) and maximum (cut-out) wind speeds at which the turbine generates usable power are approximately 5.6 miles per hour (mph) (2.5 m/s) and 55.9 mph (25 m/s), respectively, and the operational rotational speed is 68 revolutions per minute (rpm). Site preparation prior to construction would require clearing and grading an area of about 100 feet in diameter around each turbine location. This area will include equipment staging and lay-down areas required during construction. Following clearing and grading, construction of the turbines will begin with excavation for the turbine foundations.

The base of the turbines would be anchored to a spread foot foundation, an octagonal, concrete foundation 10 ft deep and fitting within a 57-ft by 57-ft square. Excavation of the foundations would be done by backhoe. Most of the foundation would be buried, with only the pedestal, to which the turbine base would be attached, being above ground. In addition to the concrete foundation, a 20-ft wide gravel area would surround the base of the turbine.

The three proposed turbines are proposed to occur in the south central portion of the site, approximately 300 feet apart from each other, at distances from the Rockaway Inlet shoreline of approximately 100 feet, 400 feet, and 700 feet.

Presence of Federally-Listed Species in Project Area

Piping Plover

Plovers are present within the New York Metropolitan area/project vicinity to breed from the time they arrive from southerly wintering areas in March until departure to wintering grounds in July-September. There are no records of piping plover breeding on the project site since this site, which consists primarily of upland grassland/shrubland and historic buildings, associated infrastructure, and bulkheaded shoreline along Rockaway Inlet, does not provide suitable breeding habitat (sparsely vegetated coastal beaches) for this species. No piping plovers were observed during USMC-funded surveys of the project site in 2010-2011.

The piping plover breeds along the Atlantic Ocean beaches on the Rockaway peninsula to the south and west of the project site and Rockaway Inlet on National Park Service Gateway National Recreation Area (GNRA) and private beach community property. Specifically, plovers regularly breed within the Fort Tilden (located approximately 2 miles southwest of the project site) and Breezy Point (located approximately 3 miles southwest of the project site) Units of the GNRA, and within the Breezy Point Cooperative private beach community (located approximately 2.5 miles southwest of the project site). The National Park Service and volunteers monitor and manage GNRA sites for piping plovers while the Breezy Point Cooperative, with assistance from the Service, monitors and manages the Co-op property. Management includes the installation of symbolic fencing (fence-posts connected by flagged string) to protect breeding areas each year. A total of 17 pair of plovers bred on GNRA property in 2012, which is within the typical range of plover abundance for this site over the past five years (17 pair in 2008 and a low of 14 pair in 2009). At the Breezy Point Cooperative, 15 pair bred on the property in 2012, which is also within the typical range of plover abundance for this site over the last five years (a high of 15 pair in 2012 and a low of 10 pair in 2011).

Piping plovers forage in intertidal portions of ocean beaches, mud and sand flats, wrack lines, and shorelines of salt marshes (USFWS 1996). Bulkheaded shorelines do not provide optimal foraging habitat for shorebirds, including plovers, since they are generally void of an intertidal zone and associated wrack-line; plovers prefer unobstructed views of the shoreline and adjacent uplands to be able to observe predators; and bulkheads provide perches for predators. However, as stated in the USMC correspondence, the beaches on the project site may support foraging piping plovers at low tide when the substrate is exposed. More suitable foraging habitat is present in the form of salt marsh shoreline and exposed sand/mud flats adjacent to breeding areas

on Rockaway Peninsula to the south and west of the project site or within the Jamaica Bay complex of numerous salt marsh islands located east and north of the project site (closest marsh is located approximately one mile east of the site).

Roseate Terns

Like the piping plover, there are no records of roseate tern breeding on the project site as this site does not provide suitable breeding habitat (small islands or sand dunes at ends of barrier islands) for this species. There are no recent observations of roseate tern breeding in the vicinity of the project site. Historic records (NYSDEC 2002) indicate that the roseate tern bred at GNRA Breezy Point Unit up to 1998, with no records of breeding since then. Additionally, no roseate terns were observed during USMC-funded surveys of the project site in 2010-2011 or during Service weekly surveys of the Breezy Point Cooperative during plover/tern breeding seasons over the last ten years.

Roseate terns prey on fish in shallow coastal waters close to their breeding colonies. As stated above, there are no breeding colonies in the vicinity of the project site. The closest roseate tern breeding colony documented in 2012 was the Grouts, a small island in Great South Bay, located approximately 25 miles to the east of the project site.

Red Knot

The red knot breeds in the Canadian arctic and winters mainly in Tierra del Fuego, northern Brazil, or Florida, and migrates through the project vicinity to and from its breeding sites in the spring and fall, feeding primarily on horseshoe crab eggs (New Jersey Department of Environmental Protection 2007). Bulkheading either completely eliminates intertidal sand beach habitat or sufficiently alters the sediment quality and beach morphology to negatively affect the suitability of the remaining habitat for horseshoe crab spawning and red knot foraging (New Jersey Department of Environmental Protection 2007). As such, the Service agrees with the USMC's determination that, although not ideal habitat, the shoreline within the project may support red knots during migration for foraging or resting/loafing, but that no suitable habitat is located in the footprint of the actual project area. Red knots were observed along the shoreline of the project area during USMC-funded avian surveys in 2010-2011.

The red knot was designated as a candidate species for possible addition to the federal list of threatened and endangered species in 2006. A candidate species is one for which the Service has on file sufficient information on biological vulnerability and threats to support a proposal to list as threatened or endangered, but for which preparation and publication of a proposal is precluded by higher priority listing actions (February 28, 1996 Federal Register, p. 7597). Although candidate species receive no substantive or procedural protection under the ESA until formal listing, the Service encourages consideration of candidate species in project planning. Accordingly, the following ESA consultation concurrence determination does not include the red knot. Should the red knot be added to the federal list of threatened and endangered species, this species shall be included in any future ESA consultation for this project.

Potential Project Impacts

The Service agrees with the USMC that the areas within the project footprint do not provide suitable habitat for federally-listed species. However, there is the potential for piping plovers to collide with the proposed turbines as they migrate between foraging areas in Jamaica Bay and breeding areas along the Rockaway Peninsula during this species' breeding season (March-September). Although there are no recent records of roseate tern breeding within the project vicinity, there is the potential for an occasional transient to collide with the turbines while passing through the area as well.

The USMC indicated that the rotor-sweep zone for the three turbines is approximately 45 to 98 feet. Plover adult flights within breeding habitats or between nesting or brood-rearing areas and nearby intertidal sand or mudflats are usually low to the ground, less than 50 feet (USFWS 2008). Additionally, previous studies of plover movements on other sites and observations of plovers breeding on the Rockaway Peninsula indicate that foraging areas are generally contiguous to nesting territories. Data suggest that this behavior conserves energy, thus reducing the time and energy expenditure needed to provision themselves and their chicks, and facilitates the availability of non-incubating adults for nest-defense against predators (USFWS 2008). Suitable foraging habitats (ephemeral pools, wrack lines, shorelines of salt marshes, sand/mud flats) are located adjacent to breeding areas at GNRA and Breezy Point Co-op on the Rockaway Peninsula. While the potential for plovers to fly over the upland portions of the project site exists, the presence of suitable foraging habitats along the Rockaway Peninsula and the typical behavior of the species suggest that the likelihood of such fly-overs is low.

Regarding roseate terns, boat surveys conducted in 2003 and 2004 in Nantucket Sound, Massachusetts, found that average common (*Sterna hirundo*) and roseate tern foraging flights were an average of 29 feet above the water (USFWS 2008). Although these observations were over water, these findings give some indication of roseate tern flights patterns in coastal areas. Additionally, roseate terns usually feed in clear, deep water and rarely feed close to shore or in marshy inlets like those present in Jamaica Bay (USFWS 1998).

Conservation Measures

In their September 24, 2012, correspondence, the USMC provided conservation measures/mitigation in their determination, including post-construction surveys. The Service will coordinate with the USMC in development of a specific post-construction monitoring plan. This plan will include aspects of survey design, timing, and frequency and will be reviewed and approved by the Service prior to project operation. Among the proposed conservation measures are:

- Conduct one year of post-construction mortality surveys after operation of the turbine begins to assess the impacts to the listed species and other birds and bats. The survey methodology will be reviewed and approved by the Service prior to implementation. Submit post-mortality survey results every three months during surveys.
- Immediately contact the Service if any listed species is injured or killed during operations.

- Turbines will not have guide wires.
- All power lines for the turbines will be buried.
- Only red or dual red and white strobe or flashing lights will be used to illuminate.
- Lighting at operation and maintenance facilities near the turbines will not be illuminated at all times. These lights should be on motion sensors or switches to keep lights off when not required. This will minimize insect attraction.
- Lights will be hooded downward and directed to limit skyward illumination.

We note that there is a paucity of information regarding collision risk of small turbines (less than one megawatt) to birds and bats. Post-construction monitoring should focus on identifying the risk the turbines pose to species found in the project area. A rigorous study should consist of fatality searches over multiple seasons and years to account for variation in avian and bat use of the turbine rotor swept zone at a frequency that ensures that carcasses will not be missed due to scavenging. Recent research indicates that bats may be attracted to turbines, thereby increasing collision risk (Arnett et al. 2008). Research has also shown that raising the cut-in speed (the point at which the blades start generating electricity) can reduce bat fatalities (Baerwald et al. 2009 and Arnett et al. 2011) from 44 to 93 percent. We encourage the USMC to consider raising the cut-in speed of the proposed turbines to when winds reach at least 5 meters/second to reduce bat mortality during operation at night. The Service will provide additional recommendations after our review of the post-construction monitoring protocols.

Conclusion

The USMC has included conservation measures as part of the project description that will minimize the likelihood of adverse effects to federally-listed species. The turbines will have no guide wires; all power lines will be buried and the lighting of the turbines has been designed to minimize the likelihood of bird collisions.

As stated above, piping plovers forage and breed in the vicinity of the project site and may forage along the shoreline line of the site, but are not likely to breed or forage in the upland portion of the site where the project footprint occurs. Additionally, plovers usually forage in areas adjacent to breeding areas, which, in this case, would be along the Rockaway Peninsula. Furthermore, foraging plovers usually fly at heights below the rotor sweep zone of the turbines and generally fly along shorelines as opposed to across upland areas where the turbines are proposed. Regarding roseate terns, surveys on the project site and breeding surveys indicate that roseate terns are only occasional transients that are not likely to traverse the site.

The Service concurs with the USMC's determination that the proposed action may affect, but is not likely to adversely affect, the piping plover and roseate tern. At this time, no further consultation under the ESA is required with the Service. Further coordination shall continue as post-construction survey methodologies are developed and survey results are assessed.

Should project plans change, or if additional information on listed or proposed species or designated critical habitat becomes available this determination may be reconsidered. The most recent compilation of federally-listed and proposed endangered and threatened species in New York is available for your information. Until the proposed project is complete, we

recommend that you check our website every 90 days from the date of this letter to ensure that listed species presence/absence information for the proposed project is current.*

The USMC states that, "if post construction surveys determine higher than acceptable impacts to birds or bats that additional mitigation efforts will be recommended by the USMC and Service." Section 9 of the ESA prohibits the take** of federally-listed (threatened or endangered) wildlife. As such, there is no "acceptable impact" to federally-listed species. Accordingly, if take occurs, the USMC should immediately cease any activities that resulted in the take and request initiation of formal consultation pursuant to section 7 of the ESA.

For further information, please contact Steve Sinkevich of the Long Island Field Office at 631-286-0485 or Tim Sullivan at 607-753-9334.

Sincerely,

for Patricia Cole

David A. Stillwell
Field Supervisor

*Additional information referred to above may be found on our website at: http://www.fws.gov/northeast/nyfo/es/section7.htm

**"Take" is defined in Section 3 of the ESA as "harm, harass, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." "Harm" is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. "Harass" is defined by the Service as an intentional or negligent act or omission which creates a likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3).

References

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U.S. Fish and Wildlife Service. 2008. Final Biological Opinion, Cape Wind Assoc.., LLC, Wind Energy Project, Nantucket Sound, MA. Formal Consultation #08-F-0323. New England Field Office, Concord, NH.

cc: U.S. Navy, Norfolk, VA (P. Block)
NYSDEC, Long Island City, NY (J. Pane)
National Park Service, Gateway National Recreation Area, Staten Island, NY (D. Adamo)

Andrew M. Cuomo
Governor

Rose Harvey
Commissioner

New York State Office of Parks, Recreation and Historic Preservation

Division for Historic Preservation
Peebles Island, PO Box 189, Waterford, New York 12188-0189
518-237-8643
www.nysparks.com

December 26, 2012

Alain Flexer, Esq.
Facilities/Energy
Marine Forces Reserve
2000 Opelousas Ave
New Orleans, New York 70146-5400
(via e-mail)

Re: DOD
Proposed Wind Turbines
US Marine Corps Marine Forces Reserve (MARFORRES)
MARFORRES Reserve Training Ctr. at Floyd Bennett Field,
Brooklyn, Kings County
12PR03629

Dear Mr. Flexer, Esq.:

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have reviewed the project in accordance with Section 106 of the National Historic Preservation Act of 1966. These comments are those of the SHPO and relate only to Historic/Cultural resources. They do not include potential environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the National Environmental Policy Act and/or the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8).

Thank you for the additional information including the requested photo simulations. The project site is located adjacent to the Floyd Bennett Field/Naval Air Station National Register District and within the proposed Floyd Bennett Field Historic District Boundary Increase that NPS has proposed. We understand that the proposed project includes three 50 kW wind turbines (93 feet in total height) and associated electrical infrastructure required for converting wind energy into electricity for use by the MARFORRES Center. We note that previous radar installations and multiple radio towers in excess of 100 feet tall are located at Floyd Bennett Field. Based upon this review, it is the SHPO's opinion that your project will have No Adverse Effect upon cultural resources in or eligible for inclusion in the National Registers of Historic Places.

If there are substantive changes to the project, consultation with our office should resume. If further correspondence is required regarding this project, I can be reached at (518) 237-8643, ext. 3260 or at eric.kuchar@parks.ny.gov. Please be sure to refer to the OPRHP Project Review (PR) number noted above.

Sincerely,

Eric N. Kuchar
Weatherization Specialist

November 30, 2012

Eric N. Kuchar
Weatherization Specialist
New York State Office of Parks, Recreation and Historic Preservation
Division for Historic Preservation
Peebles Island, PO Box 189, Waterford, New York 12188-0189

Re: DOD
Proposed Wind Turbines
US Marine Corps Marine Forces Reserve (MARFORRES)
MARFORRES Reserve Training Ctr. At
Floyd Bennett Field, Brooklyn, Kings County
12PR03629

Dear Mr. Kuchar,

This letter is in response to the 19 September 2012 request for additional visual simulations from three new locations. Due to closures related Hurricane Sandy and ongoing cleanup, obtaining images from the locations identified in your letter was not possible. As such, an internet search was conducted for location-specific imagery. Figure 1 provides the locations of the visual simulations and the proposed wind turbines.

Figure 2 simulates the appearance of the turbines from the center of the Memorial Parkway Bridge. Figure 3 simulates the appearance of the turbines from the coastline near the northwest corner of Jacob Riis Park. The existing 200-ft meteorological tower, located within the project area, is visible when viewed electronically but may not show up on a hard copy.

No usable imagery was available from the Ryan Visitor Center Control Tower. As such, a simulation of the landscape using a digital elevation model was employed (Figure 4). This figure approximates the view as it would be seen by a human eye, assuming the turbines are not screened by buildings, trees, or other objects. The existing 200-ft meteorological tower is also simulated. The JFK Terminal Doppler Weather Radar (TDWR) is not within the same field of view but is approximately the same distance from the Ryan Visitor Center Control Tower as the middle proposed turbine. The TDWR is 20 feet taller than the proposed turbines (hub and blade combined) and is significantly more massive.

We believe these simulations further support our previous conclusion that the project would have no effect on historic properties.

Figure 1. Locations of the visual simulations (red) and the proposed wind turbines (yellow)

Figure 2. View from the center of the Marine Parkway Bridge with simulated turbines (0.45 mi)

Figure 3. View from the shoreline near the northwestern corner of Jacob Riis Park with simulated turbines (0.85 mi)

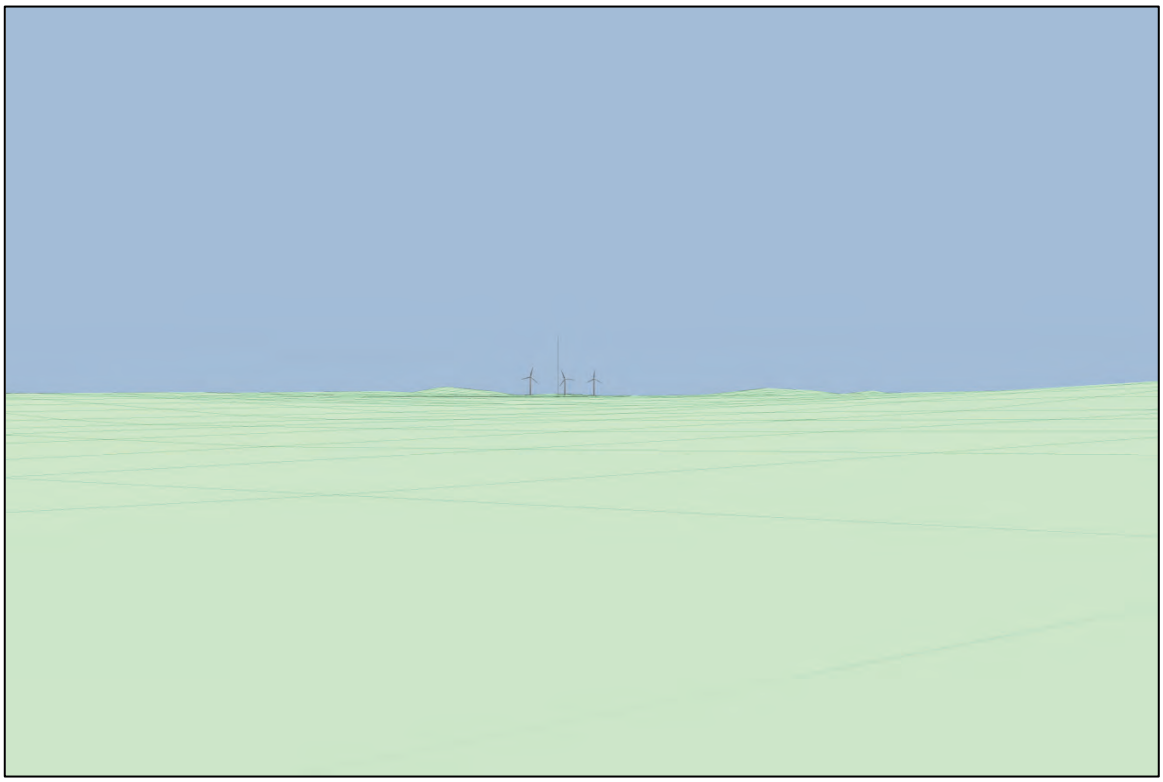


Figure 4. Simulated view from the Ryan Visitor Center Control Tower with simulated turbines (0.85 mi)

Andrew M. Cuomo
Governor

Rose Harvey
Commissioner

New York State Office of Parks, Recreation and Historic Preservation

Division for Historic Preservation
Peebles Island, PO Box 189, Waterford, New York 12188-0189
518-237-8643
www.nysparks.com

September 19, 2012

Alain Flexer,
Facilities/Energy
Marine Forces Reserve
2000 Opelousas Avenue
New Orleans, Louisiana 70146-5400

Re: DOD
Proposed Wind Turbines
US Marine Corps Marine Forces Reserve (MARFORRES)
MARFORRES Reserve Training Ctr. at
Floyd Bennett Field, Brooklyn, Kings County
12PR03629

Dear Mr. Flexer,

Thank you for requesting the comments of the New York State Historic Preservation Office (SHPO). We have reviewed the submitted materials in accordance with Section 106 of the National Historic Preservation Act of 1966. These comments are those of the SHPO and relate only to Historic resources.

Our architectural historian for Kings County notes that the project site is located within the proposed Floyd Bennett Field Historic District Boundary Increase. Please note that the boundary increase is currently under review by the NPS and therefore the site for the proposed wind turbines is National Register Eligible. The site is also within the view shed of the National Register listed Jacob Riis Park Historic District and the National Register Eligible Marine Parkway Bridge.

In order to better understand the visual impacts of the proposed wind turbines on the adjacent historic resources, we request visual simulations at a minimum of three locations (see attached diagram):

1. Ryan Visitor Center Control Tower at Floyd Bennett Field
2. NRE Marine Parkway Bridge.
3. Jacob Riis Park entrance/drop off at Rockaway Beach Boulevard.

The submitted simulations indicate that the turbines are white. Is this the only color option available?

If you have any questions, I can be reached at (518) 237-8643, ext. 3260 or eric.kuchar@parks.ny.gov. Please refer to the SHPO Project Review (PR) number in any future correspondences regarding this project.

Sincerely,

Eric N. Kuchar
Weatherization Specialist

Enc: SHPO Visual Simulation Map

SHPO Visual Simulation Map

UNITED STATES MARINE CORPS
MARINE FORCES RESERVE
2000 OPELOUSAS AVENUE
NEW ORLEANS, LA 70146-5400

IN REPLY REFER TO
5080
FAC/adf
23 Aug 12

New York State Office of Parks, Recreation, and Historic Preservation
Historic Preservation Field Services Bureau
Attn: Ruth Pierpont, Deputy SHPO
Peebles Island Resource Center
PO Box 189
Waterford, NY 12188-0189

Dear Ms. Pierpont,

The United States Marine Corps, Marine Forces Reserve (MARFORRES) requests a consultation under Section 106 of the National Historic Preservation Act for their small wind energy project at the MARFORRES Reserve Training Center at historic Floyd Bennett Field in Brooklyn. The proposed project includes three 50 kW wind turbines, 93 feet in total height, with the associated electrical infrastructure required for converting the wind energy into electricity for use by the MARFORRES Center.

The enclosed materials include the standard project review cover form, a project description, photographs and maps of the project site, and photo simulations of what the wind turbines would look like from various points of observation. In the project description is a discussion of potential effects of the project and a determination of No Effect to historic properties. Please send your response to the following point of contact:

MARFORRES, Attn: Alain Flexer, Facilities/Energy
2000 Opelousas Ave.
New Orleans, LA 70146-5400

If you have any questions please call Casey Barker at (805) 982-1478. We look forward to your prompt response.

Sincerely,

E. J. MAGUIRE
Deputy AC/S Facilities

cc:
National Park Service/Gateway

Project Description

The Marine Forces Reserve (MARFORRES) Command has proposed a small wind energy project to be located at the Marine Corps Reserve Center at Floyd Bennett Field in Kings County. The Marine Corps Reserve Forces (MARFORRES) Center is located within the Gateway National Recreation Area at the south end of the Barren Island peninsula. It is bounded on the north by the Floyd Bennett Field/Naval Air Station National Register District (11NRO6226), on the south by the Rockaway Inlet, on the east by Jamaica Bay, and on the west by Dead Horse Bay (Figure 1).

The project would involve the placement of three 50 kilowatt wind turbines in the southwestern portion of the Marine Corps Reserve Center property adjacent to the NPS Floyd Bennett Field/Air Station National Register District in a previously disturbed area filled with dredge material (Figure 2). Each turbine will consist of a tower with a hub height of 60.7 feet and a rotor with a diameter of 60 feet, for a total height of about 92.6 feet when the rotor reaches its maximum height at the top of its arc (Figure 3). The turbines would be anchored to a concrete foundation that would be buried with only the pedestal to which the turbine is attached showing above ground. A 20-foot wide gravel area would surround each turbine pedestal, and a gravel access road would be constructed from the turbine sites to the nearby parking area at the Marine Corp Reserve Center. Laydown areas and staging areas would be cleared adjacent to each turbine location to accommodate the storage of equipment and materials.

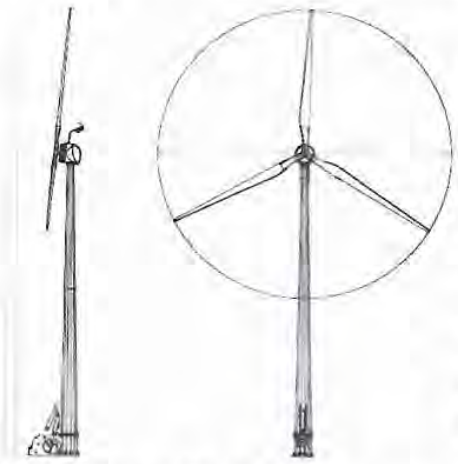


Figure 3: Proposed Turbine Design

In addition to the wind turbine itself, electrical infrastructure required for the operation of the turbine and integration with the existing electrical grid would be installed at the site. The electrical infrastructure includes a dedicated transformer adjacent to each of the turbines and electrical cables to convey the energy produced at the turbine to the electrical grid. The transformers would be located on 8 foot by 8 foot concrete pads adjacent to the gravel access area that surrounds the turbine pedestal. The cables would be laid underground and connected to the grid at existing switchgear at the Marine Corp Reserve Center office building.

Ground disturbance would be limited to the turbine foundation, the trench dug for the electrical cables, and the clearing of areas next to the proposed turbine sites for staging areas (Figure 4). The turbine foundation would be a spread-foot foundation which looks like a truncated pyramid with an octagonal base. The installation of such a foundation would require digging a pit approximately 57 feet by 57 feet in size and 10 feet deep using a backhoe. However, the above ground footprint of the foundation, when

installed, would be a circular area, 15 feet in diameter. The trench for the electrical cable to connect the turbines to the electrical grid would be 1600 feet long, 2.5 feet wide, and 4 feet deep. The trench would be excavated with a "ditch witch" trenching machine. The cleared areas for each staging area would be approximately 30 feet by 30 feet in size. The permanent disturbance area for each wind turbine would be less than 0.27 acres with an overall project disturbance area of less than 1.34 acres.

Figure 1
Proposed Wind Turbine Alternatives
USMC Wind Turbine EA
Coney Island Quad (1999)
Kings County, New York

Figure 1: Project Location Map (USGS topo map)

Figure 2: Project Location Map (aerial base)

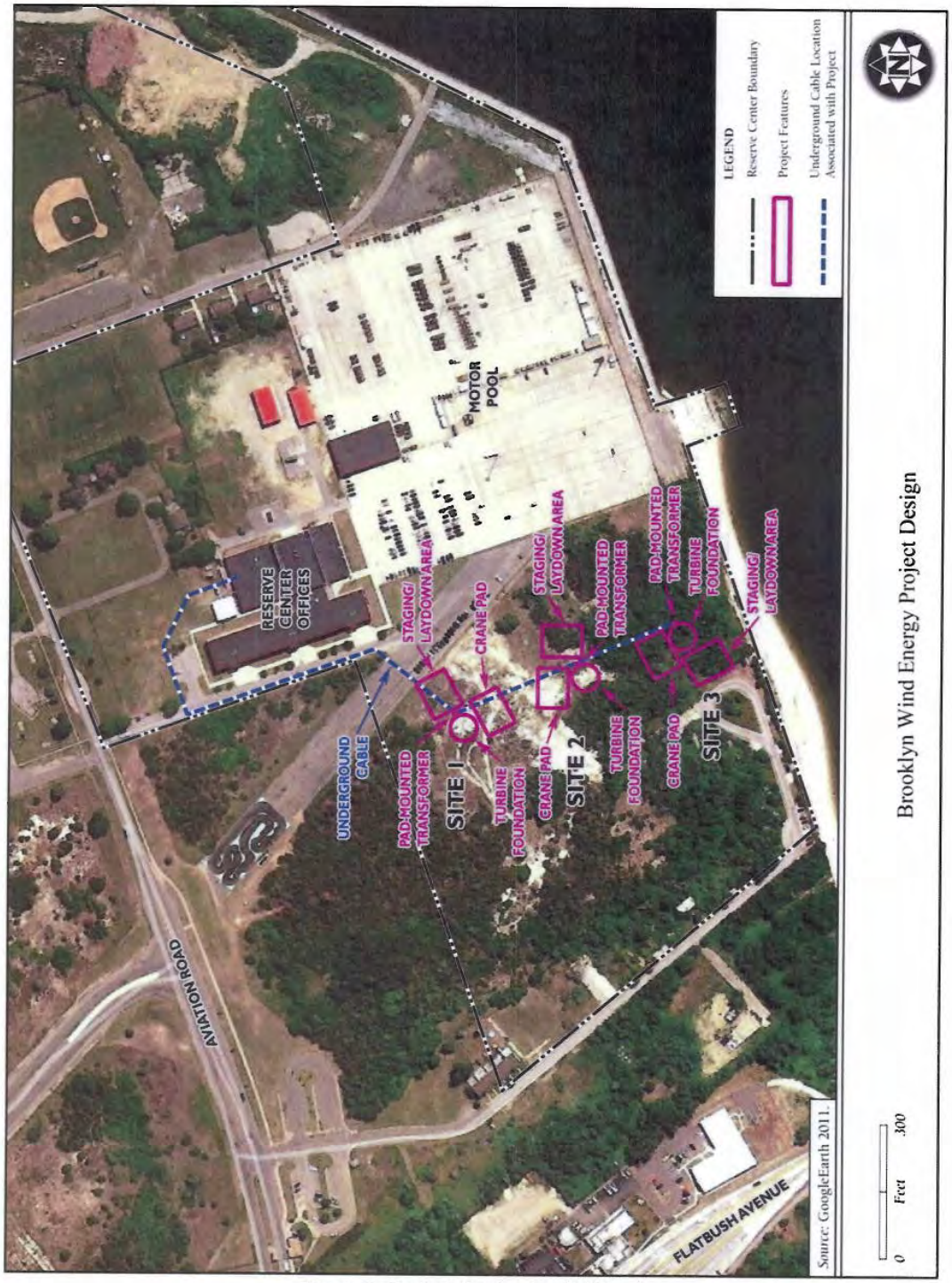


Figure 4: Project Design (aerial base)

Historic Properties Potentially Affected

The MARFORRES Center occupies approximately 70+ acres on the south end of Barren Island. The 1,450 acre Floyd Bennett Field/Naval Air Station National Register District borders the Marine Corp Reserve Center on the north (Figure 5). The Floyd Bennett Field/Naval Air Station National Register District is part of the Gateway National Recreation Area administered by the National Park Service (NPS). The boundary of the National Register District is located immediately north and west of the project area. The project area also lies partially within the archaeological sensitive zone for the Floyd Bennett Field/Naval Air Station National Register site as depicted on the New York SHPO website (http://nysparks.state.ny.us).

Site History

The project area is located on the highly modified landscape of Barren Island, a barrier island on the southern tip of Long Island at the entrance to Jamaica Bay. Originally, the island consisted of low dunes and a sandy beach with the open Atlantic Ocean to the south and Jamaica Bay to the north. By the beginning of the 19th Century, the longshore current and storms had extended the Rockaway Island beach to the west transforming Barren Island into an interior island and creating an inlet (Rockaway Inlet) between the two (Cody and Auwaerter 2009:7). In addition to informal grazing and harvesting, the island was utilized during colonial times for mining sand. Beginning in 1740s, sand was mined from the beach and shipped to New York City (Cody and Auwaerter 2009:23). The first buildings were present on the island by about 1800 consisting of a hotel catering to fisherman on the east side of the island adjacent to Rockaway Inlet, and a residence on the west side of the island (Cody and Auwaerter 2009:23).

Beginning in the mid-19th Century and ending in 1972 with the acquisition of the former air field by the National Park Service, Barren Island went through four major periods of development that have severely disturbed and altered the original natural landscape. The first period of development began in 1850 and continued through 1928. During this period, three horse rendering and fertilizer factories (Products Manufacturing Company plant, White fertilizer plant, and the New York Sanitary Utilization Company plant) and their associated communities of workers were located on the island (Cody and Auwaerter 2009:25). The current project area is located in what was formally the Rockaway Inlet between the Products Manufacturing Plant on the southwest end of the island and the White fertilizer plant on the southeast end (Figure 6).

The second period of development on the island consisted of the construction of the Floyd Bennett Air Field between 1928 and 1941 in four distinct phases (Cody and Auwaerter 2009:56). The Floyd Bennett Air Field and the area around Jamaica Bay north and east of the proposed project site went through three phases of improvement and additional construction during the 1930's (1928-1931, 1932-1933, and 1934-1938). At the southwest end of the island where the current project is located, the Products Manufacturing Plant and the associated community surrounding it were demolished by 1938.

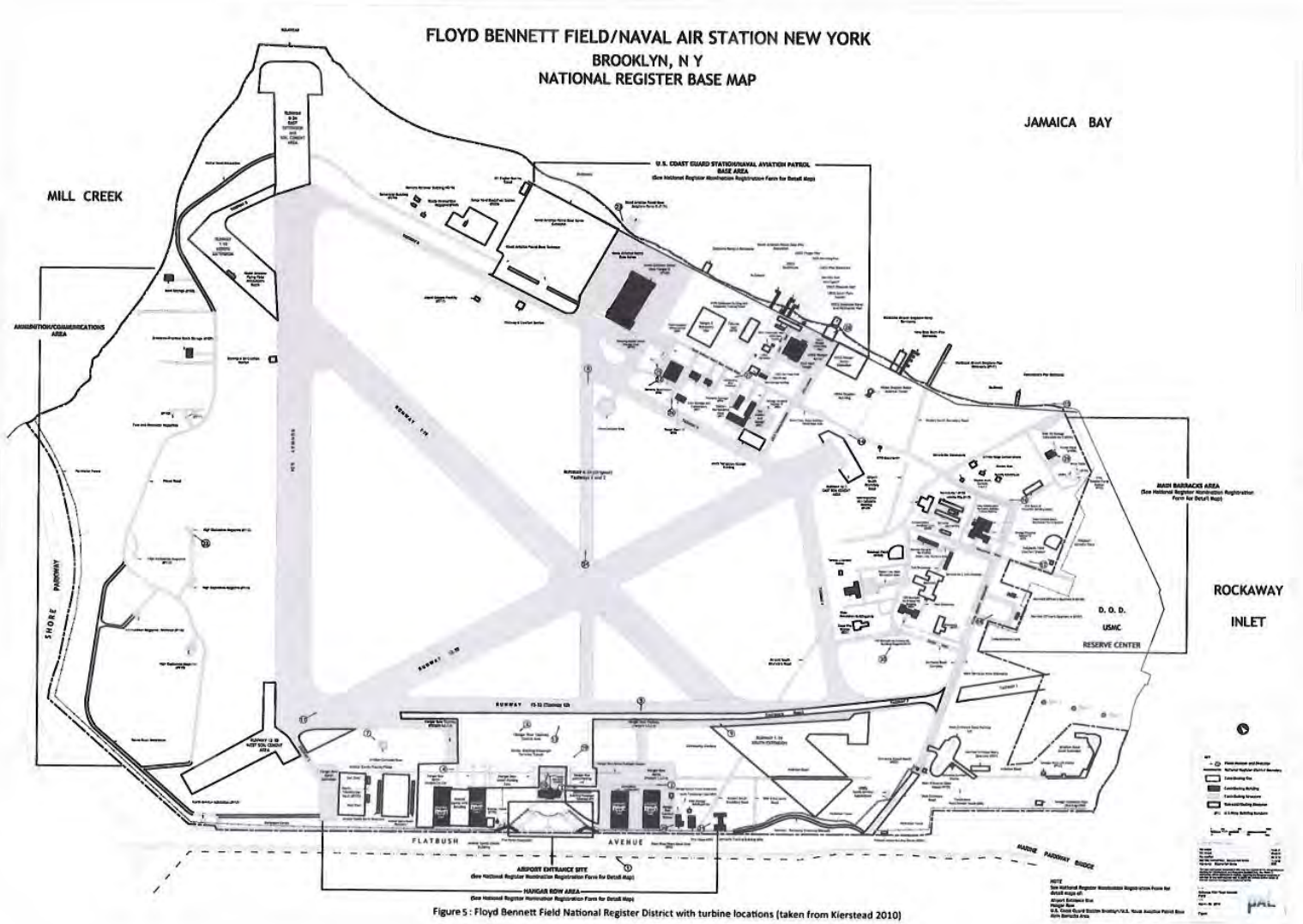


Figure 5 : Floyd Bennett Field National Register District with turbine locations (taken from Kierstead 2010)

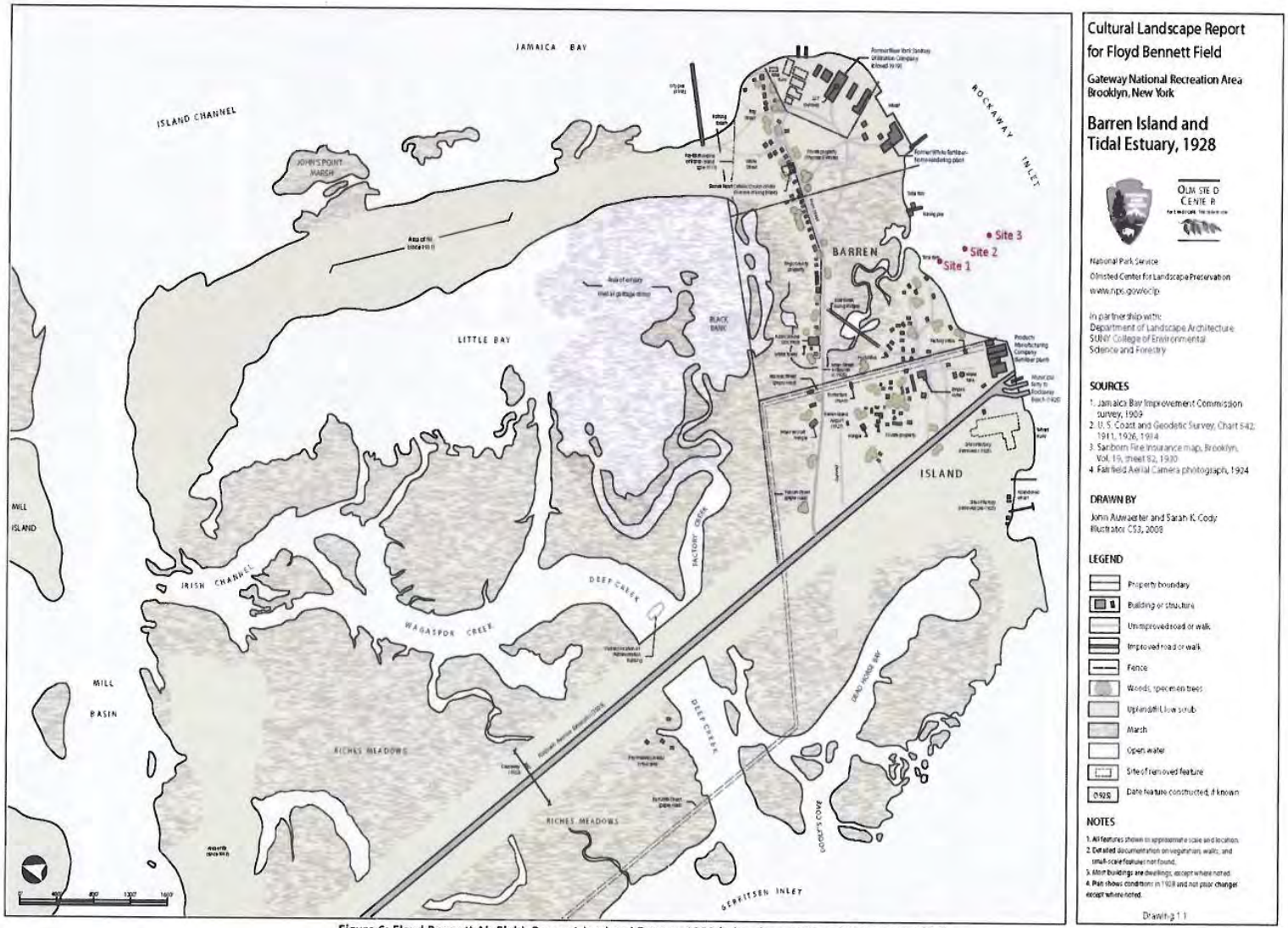


Figure 6: Floyd Bennett Air Field, Barren Island and Estuary, 1928 (taken from Cody and AuWaerter 2009)

In the run-up to World War II between 1938 and 1941, the Navy greatly expanded its presence on the island with construction of an aviation patrol base along Jamaica Bay at the southeast end of the island and a reserve base south of Hanger Row (fourth period of construction). A Coast Guard seaplane patrol base was also constructed along Jamaica Bay at the southeast end of the island. The current proposed project would have been located in Rockaway Inlet at the south end of the island adjacent to the proposed Brooklyn Marine Park (Figure 7).

The third period of development began in 1941 a few months prior to the United States entry into World War II, and continued to the of the war in 1945. In 1941, the Navy acquired the property from the city of New York and converted the Floyd Bennett civilian air field to a Naval Air Station (Naval Air Station-Brooklyn). As part of the Naval Air Station construction, the area of the current proposed project appears to have been graded and covered with fill (Figure 8). The area was raised to an elevation of 16 feet above sea level and the landmass extended 50-400 feet into Rockaway Inlet. The new Barren Island shoreline had to be contained with steel pile bulkheads (Cody and Auwaerter 2009:119).

The current project area became part of the Naval Air Station housing area, referred to as the west barracks area. The west barracks area consisted of two barracks buildings parallel to the main entrance drive (Aviation Road) with a heater house in between. The air station's incinerator and sewage treatment plant were located to the south (Cody and Auwaerter 2009:121). Taxiways were constructed to connect the ends of runways, and one taxiway (Taxiway 7) was constructed to connect the south end of runaway 15-33 to the sea plane base at the south end of Barren Island (Cody and Auwaerter 2009: 115). This taxiway crosses through the current project area, and would be crossed by the proposed underground cable connecting the turbines to the electrical grid at the Reserve Center Offices. In addition, a sea plane ramp was constructed into Rockaway Inlet and large sea plane parking apron that is directly adjacent to the current project area were constructed that are now part of the Motor Pool at the Marine Reserve Forces base (see Figure 8). A city-owned toll booth for the Marine Parkway Bridge bordered the west barracks area on the west. An access road (Aviation Road) to the west barracks was constructed from an entrance station located at the former intersection of Flatbush Avenue and Main Street. The road (now Floyd Bennett Boulevard) then branched east to the main barracks area (Cody and Auwaerter 2009:120). Aviation Road currently borders the project area on the west and Floyd Bennett Boulevard borders it on the north.

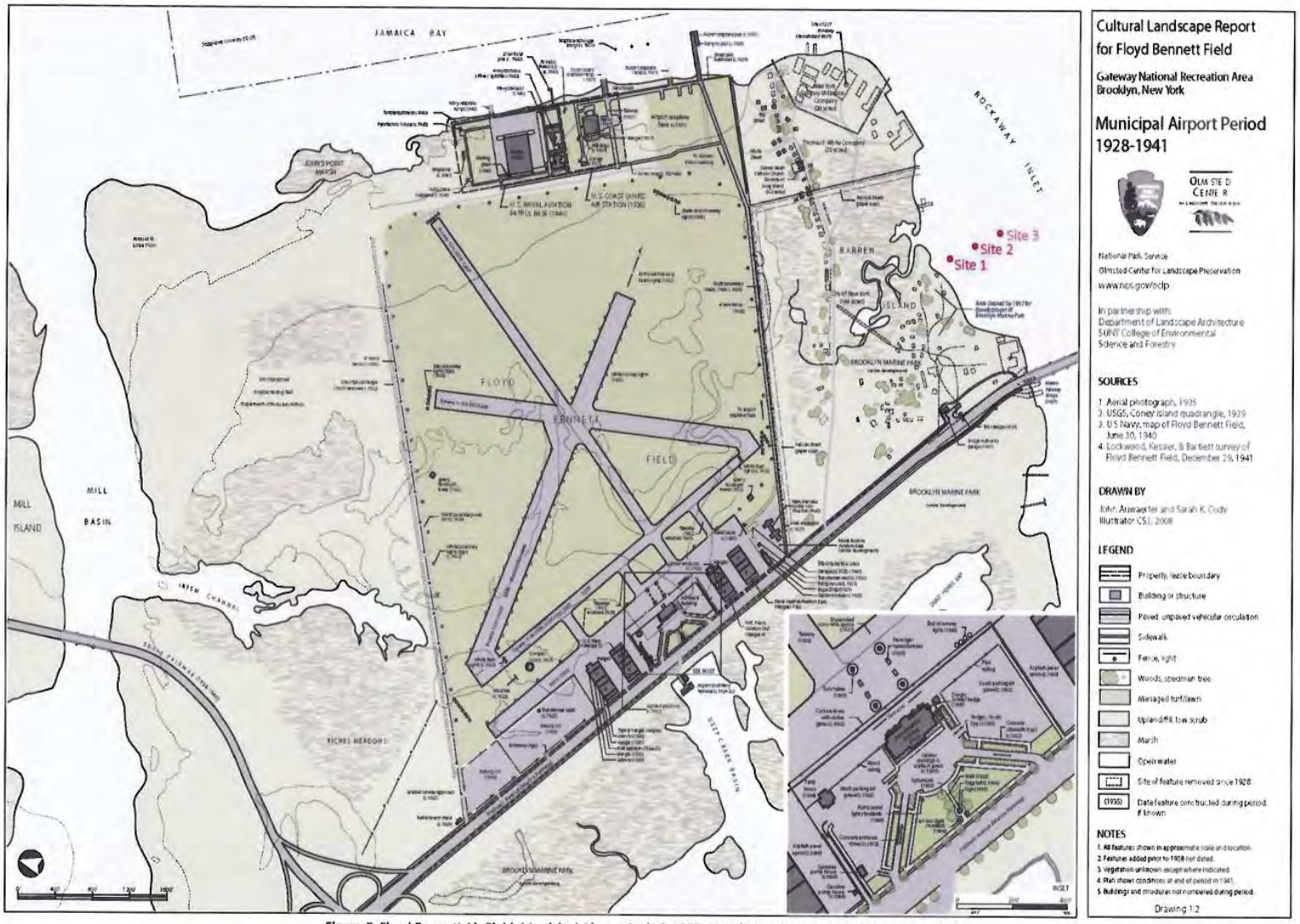


Figure 7: Floyd Bennett Air Field, Municipal Airport Period, 1928-1941 (taken form Cody and Auwaerter 2009)

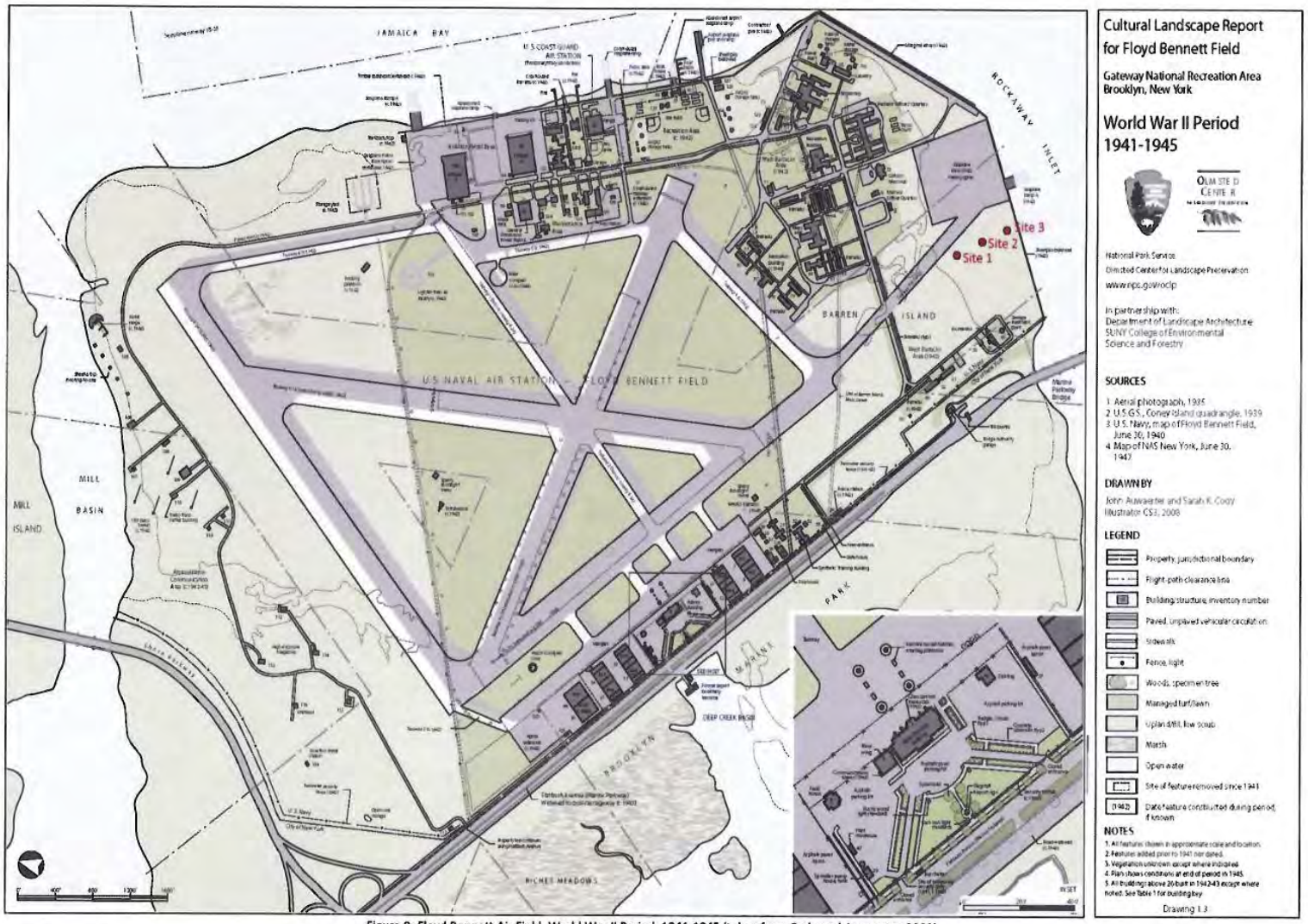


Figure 8: Floyd Bennett Air Field, World War II Period, 1941-1945 (taken from Cody and Auwaerter 2009)

During the subsequent Cold War Period (1945-1972), a number of the old barracks were removed and new ones constructed. By 1948, eight temporary barracks were removed in the west barracks area leaving behind the concrete pads, and eight new buildings were constructed to house returning veterans (Cody and Auwaerter 2009:139). Four of these new buildings were located directly adjacent to Site 3 of the current proposed project along Rockaway Inlet. In addition, the runways were lengthened, roads and aprons were modified, jet-fuel storage tanks were added, new communications facilities were added, and some new barracks constructed (Cody and Auwaerter 2009:141). An extension of runway 15-33 caused the entrance station from the World War II period to be relocated further south on alignment with Floyd Bennett Boulevard in 1951 (Cody and Auwaerter 2009:142). The sea plane ramp and parking apron on the Rockaway Inlet fell into to disuse and was designated for redevelopment by the Army in 1952 as an Armed Forces Reserve Center (Cody and Auwaerter 2009:152). In 1965, the Navy constructed a mobile home court with 24 spaces in the former west barracks area adjacent to the current project area (Cody and Auwaerter 2009:148). A system of irregular driveways and cul-de-sacs was also constructed within the mobile home court area. By 1972, only the garbage incinerator building, a pump house, the sewage treatment plant, and one barracks remained in the west barracks area (Cody and Auwaerter 2009: 154). The current proposed project would have been located in an undeveloped area between the Cold War Period mobile home courts and the World War II Period seaplane parking apron and taxiway (Figure 9).

Ownership of the Naval Air Station was transferred to the National Park Service in 1972 with the exception of the 70+ acres at the south end of island on which the Marine Corp Reserve Center is currently located (Cody and Auwaerter 2009:10). This property had remained under separate administration as a Department of Defense Armed Forces Center following the transfer of a majority of the property to the National Park Service. The Army constructed a large building and several smaller ones on the north end of the former seaplane apron in 1975, and rerouted the entrance road through the main barracks area. Ownership of the property was transferred to MARFORRES. The 1972 boundary of the MARFORRES Center included a portion of the west barracks area (Cody and Auwaerter 2009:169).

Figure 9: Floyd Bennett Field Airfield, Cold War Period, 1945-1972 (taken from Cody and Auwaerter 2009)

Current Site Management

A National Register District nomination was prepared in 1980 for the historic municipal air field that encompassed 329 acres of the Jamaica Bay Unit of the Gateway National Recreation Area. The period of significance for the District began with the dedication of the municipal airport in 1931 and ended with its transition to a Naval Air Station in 1941 (Cody and Auwaerter 2009:172). The District was accepted for listing in the National Register of Historic Places in 1981. The boundaries of the District were essentially those of the 1930s civilian air field and included the Developed Area and the Natural Area, but not the (South) Administrative Area adjacent to the current project area.

Based on a 2009 landscape report (Cody and Auwaerter 2009), the nomination of the air field was revised in 2010 to include many areas and facilities to the addition of the pre-World War II municipal Navy and Coast Guard properties along Jamaica Bay, Hanger Row, the expanded air field during World War II, and the Naval Aviation Patrol Base and Coast Guard Air Station along Jamaica Bay (Cody and Auwaerter 2009:229). The South Administrative Area, along with areas along Jamaica Bay and at the north end of the air field, was also added to the 2010 National Register District nomination by the Gateway Recreation Area staff. The revised boundary of the District encompasses 1,450 acres of the Jamaica Bay Unit of the Gateway National Recreation Area. It has a period of significance extending from the initial construction of the municipal airfield (1928) through its usage by the Navy as a Naval Air Station (1945). The District includes 94 contributing resources and 90 non-contributing resources. The contributing resources include 27 buildings, 1 site, and 66 structures (Kierstead 2010:7-1). The District has national level significance under Criterion A because of its association with the development of aviation in the 1930s and its association with World War II as a Naval Air Station in the early 1940s. It has national level significance under Criterion C in the area of Engineering and Architecture because the buildings and structures embody the characteristics of early twentieth century civilian aviation facility construction and World War II era military facility construction (Kierstead 2010:8-1).

The National Park Service currently manages the Floyd Bennett Air Field and Naval Air Station as the Jamaica Bay Unit of the Gateway National Recreation Area, a recreation and natural conservation area. Under its 1979 General Management and Development Concept Plan, three management zones were created. These zones consisted of a Developed Area, a Natural Area, and an Administrative Area (renamed the South Administrative Area). The current proposed project site is located adjacent to the designated South Administrative Area of the Park. The South Administrative Area is bounded by Flatbush Avenue and the Marine Parkway Bridge on the west; the Marine Corp Reserve Center and frontage road along Rockaway Inlet on the south, Jamaica Bay on the east; and the historic southern boundary of the Floyd Bennett Municipal Air Field on the north.

Gateway National Recreation Area (NRA) is currently in the process of writing a new management plan for all of its units including the Jamaica Bay Unit. Four alternatives are being considered (A-D) including a No Action alternative (Alternative A) under which the current

management practices would continue. Under Alternative B, Gateway NRA would become a popular destination for recreation, education, and interpretive experiences. Floyd Bennett Field becomes a regional recreation destination under this alternative. Under Alternative C, natural systems, historic sites, and landscapes receive the highest levels of preservation and restoration. The aviation history of Floyd Bennett Field would be preserved and showcased under this alternative. Under Alternative D, the three park units (Jamaica Bay, Jacob Riis, and Frank Charles Memorial) and their resources are linked through the broad themes of coastal ecology, coastal defines and coastal recreation. The coastal edges of Floyd Bennett Field would be enhanced with improved water access, water trails, and additional lands and camping facilities (http://www.nps.gov/gate/parkmgmt/gmp-2012.htm). Each of these alternatives has the potential to affect the Floyd Bennett Field National Register District.

Recently, the Department of Defense (DoD) and Department of the Interior (DoI) have entered into a Memorandum of Understanding (MOU) regarding the development of renewable energy. The purpose of the MOU is to foster cooperation between the two agencies in development of renewable energy projects in the interests of greater energy security and reducing energy costs on installations, and to meet national goals of increasing renewable energy generation from public lands. In the spirit of the MOU, the MARFORRES is currently negotiating an agreement with NPS to refurbish Quarters A and B of the former World War II period Naval Air Station.

Current Site Conditions

Under National Park Service management, the landscape character at Floyd Bennett Field has changed significantly. These changes have been brought on primarily by building demolition, deterioration, changes in circulation, and most notably by natural succession (Cody and Auwaerter 2009:180). In 1800, the landscape of Barren Island likely consisted of sand dunes and scattered tree cover (Cody and Auwaerter 2009:23). By 1928, the landscape of the south end of Barren Island would have consisted of narrow streets, small houses, groves of trees, dunes, beaches, and factory remnants (Cody and Auwaerter 2009:123). During the Municipal Air Field period (1931-138), the views and vistas were generally panoramic and expansive across the open tidal flats to the north and open water to the west, east, and south (Cody and Auwaerter 2009:90). Under National Park Service management, the landscape character at Floyd Bennett Field has changed significantly. The landscape of the South Administrative Area has been significantly altered with the growth of woods and planting of trees along the roads and around the buildings as well as by the demolition of several large and small buildings. Several of the buildings are in a highly deteriorated condition due to a shortage of funding. In addition, the National Park Service has placed a 100-foot tall communications tower across Aviation Avenue from the MARFORRES Center. The addition of the buildings, entrance drive, perimeter fence, and a 196-foot tall cell tower at the Marine Corp Reserve Center has also altered the landscape (Cody and Auwaerter 2009:181). Recreation improvements initially consisted of development of youth campgrounds. One cluster is located at the northeast end of the air field and the other at the south end of the air field. The beach area along Rockaway Inlet in the west barracks area is currently a restricted fishing area. In addition, a new seawall was recently added to the beach along the MARFORRES compound (Figure 10).

Figure 10: Restricted fishing area on Rockaway Inlet adjacent to west barracks area. Note remains of steel bulkheads from dredge and fill operation during municipal airport construction. View to the east.

The South Administrative Area is currently characterized by asphalt roads, parking lots, concrete sidewalks, frame and brick buildings, building foundations, mown grass, overgrown shrubs, and woods. The Park headquarters, park police station, facilities used by various park partners, and the main entrance to the Park are located here. The parking lot constructed in 1996 adjacent to the main entrance is located at the north end of Aviation Road. A few scattered buildings are located along Aviation Road in the World War II era west barracks area. Floyd Bennett Blvd extends through this area from the main entrance, flanked by numerous side roads and associated sidewalks most of which date to the World War II era (Cody and Auwaerter 2009:216). Modern street lights also line the roadway (Figure 11). A berm was constructed along Floyd Bennett Blvd to close off the intersection with taxiway 7 leading the former seaplane base along Rockaway Inlet.

Figure 11: Floyd Bennett Blvd looking to the west through main barracks area toward main entrance. Occupied barracks at right with abandoned married officer's quarters in background at left.

Several of the historic buildings in the main barracks and west barracks areas have been abandoned including the married officer's quarters (Figure 12) and the sewage treatment plant (Figure 13). Others are still currently used by the Park Service for various functions such as the married enlisted men's quarters (Figure 14) and the entrance gate booth (Figure 15). The Park Service has authorized the construction of a model racetrack (Figure 16) on the south end of taxiway 7 in the west barracks area (Cody and Auwaerter 2009:179). Successional woods cover much of the area south of the air field and the natural shoreline along Jamaica Bay and Rockaway inlet has increased with the collapse of the bulkheads (Figure 17) (Cody and Auwaerter 2009:181). The addition of the modern buildings associated with the MARFORRES Center adjacent to the Park at its southwest end has also impacted the landscape (Figure 18).

Figure 12: Abandoned married officer's quarters, main barracks area. Note MARFORRES Center in background at right. View to northeast.

Figure 13: Remains of abandoned Sewage Treatment Plant in west barracks area. View to the northwest.

Figure 14: Married enlisted men's quarters (now Park staff housing) in west barracks area with Aviation Road in foreground. View to the east.

Figure 15: Entrance booth and Ranger Station at west entrance to Park. View to the south.

Figure 16: Turbine locations as viewed from beach along Rockaway Inlet. Note remains of steel bulkheads associated with dredging and filling during construction of municipal air field in middle ground and successional woods in background as well as a communications tower. View to the north/northwest.

Figure 17: Racetrack at north end of taxiway 7 as seen from top of berm along Floyd Bennett Blvd. MARFORRES Center is at left. Proposed turbine sites are at right in wooded area. View to the south/southwest. Note communications tower at right in wooded area and MARFORRES Center at left.

Figure 18: View of western portion of Officer's Quarters loop road with MARFORRES Center in background. View to south.

Impacts Analysis

Archaeological Sites

Given the number and extensive nature of the developments that have occurred at the Floyd Bennett Field, the potential for archaeological is assessed as low. Impacts from natural erosion and depositional cycles in the estuaries north of Barren Island prior to 1850 would not be conductive to prehistoric and historic site preservation. Subsequent dredging and filling after 1850 associated with the late 19th and early 20th centuries industrial development would also likely have impacted any prehistoric and historic archaeological sites present over a large portion the island. Archaeological remains associated with the construction of the municipal air field and Naval Air Station are unlikely to be present given the amount of development that occurred at the site and the amount of surface area under concrete, and only one archaeological site has been identified within the District to date. Archaeological remains, if present, would be buried very deeply under several feet of fill at the proposed site.

A 1978 assessment (Blakemore and Linck 1981) of archaeological potential by NPS archaeologist Dana Link noted that an average of 9 feet of fill was dredged from Jamaica Bay

and spread across the site prior to construction of the municipal air field on top of the unknown amount of previous dredging and filling that occurred (Kierstead 2010:8-31). While the air field buildings and structures were constructed primarily on dredged material, it would have been thinnest at the south end of the island and may have impacted the original ground surface. The 1978 assessment concludes that any prehistoric archaeological sites would most likely be buried below the fill material while early historic sites are likely to be ephemeral in nature and unlikely to leave a strong archaeological signature (Kierstead 2010:8-31).

The potential for archaeological sites at the Floyd Bennett Field was assessed again by URS in 2005 (URS 2005). After a review of primary and secondary sources, URS concluded that there is low potential for pre- and post-contact archaeological sites. The low-lying marshy nature of the environment over a majority of the island during the pre-contact period would not have made it attractive for human occupation and the conditions were not considered likely to have been conducive to the preservation of any ephemeral sites that might be present with the exception of shell middens (Kierstead 2010:8-32). Post-contact period sites were equally unlikely to be preserved. The uplands at the south end of the island were considered to have been the most likely to have been occupied during the pre-contact and post-contact periods and were known to have been the site of a historic inn and residence prior to the development of factories and their associated communities. The land filling that occurred during the Navy occupation period beginning in 1941 may have buried the remains archaeological remains of the earlier occupations including residential, commercial, and industrial foundations; roadways, privies, and wells below 5-6 feet of fill (Kierstead 2010:8-33). Archaeological sites are thus more likely to be present at shallower depths in the southern portion of the District than in the northern.

The Marine Corp Reserve Center property at Brooklyn was intensively surveyed (Phase I) for archaeological resources in 2003 by HHM of Austin, Texas in accordance with Section 110 of the National Historic Preservation Act (NHPA). Data from historical maps, nautical charts, soils survey, subsurface testing conducted by the National Park Service, and a pedestrian survey indicated extensive surface and subsurface disturbance to Marine Corp Reserve Center (HHM 2004a:22). Extensive changes to the shoreline and marshlands on the island occurred prior to 1899. Infilling of the marshes with incinerated garbage occurred during the late nineteenth and early 20th centuries, and the construction of the Floyd Bennett Field in the 1920s and 1930s (HHM 2004a:22). Further, the Marine Corp Reserve Center was believed to have been submerged beneath the Rockaway Inlet as recently as 1935 (HHM 2004b:22). The potential for intact archaeological deposits at the Center was rated as very low and additional archaeological investigations were not recommended (HHM 2004a:22).

The buildings and structures at the Marine Corp Reserve Center property Brooklyn were also surveyed in accordance with Section 110 of the NHPA. Six buildings and structures were surveyed at the Center. All of the buildings and structures in the survey were constructed between 1977 and 2000. They had not attained the minimum age of 50 years old for historic properties and did not meet any of the NRHP criteria for National Register of Historic Places eligibility (HHM 2004b:50). The buildings and structures at the Center were also found to not

be of "exceptional significance" with regards to the Cold War, and thus did not meet NRHP Criterion Consideration G (HHM 2004b:51).

The current boundary of the National Register District lies immediately north and west of the proposed project site (see Figure 3-National Register Base Map turbine locations). A number of buildings and structures are associated with the District are located in close proximity to the project area. Contributing buildings include married officer's quarters (Building #s 157 and 158) and the entrance guard booth (Building #207). Non-contributing buildings include the married enlisted men's quarters (Building #267), the sewage treatment plant (Building #60), the sewage treatment plant lift station (Building #154), the transformer vault/heater house (Building #82), and the main entrance gate house (Building #135). Contributing portions of several roadways are also present in the area including Floyd Bennett Blvd, Aviation Road, and Independence Lane. Non-contributing portion of these roads (Floyd Bennett Blvd and Aviation Road) area also present as are non-contributing taxiways (taxiway 7) and parking lots (main entrance parking lot).

Visual impacts to the District from the wind turbines would vary, but would generally be low when viewed from locations within the Park that would be most frequented by the public. Visual impacts when looking north/northwest from the beach along Rockaway Inlet where the closest turbine would be within 170 feet of the viewer would be high due to proximity (Figure 19). From this location, the turbines would have high levels of contrast with the surrounding landscape. However, since the shoreline along the Marine Corp Reserve Center is a restricted fishing area, it would not be visited by large numbers of the viewing public. Views from the berm above the miniature car racetrack at the edge of the Park to the south/southeast would be considerably less impacted by the turbines as a result of the increased distance (728 feet from Turbine 1 turbine), and the inclusion of several similar linear structures in the view including communications towers, cell towers, and the 4022- foot long, 150-foot tall Gil Hodges Memorial Bridge (Figure 20). The visual impact from this location that likely has increased visitation from the viewing public would be moderate. Views from the west end of the Officer's Quarters Loop along Floyd Bennett Blvd. to the south would be minimally impacted by the turbines due to the great distance involved to the closest turbine (1050 feet to Turbine 1), and the obscuring of some turbines (i.e.-Turbine 3) by the MARFORRES Center building (Figure 21). Visual impacts from the location would be low, and the view from this location is one that is likely to be seen by the greatest numbers of the viewing public. Beyond this location, views of the turbines would be obscured by buildings and vegetation. Increased distance would also decrease the visual impact.

Figure 19: Simulation of wind turbines as seen from the restricted fishing beach on Rockaway Inlet. Turbine 3 is the closest one and Turbine 1 is the farthest away. View to north/northwest.

Figure 20: Simulation of wind turbines as seen from berm at north end of racetrack. Turbine 1 is the closest and Turbine 3 is the farthest away. View to south/southwest.

Figure 21: Visual simulation as seen from parking lot along Floyd Bennett Blvd. Turbines 1 and 2 are barely visible above the top of the MARFORRES Center building. Views of Turbine 3 are blocked by a tall unknown structure in center of frame. View to south.

Determination of Effect

The MARFORRES Command has determined that the proposed project will have no effect on any historic properties. This determination is based on the lack of any known historic properties within the Area of Potential Effect (APE) of the project, and the lack of potential for impacting intact subsurface archaeological materials. The cumulative effect of the project on the visual integrity of the adjacent Floyd Bennett Air Field National Historic District is anticipated to be moderate with severe visual impacts when viewed close up from the adjacent access restricted beach and low impacts at greater distances from areas of the Park frequented by more members of the viewing public. As well, the existing landscape within the current project area lacks integrity. Due to demolition and abandonment of several buildings present during the period of significance (1931-1945) within the main barracks and west barracks areas, the construction of new buildings and structures associated with the Jamaica Bay National Recreation Area within the South Administrative Area, and the growth of successional woods on the south end of Barren Island, the landscape that is present today is no longer that which

existed during the period of significance for the District. The MARFORRES Command therefore requests the concurrence of the New York State Historic Preservation Office with its determination of No Effect for the proposed project.

References Cited

Blakemore, Porter R. and Dana C. Linck. 1981. *Historic Structures Report Data Section, Archeological Data Section, Floyd Bennett Field, Gateway National Recreation Area, Volume I.* Report on file, Fort Wadsworth, Gateway NRA, Staten Island, NY.

Cody, Sarah K. and John Auwaerter. 2009. *Cultural Landscape Report for Floyd Bennett Field, Gateway National Recreation Area, Brooklyn, New York.* George W. Curry, Project Director. State University of New York, College of Environmental Science and Forestry. Olmstead Center for Landscape Preservation, National Park Service, Boston, Massachusetts.

HHM, Inc. 2004a. Final *Marine Forces Reserve Archaeological Resources Survey, Armed Forces Reserve Center, Brooklyn, NY.* September 2004. Prepared for Department of the Navy, Naval Facilities Engineering Command, Engineering Field Division South, 2155 Eagle Drive, North Charleston, SC. Prepared by HHM, Inc., Austin, TX. Contract N622467-01-D-0430. Delivery Order 0014.

HHM, Inc. 2004b. Final *Marine Forces Reserve Historic Resources Survey, Armed Forces Reserve Center, Brooklyn, NY.* September 2004. Prepared for Department of the Navy, Naval Facilities Engineering Command, Engineering Field Division South, 2155 Eagle Drive, North Charleston, SC. Prepared by HHM, Inc., Austin, TX. Contract N622467-01-D-0430. Delivery Order 0014.

Kierstead, Matthew. 2010. *National Register of Historic Places Registration Form, Floyd Bennett Field/U.S. Naval Air Station, New York.* PAL, Pawtucket, RI.

URS Corporation. 2005. *Modified Phase 1A Cultural Resources Inventory, Floyd Bennett Field, Jamaica Bay Unit, Gateway National Recreation Area, Brooklyn, New York.* Report on file, Fort Wadsworth, Gateway NRA, Staten Island, NY.

New York State Department of Environmental Conservation
Division of Fish, Wildlife & Marine Resources
New York Natural Heritage Program
625 Broadway, Albany, New York 12233-4757
Phone: (518) 402-8935 • **FAX:** (518) 402-8925
www.dec.state.ny.us

Alexander B. Grannis
Commissioner

December 18, 2009

Derek Hengstenberg
Tetra Tech
451 Presumpscot Street
Portland, Maine, 04103

Dear Mr. Hengstenberg:

In response to your recent request, we have reviewed the New York Natural Heritage Program database with respect to an Environmental Assessment for the proposed Wind Development Project - 2 Turbines at Floyd Bennett Field, area as indicated on the map you provided, located in Kings County.

Enclosed is a report of rare or state-listed animals and plants, significant natural communities, and other significant habitats, which our databases indicate occur, or may occur, on your site or in the immediate vicinity of your site. The information contained in this report is considered sensitive and should not be released to the public without permission from the New York Natural Heritage Program.

PLEASE NOTE: For Windpower Projects, we report all records found within the project boundary, and any avian records that may be located within a 10-mile buffer of project boundary. We also report Indiana Bat Hibernacula that may be located within a 40-mile buffer of the project boundary.

PLEASE NOTE: We refer you to hhtp://www.dec.ny.gov/energy 40899.html on the DEC Website for guidelines for proposed project.

The presence of the plants and animals identified in the enclosed report may result in this project requiring additional review or permit conditions. For further guidance, and for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the appropriate NYS DEC Regional Office, Division of Environmental Permits, at the enclosed address.

For most sites, comprehensive field surveys have not been conducted; the enclosed report only includes records from our databases. We cannot provide a definitive statement on the presence or absence of all rare or state-listed species or significant natural communities. This information should not be substituted for on-site surveys that may be required for environment impact assessment.

Our databases are continually growing as records are added and updated. If this proposed project is still under development one year from now, we recommend that you contact us again so that we may update this response with the most current information.

Sincerely,

Tara Salerno

Tara Salerno, Information Services
New York Natural Heritage Program

cc: Reg. 2, Wildlife Mgr.
Brianna Gary, Bureau of Wildlife, Albany,
R. Edick, Env. Permits, Albany

Natural Heritage Report on Rare Species and Ecological Communities

NY Natural Heritage Program, NYS DEC, 625 Broadway, 5th Floor,
Albany, NY 12233-4757
(518) 402-8935

These rare bird species and bird concentration areas have been documented within 10 miles of the project site.

~Refer to the User's Guide for explanations of codes, ranks and fields.

Natural Heritage Report on Rare Species and Ecological Communities

	NY Protection Status	Federal Listing	NY Conservation Rank	Global Conservation Rank
BIRDS				
Black Skimmer *Rynchops niger* Breeding	Special Concern		S2 - Imperiled	G5 - Secure
Cattle Egret *Bubulcus ibis* Breeding			S2 - Imperiled	G5 - Secure
Common Tern *Sterna hirundo* Breeding	Threatened		S3B - Vulnerable	G5 - Secure
Forster's Tern *Sterna forsteri* Breeding			S1 - Critically imperiled	G5 - Secure
Glossy Ibis *Plegadis falcinellus* Breeding			S2 - Imperiled	G5 - Secure
Great Egret *Ardea alba* Breeding			S2 - Imperiled	G5 - Secure
Gull-billed Tern *Gelochelidon nilotica* Breeding			S1 - Critically imperiled	G5 - Secure
Laughing Gull *Leucophaeus atricilla* Breeding			S1 - Critically imperiled	G5 - Secure
Least Bittern *Ixobrychus exilis* Breeding	Threatened		S3B,S1N - Vulnerable	G5 - Secure
Least Tern *Sternula antillarum* Breeding	Threatened		S3B - Vulnerable	G4 - Apparently secure
Little Blue Heron *Egretta caerulea* Breeding			S2 - Imperiled	G5 - Secure
Northern Harrier *Circus cyaneus* Breeding	Threatened		S3B,S3N - Vulnerable	G5 - Secure

	NY Protection Status	Federal Listing	NY Conservation Rank	Global Conservation Rank
BIRDS				
Peregrine Falcon ***Falco peregrinus*** Breeding	Endangered		S3B - Vulnerable	G4 - Apparently secure
Pied-billed Grebe ***Podilymbus podiceps*** Breeding	Threatened		S3B,S1N - Vulnerable	G5 - Secure
Piping Plover ***Charadrius melodus*** Breeding	Endangered	Endangered/ Threatened	S3B - Vulnerable	G3 - Vulnerable
Roseate Tern ***Sterna dougallii*** Breeding	Endangered	Endangered	S1B - Critically imperiled	G4 - Apparently secure
Short-eared Owl ***Asio flammeus*** Breeding	Endangered		S2 - Imperiled	G5 - Secure
Short-eared Owl ***Asio flammeus*** Nonbreeding	Endangered		S2 - Imperiled	G5 - Secure
Snowy Egret ***Egretta thula*** Breeding			S2S3 - Imperiled	G5 - Secure
Tricolored Heron ***Egretta tricolor*** Breeding			S2 - Imperiled	G5 - Secure
Upland Sandpiper ***Bartramia longicauda*** Breeding	Threatened		S3B - Vulnerable	G5 - Secure
Yellow-crowned Night-Heron ***Nyctanassa violacea*** Breeding			S2 - Imperiled	G5 - Secure
OTHER				
Gull Colony	Unlisted		SNR - Rank not assigned	GNR - Not ranked

23 Records Processed

More detailed information about many of the rare and listed animals in New York, including biology, identification, habitat, conservation, and management, are available online in Natural Heritage's Conservation Guides at www.acris.nynhp.org, from NatureServe Explorer at http://www.natureserve.org/explorer, from NYSDEC at http://www.dec.ny.gov/animals/7494.html.

The occurrences are within the project site or in close proximity.

Natural Heritage Report on Rare Species and Ecological Communities

NY Natural Heritage Program, NYS DEC, 625 Broadway, 5th Floor, Albany, NY
12233-4757
(518) 402-8935

~This report contains **SENSITIVE** information that should not be released to the public without permission from the NY Natural Heritage Program.
~Refer to the User's Guide for explanations of codes, ranks and fields.
~Location maps for certain species and communities may not be provided 1) if the species is vulnerable to disturbance, 2) if the location and/or extent is not precisely known, 3) if the location and/or extent is too large to display, and/or 4) if the animal is listed as Endangered or Threatened by New York State.

Natural Heritage Report on Rare Species and Ecological Communities

BIRDS

Asio flammeus

Short-eared Owl	**NY Legal Status:**	Endangered	**NYS Rank:**	S2 - Imperiled	Office Use 841
Breeding	**Federal Listing:**		**Global Rank:**	G5 - Secure	ESU
	Last Report:	**	**EO Rank:**	**	
	County:	Kings			
	Town:	New York City (Kings County)			
	Location:	At, or in the vicinity of, the project site.			
	Directions:	**			
	General Quality and Habitat:	**For information on the population at this location and management considerations, please contact the NYS DEC Regional Wildlife Manager for the Region where the project is located.			

Circus cyaneus

Northern Harrier	**NY Legal Status:**	Threatened	**NYS Rank:**	S3B,S3N - Vulnerable	Office Use 720
Breeding	**Federal Listing:**		**Global Rank:**	G5 - Secure	ESU
	Last Report:	**	**EO Rank:**	**	
	County:	Kings			
	Town:	New York City (Kings County)			
	Location:	At, or in the vicinity of, the project site.			
	Directions:	**			
	General Quality and Habitat:	**For information on the population at this location and management considerations, please contact the NYS DEC Regional Wildlife Manager for the Region where the project is located.			

Tyto alba

Barn Owl	**NY Legal Status:**		**NYS Rank:**	S1S2 - Critically imperiled	Office Use 333
Breeding	**Federal Listing:**		**Global Rank:**	G5 -.Secure	
	Last Report:	2004-su	**EO Rank:**	Excellent or Good	
	County:	Kings, Queens			
	Town:	New York City (Kings County), New York City (Queens County)			
	Location:	Jamaica Bay			
	Directions:	The barn owls nest in boxes at Jamaica Bay National Wildlife Refuge and Floyd Bennett Field, and in an abandoned building about 0.15 mi northeast of the radio towers at Floyd Bennett Field.			
	General Quality and Habitat:	The rank is based on a comparison to other sites within New York State. The owls were observed on islands and a peninsula at a bay. Dredge spoil was applied to some of the islands and to the peninsula. The peninsula was formerly an airfield. Now the airfield is abandoned, and the peninsula has succeeded into a grass/early shrub seral stage.			

BUTTERFLIES and SKIPPERS

The occurrences are within the project site or in close proximity.

Calycopis cecrops

				Office Use
Red-banded Hairstreak	**NY Legal Status:** Unlisted	**NYS Rank:**	SU - Unrankable	11280
	Federal Listing:	**Global Rank:**	G5 - Secure	
	Last Report: 1989-08-09	**EO Rank:**	Extant	
	County: Kings			
	Town: New York City (Kings County)			
	Location: Floyd Bennett Field			
	Directions: The butterflies were observed at Floyd Bennett Field in the Jamaica Bay Wildlife Refuge.			
	General Quality and Habitat: The butterflies were observed in overgrown fields.			

Parrhasius m-album

				Office Use
White-m Hairstreak	**NY Legal Status:** Unlisted	**NYS Rank:**	SU - Unrankable	11281
	Federal Listing:	**Global Rank:**	G5 - Secure	
	Last Report: 1984-07-29	**EO Rank:**	Extant	
	County: Kings			
	Town: New York City (Kings County)			
	Location: Floyd Bennett Field			
	Directions: The butterflies were observed in the South Field at Floyd Bennett Field in the Jamaica Bay Wildlife Refuge.			
	General Quality and Habitat: The butterflies were observed nectaring on white sweet clover in the South Field.			

VASCULAR PLANTS

Cyperus schweinitzii

				Office Use
Schweinitz's Flatsedge	**NY Legal Status:** Rare	**NYS Rank:**	S3 - Vulnerable	3200
	Federal Listing:	**Global Rank:**	G5 - Secure	
	Last Report: 1997-11-12	**EO Rank:**	Excellent or Good	
	County: Kings			S
	Town: New York City (Kings County)			
	Location: Floyd Bennett Field			
	Directions: Floyd Bennett Field: The plants are located between Flatbush Avenue and the main north-south runway. The Floyd Bennett Field unit is off exit 11 on Belt Parkway. Plants are also along first road on the left after entering the park. The plants start immediately after mowed area on both sides of the road.			
	General Quality and Habitat: Hundreds of clumps on park property. Native grassland area with little bluestem, dune grass, tall red top and other wildflowers. There is some evidence of construction debris and decomposing cement runway. Many pockets are not disturbed at all. Area is also located near a wood-chipping compositing project used to cover the asphalt runways.			

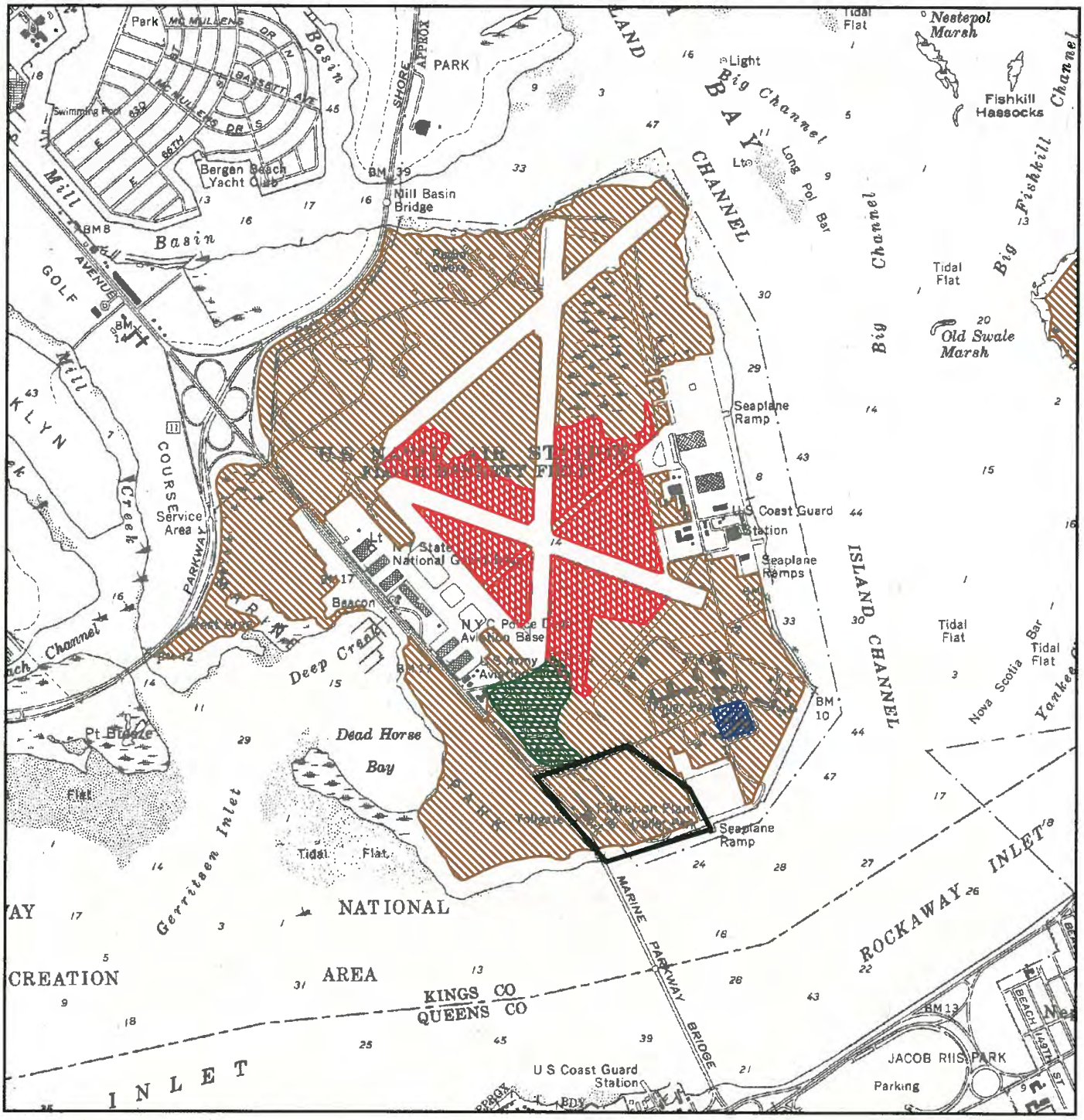
6 Records Processed

More detailed information about many of the rare and listed animals and plants in New York, including biology, identification, habitat, conservation, and management, are available online in Natural Heritage's Conservation Guides at www.acris.nynhp.org, from NatureServe Explorer at http://www.natureserve.org/explorer, from NYSDEC at http://www.dec.ny.gov/animals/7494.html (for animals), and from USDA's Plants Database at http://plants.usda.gov/index.html (for plants).

More detailed information about many of the natural community types in New York, including identification, dominant and characteristic vegetation, distribution, conservation, and management, is available online in Natural Heritage's Conservation Guides at www.acris.nynhp.org. For descriptions of all community types, go to http://www.dec.ny.gov/animals/29384.html and click on Draft Ecological Communities of New York State.

Natural Heritage Map of Rare Species and Ecological Communities

Prepared December 9, 2009 by the NY Natural Heritage Program, NYS DEC Albany, NY



Legend

Project Site

NY Natural Heritage Program Database Records*

- Barn Owl
- Red-banded Hairstreak
- White-m Hairstreak
- Schweinitz's Flatsedge

1:24,000

0 0.15 0.3 0.6 0.9 1.2 Miles

*The locations that are displayed are considered sensitive and should not be released to the public without permission. We do not provide map locations for all records. Please see report for details.

N W E S

Natural Heritage Report on Rare Species and Ecological Communities

NY Natural Heritage Program, NYS DEC, 625 Broadway, 5th Floor,
Albany, NY 12233-4757
(518) 402-8935

HISTORICAL RECORDS

The following plants and animals were documented in the vicinity of the project site at one time, but have not been documented there since 1979 or earlier.
There is no recent information on these plants and animals in the vicinity of the project site and their current status there is unknown. In most cases the precise location of the plant or animal in this vicinity at the time it was last documented is also unknown and therefore location maps are generally not provided.
If appropriate habitat for these plants or animals is present in the vicinity of the project site, it is possible that they may still occur there.

Natural Heritage Report on Rare Species and Ecological Communities

VASCULAR PLANTS

Cyperus retrorsus var. retrorsus

Office Use 4974

Retrorse Flatsedge

NY Legal Status: Endangered
NYS Rank: S1 - Critically imperiled
Federal Listing:
Global Rank: G5T5 - Secure
Last Report: 1938-09-05
EO Rank: Historical, no recent information

M

County: Kings
Town: New York City (Kings County)
Location: Marine Park
Directions: Plum Island, marine park. [Plumb Beach]. Sandy border of salt marsh west of Flatbush Avenue, Brooklyn.
General Quality and Habitat: Sandy border of salt marsh.

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1 Records Processed

More detailed information about many of the rare and listed animals and plants in New York, including biology, identification, habitat, conservation, and management, are available online in Natural Heritage's Conservation Guides at www.acris.nynhp.org, from NatureServe Explorer at http://www.natureserve.org/explorer, from NYSDEC at http://www.dec.ny.gov/animals/7494.html (for animals), and from USDA's Plants Database at http://plants.usda.gov/index.html (for plants).

New York State Department of Environmental Conservation

Regional Permit Administrators

Region	Counties	Regional Permit Administrator
1	Nassau & Suffolk FAX: 631-444-0360	Roger Evans NYSDEC 50 Circle Rd SUNY @ Stony Brook Stony Brook, NY 11790-3409 631-444-0365 631-444-0355 (Duty Analyst-M,W&F only)
2	New York City, (Boroughs of Manhattan, Brooklyn, Bronx, Queens & Staten Island) FAX: 718-482-4975	John Cryan NYSDEC One Hunters Point Plaza 47-40 21st St. Long Island City, NY 11101-5407 718-482-4997
3	Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster & Westchester FAX: 845-255-3042	Margaret Duke NYSDEC 21 South Putt Corners Rd. New Paltz, NY 12561-1620 845-256-3054
4	Albany, Columbia, Greene, Montgomery, Rensselaer & Schenectady FAX:518-357-2460	William Clarke NYSDEC 1130 North Westcott Rd. Schenectady, NY 12306-2014 518-357-2069
4 (sub-office)	Delaware, Otsego & Schoharie FAX: 607-652-2342	Kent Sanders* NYSDEC 65561 State Highway - Route 10 HCR #1, Box 3A Stamford, NY 12167-9503 607-652-7741
5	Clinton, Essex, Franklin & Hamilton FAX: 518-897-1394	Michael McMurray NYSDEC Route 86, P.O. Box 296 Ray Brook, NY 12977-0296 518-897-1234
5 (sub-office)	Fulton, Saratoga, Warren & Washington	Marc Migliore* NYSDEC

http://www.dec.ny.gov/about/39381.html 8/20/2009

USERS GUIDE TO NY NATURAL HERITAGE DATA

New York Natural Heritage Program, 625 Broadway, 5th Floor, Albany, NY 12233-4757 phone: (518) 402-8935

NATURAL HERITAGE PROGRAM: The NY Natural Heritage Program is a partnership between the NYS Department of Environmental Conservation (NYS DEC) and The Nature Conservancy. Our Mission is to facilitate the conservation of New York's biodiversity by providing comprehensive information and scientific expertise on rare species and natural ecosystems to resource managers and other conservation partners. We accomplish this mission by combining thorough field inventories, scientific analyses, expert interpretation, and the most comprehensive database on New York's distinctive biodiversity to deliver the highest quality information for natural resource planning, protection, and management.

DATA SENSITIVITY: The data provided in the report are ecologically sensitive and should be treated in a sensitive manner. The report is for your in-house use and should **not** be released, distributed or incorporated in a public document without prior permission from the Natural Heritage Program.

EO RANK: A letter code for the quality of the occurrence of the rare species or significant natural community, based on population size or area, condition, and landscape context.

A-E = Extant: A=Excellent, B=Good, C=Fair, D=Poor, E=Extant but with insufficient data to assign a rank of A-D.
F = Failed to find. Did not locate species during a limited search, but habitat is still there and further field work is justified.
H = Historical. Historical occurrence without any recent field information.
X = Extirpated. Field/other data indicates element/habitat is destroyed and the element no longer exists at this location.
U = Extant/Historical status uncertain.
Blank = Not assigned.

LAST REPORT: The date that the rare species or significant natural community was last observed at this location, as documented in the Natural Heritage databases. The format is most often YYYY-MM-DD.

NY LEGAL STATUS – Animals:

Categories of Endangered and Threatened species are defined in New York State Environmental Conservation Law section 11-0535. Animals listed as Endangered, Threatened, or Special Concern are protected against taking, importation, transportation, possession, or sale without a permit. Endangered, Threatened, and Special Concern species are listed in regulation 6NYCRR 182.5.

E - Endangered Species: any species which meet one of the following criteria:
- Any native species in imminent danger of extirpation or extinction in New York.
- Any species listed as endangered by the United States Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.

T - Threatened Species: any species which meet one of the following criteria:
- Any native species likely to become an endangered species within the foreseeable future in NY.
- Any species listed as threatened by the U.S. Department of the Interior, as enumerated in the Code of the Federal Regulations 50 CFR 17.11.

SC - Special Concern Species: those species which are not yet recognized as endangered or threatened, but for which documented concern exists for their continued welfare in New York.

P - Protected Wildlife (defined in Environmental Conservation Law section 11-0103): wild game, protected wild birds, and endangered species of wildlife.

U - Unprotected (defined in Environmental Conservation Law section 11-0103): the species may be taken at any time without limit; however a license to take may be required.

G - Game (defined in Environmental Conservation Law section 11-0103): any of a variety of big game or small game species as stated in the Environmental Conservation Law; many normally have an open season for at least part of the year, and are protected at other times.

NY LEGAL STATUS – Plants:

The following categories are defined in regulation 6NYCRR part 193.3 and apply to NYS Environmental Conservation Law section 9-1503.

E - Endangered Species: listed species are those with:
- 5 or fewer extant sites, or
- fewer than 1,000 individuals, or
- restricted to fewer than 4 U.S.G.S. 7 ½ minute topographical maps, or
- species listed as endangered by U.S. Dept. of Interior, as enumerated in Code of Federal Regulations 50 CFR 17.11.

T - Threatened: listed species are those with:
- 6 to fewer than 20 extant sites, or
- 1,000 to fewer than 3,000 individuals, or
- restricted to not less than 4 or more than 7 U.S.G.S. 7 and ½ minute topographical maps, or
- listed as threatened by U.S. Department of Interior, as enumerated in Code of Federal Regulations 50 CFR 17.11.

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2012-WTE-3371-OE
Prior Study No.
2010-WTE-6839-OE

Issued Date: 07/23/2012

Alain D. Flexer
Marine Forces Reserve (Facilities)
4400 Dauphine St.
New Orleans, LA 70146-5400

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Brooklyn WT1
Location:	Brooklyn, NY
Latitude:	40-34-50.81N NAD 83
Longitude:	73-53-04.19W
Heights:	15 feet site elevation (SE)
	97 feet above ground level (AGL)
	112 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 01/23/2014 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific

coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (404) 305-7081. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2012-WTE-3371-OE.

Signature Control No: 166258113-169468870 (DNE -WT)
Michael Blaich
Specialist

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2012-WTE-3372-OE
Prior Study No.
2010-WTE-6839-OE

Issued Date: 07/23/2012

Alain D. Flexer
Marine Forces Reserve (Facilities)
4400 Dauphine St.
New Orleans, LA 70146-5400

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Brooklyn WT2
Location:	Brooklyn, NY
Latitude:	40-34-48.34N NAD 83
Longitude:	73-53-02.50W
Heights:	15 feet site elevation (SE)
	97 feet above ground level (AGL)
	112 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 01/23/2014 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific

coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (404) 305-7081. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2012-WTE-3372-OE.

Signature Control No: 166258114-169468868 (DNE -WT)
Michael Blaich
Specialist

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
2601 Meacham Boulevard
Fort Worth, TX 76137

Aeronautical Study No.
2012-WTE-3373-OE
Prior Study No.
2010-WTE-6839-OE

Issued Date: 07/23/2012

Alain D. Flexer
Marine Forces Reserve (Facilities)
4400 Dauphine St.
New Orleans, LA 70146-5400

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine Brooklyn WT3
Location:	Brooklyn, NY
Latitude:	40-34-46.10N NAD 83
Longitude:	73-53-00.85W
Heights:	15 feet site elevation (SE)
	97 feet above ground level (AGL)
	112 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 01/23/2014 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific

coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (404) 305-7081. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2012-WTE-3373-OE.

Signature Control No: 166258115-169468869 (DNE -WT)
Michael Blaich
Specialist

STATE OF NEW YORK
DEPARTMENT OF STATE
ONE COMMERCE PLAZA
99 WASHINGTON AVENUE
ALBANY, NY 12231-0001

ANDREW M. CUOMO
GOVERNOR

CESAR A. PERALES
SECRETARY OF STATE

September 06, 2012

Mr. E.J. Maguire
Deputy AC/S, Facilities
C/O United States Marine Corps
Marine Forces Reserve
2000 Opelousas Avenue
New Orleans, LA 70146

Re: F-2012-0596 (DA)
United States Marine Corps Forces Reserve Direct Action
Install and Operate three 50 –kilowatt wind turbines
Marine Corps Reserve Center, Brooklyn
Jamaica Bay, Kings County
Concurrence with consistency determination

Dear Mr. Maguire:

The Department of State received your proposal for the above referenced project. As recently modified by you, the proposal involves developing a bird and bat monitoring plan that includes provisions for adaptive management, and implement said plan. The Department of State would be happy to consult with you on the monitoring plan development.

The Department of State concurs that this proposed activity is consistent with the New York State Coastal Management Program.

This Concurrence is without prejudice to and does not obviate the need to obtain all other applicable licenses, permits, other forms of authorization or approval that may be required pursuant to existing State statutes. This specifically includes any required consultation with the New York State Historic Preservation Office.

When communicating with us regarding this matter, please contact Matthew Maraglio at (518) 474-5290 (e-mail: matthew.maraglio@dos.ny.gov) and refer to our file #F-2012-0596 (DA).

Sincerely,

George Stafford
Deputy Secretary of State

GRS/mm
cc: DEC/Region 2 – John Cryan
NYSHPO – John Bonafide
NYC WRP – Mary Kimball
USMC – Alain Flexer
USN – Casey Barker (by email)

APPENDIX C
SHADOW FLICKER ANALYSIS

Project:
Brooklyn

Description:
Brooklyn Wind TEA

Printed/Page
8/24/2012 1:43 PM / 1

Licensed user:
TEC Inc.
2496 Old Ivy Road, Suite 300
US-CHARLOTTESVILLE, VA 22903
5101
Chris Noddings / crnoddings@tecinc.com

Calculated:
8/24/2012 1:42 PM/2.7.486

SHADOW - Main Result

Calculation: Worst Case Scenario

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3	°
Day step for calculation	1	days
Time step for calculation	1	minutes

The calculated times are "worst case" given by the following assumptions:
- The sun is shining all the day, from sunrise to sunset
- The rotor plane is always perpendicular to the line from the WTG to the sun
- The WTG is always operating

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used:
Obstacles used in calculation
Eye height: 1.5 m
Grid resolution: 10 m

Scale 1:4,000
New WTG Shadow receptor

WTGs

	Geo DMS: WGS 84 Longitude	Latitude	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
1	-73°53'04.29" East	40°34'50.87" North	0.0	Site 1	No	KROGMANN	15/50 B-50	50	15.2	28.5	152	70.0
2	-73°53'02.50" East	40°34'48.34" North	0.0	Site 2	No	KROGMANN	15/50 B-50	50	15.2	28.5	152	70.0
3	-73°53'00.80" East	40°34'45.93" North	0.0	Site 3	No	KROGMANN	15/50 B-50	50	15.2	28.5	152	70.0

Shadow receptor-Input

No.	Name	Geo DMS: WGS 84 Longitude	Latitude	Z [m]	Width [m]	Height [m]	Height a.g.l. [m]	Degrees from south cw [°]	Slope of window [°]	Direction mode
A	Southern Entrance	-73°53'01.48" East	40°34'53.22" North	0.0	1.0	1.0	1.0	-180.0	90.0	"Green house mode"

Calculation Results

Shadow receptor

No.	Name	Shadow, worst case Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
A	Southern Entrance	48:28	83	0:40

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	Site 1	48:28	
2	Site 2	0:00	
3	Site 3	0:00	

Project:
Brooklyn

Description:
Brooklyn Wind TEA

Printed/Page
8/24/2012 1:43 PM / 1

Licensed user:
TEC Inc.
2496 Old Ivy Road, Suite 300
US-CHARLOTTESVILLE, VA 22903
5101
Chris Noddings / crnoddings@tecinc.com

Calculated:
8/24/2012 1:42 PM/2.7.486

SHADOW - Calendar

Calculation: Worst Case Scenario**Shadow receptor:** A - Southern Entrance

Assumptions for shadow calculations

Maximum distance for influence	152	m
Minimum sun height over horizon for influence	3	°
Day step for calculation	1	days
Time step for calculation	1	minutes

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January		February	March	April	May	June	July	August	September	October	November		December		
1	07:20		14:36 (1)	07:07	06:31	06:41	05:56	05:28	05:29	05:52	06:22	06:52	06:25			07:00		14:22 (1)
	16:39	38	15:14 (1)	17:13	17:47	19:20	19:51	20:19	20:31	20:13	19:29	18:39	16:54			16:30	40	15:02 (1)
2	07:20		14:37 (1)	07:06	06:30	06:39	05:55	05:27	05:29	05:53	06:23	06:53	06:26			07:01		14:22 (1)
	16:40	38	15:15 (1)	17:14	17:48	19:21	19:52	20:20	20:31	20:12	19:28	18:38	16:52			16:30	40	15:02 (1)
3	07:20		14:37 (1)	07:05	06:28	06:38	05:53	05:27	05:30	05:54	06:24	06:54	06:28			07:02		14:23 (1)
	16:41	38	15:15 (1)	17:16	17:49	19:22	19:53	20:21	20:31	20:11	19:26	18:36	16:51			16:29	39	15:02 (1)
4	07:20		14:37 (1)	07:04	06:27	06:36	05:52	05:27	05:30	05:55	06:25	06:55	06:29			07:03		14:23 (1)
	16:42	39	15:16 (1)	17:17	17:50	19:23	19:54	20:22	20:30	20:10	19:25	18:35	16:50			16:29	40	15:03 (1)
5	07:20		14:38 (1)	07:03	06:25	06:34	05:51	05:26	05:31	05:56	06:26	06:56	06:30			07:04		14:24 (1)
	16:43	39	15:17 (1)	17:18	17:51	19:24	19:55	20:22	20:30	20:09	19:23	18:33	16:49			16:29	39	15:03 (1)
6	07:20		14:38 (1)	07:01	06:23	06:33	05:50	05:26	05:31	05:57	06:27	06:57	06:31			07:05		14:24 (1)
	16:44	39	15:17 (1)	17:19	17:52	19:25	19:56	20:23	20:30	20:07	19:21	18:31	16:48			16:29	39	15:03 (1)
7	07:20		14:38 (1)	07:00	06:22	06:31	05:49	05:26	05:32	05:58	06:28	06:58	06:32			07:05		14:25 (1)
	16:45	40	15:18 (1)	17:21	17:53	19:26	19:57	20:24	20:30	20:06	19:20	18:30	16:47			16:29	39	15:04 (1)
8	07:20		14:39 (1)	06:59	07:20	06:30	05:47	05:25	05:33	05:59	06:29	06:59	06:34			07:06		14:25 (1)
	16:46	40	15:19 (1)	17:22	18:55	19:27	19:58	20:24	20:30	20:05	19:18	18:28	16:46			16:29	39	15:04 (1)
9	07:20		14:39 (1)	06:58	07:19	06:28	05:46	05:25	05:33	06:00	06:30	07:00	06:35			07:07		14:26 (1)
	16:47	39	15:18 (1)	17:23	18:56	19:28	19:59	20:25	20:29	20:04	19:16	18:26	16:45			16:29	38	15:04 (1)
10	07:19		14:39 (1)	06:57	07:17	06:26	05:45	05:25	05:34	06:01	06:31	07:01	06:36		14:37 (1)	07:08		14:26 (1)
	16:48	40	15:19 (1)	17:24	18:57	19:29	20:00	20:25	20:29	20:03	19:15	18:25	16:44	3	14:40 (1)	16:29	38	15:04 (1)
11	07:19		14:40 (1)	06:56	07:15	06:25	05:44	05:25	05:35	06:02	06:32	07:02	06:37		14:31 (1)	07:09		14:26 (1)
	16:49	40	15:20 (1)	17:25	18:58	19:30	20:00	20:26	20:28	20:01	19:13	18:23	16:43	14	14:45 (1)	16:29	38	15:04 (1)
12	07:19		14:40 (1)	06:55	07:14	06:23	05:43	05:25	05:35	06:03	06:33	07:03	06:38		14:29 (1)	07:10		14:27 (1)
	16:50	39	15:19 (1)	17:27	18:59	19:31	20:01	20:26	20:28	20:00	19:11	18:22	16:42	18	14:47 (1)	16:29	38	15:05 (1)
13	07:19		14:40 (1)	06:53	07:12	06:22	05:42	05:25	05:36	06:04	06:34	07:04	06:39		14:27 (1)	07:11		14:28 (1)
	16:51	40	15:20 (1)	17:28	19:00	19:32	20:02	20:27	20:28	19:57	19:10	18:20	16:41	21	14:48 (1)	16:29	37	15:05 (1)
14	07:18		14:41 (1)	06:52	07:11	06:20	05:41	05:25	05:37	06:05	06:35	07:05	06:41		14:26 (1)	07:11		14:29 (1)
	16:52	40	15:21 (1)	17:29	19:01	19:34	20:03	20:27	20:27	19:56	19:08	18:19	16:40	24	14:50 (1)	16:30	37	15:06 (1)
15	07:18		14:41 (1)	06:51	07:09	06:19	05:40	05:25	05:37	06:06	06:36	07:06	06:42		14:24 (1)	07:12		14:28 (1)
	16:53	40	15:21 (1)	17:30	19:02	19:35	20:04	20:28	20:27	19:55	19:06	18:17	16:39	27	14:51 (1)	16:30	38	15:06 (1)
16	07:18		14:42 (1)	06:50	07:07	06:17	05:39	05:25	05:38	06:07	06:37	07:07	06:43		14:23 (1)	07:13		14:29 (1)
	16:54	39	15:21 (1)	17:32	19:03	19:36	20:05	20:28	20:26	19:53	19:05	18:16	16:38	29	14:52 (1)	16:30	37	15:06 (1)
17	07:17		14:42 (1)	06:48	07:06	06:16	05:38	05:25	05:39	06:08	06:38	07:08	06:44		14:22 (1)	07:13		14:30 (1)
	16:55	39	15:21 (1)	17:33	19:04	19:37	20:06	20:29	20:25	19:52	19:03	18:14	16:37	31	14:53 (1)	16:30	37	15:07 (1)
18	07:17		14:43 (1)	06:47	07:04	06:14	05:37	05:25	05:40	06:09	06:39	07:10	06:45		14:22 (1)	07:14		14:30 (1)
	16:56	39	15:22 (1)	17:34	19:05	19:38	20:07	20:29	20:25	19:51	19:01	18:13	16:37	33	14:55 (1)	16:31	37	15:07 (1)
19	07:16		14:44 (1)	06:46	07:02	06:13	05:36	05:25	05:41	06:10	06:40	07:11	06:46		14:21 (1)	07:15		14:31 (1)
	16:58	37	15:21 (1)	17:35	19:06	19:39	20:08	20:29	20:24	19:49	19:00	18:11	16:36	34	14:55 (1)	16:31	37	15:08 (1)
20	07:16		14:44 (1)	06:44	07:01	06:11	05:36	05:25	05:41	06:11	06:41	07:12	06:48		14:21 (1)	07:15		14:31 (1)
	16:59	37	15:21 (1)	17:36	19:07	19:40	20:09	20:30	20:23	19:48	18:58	18:10	16:35	35	14:56 (1)	16:31	37	15:08 (1)
21	07:15		14:45 (1)	06:43	06:59	06:10	05:35	05:25	05:42	06:12	06:42	07:13	06:49		14:20 (1)	07:16		14:32 (1)
	17:00	36	15:21 (1)	17:37	19:08	19:41	20:10	20:30	20:23	19:46	18:56	18:08	16:35	36	14:56 (1)	16:32	37	15:09 (1)
22	07:14		14:46 (1)	06:41	06:57	06:08	05:34	05:25	05:43	06:13	06:43	07:14	06:50		14:21 (1)	07:16		14:32 (1)
	17:01	35	15:21 (1)	17:39	19:10	19:42	20:11	20:30	20:22	19:45	18:54	18:07	16:34	37	14:58 (1)	16:32	37	15:09 (1)
23	07:14		14:46 (1)	06:40	06:56	06:07	05:33	05:26	05:44	06:14	06:44	07:15	06:51		14:21 (1)	07:17		14:33 (1)
	17:02	34	15:20 (1)	17:40	19:11	19:43	20:12	20:30	20:21	19:43	18:53	18:05	16:33	37	14:58 (1)	16:33	37	15:10 (1)
24	07:13		14:48 (1)	06:38	06:54	06:05	05:32	05:26	05:45	06:15	06:45	07:16	06:52		14:20 (1)	07:17		14:33 (1)
	17:03	33	15:21 (1)	17:41	19:12	19:44	20:13	20:31	20:20	19:42	18:51	18:04	16:33	39	14:59 (1)	16:33	37	15:10 (1)
25	07:12		14:49 (1)	06:37	06:53	06:04	05:32	05:26	05:46	06:16	06:46	07:17	06:53		14:20 (1)	07:18		14:33 (1)
	17:05	31	15:20 (1)	17:42	19:13	19:45	20:14	20:31	20:20	19:40	18:49	18:03	16:32	39	14:59 (1)	16:34	37	15:10 (1)
26	07:12		14:50 (1)	06:36	06:51	06:03	05:31	05:27	05:47	06:17	06:47	07:18	06:54		14:20 (1)	07:18		14:34 (1)
	17:06	29	15:19 (1)	17:43	19:14	19:46	20:14	20:31	20:19	19:39	18:48	18:01	16:32	39	14:59 (1)	16:35	37	15:11 (1)
27	07:11		14:51 (1)	06:34	06:49	06:01	05:31	05:27	05:48	06:18	06:48	07:20	06:55		14:20 (1)	07:18		14:34 (1)
	17:07	27	15:18 (1)	17:44	19:15	19:47	20:15	20:31	20:18	19:37	18:46	18:00	16:31	40	15:00 (1)	16:35	37	15:11 (1)
28	07:10		14:53 (1)	06:33	06:48	06:00	05:30	05:27	05:49	06:19	06:49	07:21	06:56		14:20 (1)	07:19		14:34 (1)
	17:08	24	15:17 (1)	17:46	19:16	19:48	20:16	20:31	20:17	19:36	18:44	17:59	16:31	40	15:00 (1)	16:36	38	15:12 (1)
29	07:09		14:56 (1)		06:46	05:59	05:29	05:28	05:49	06:19	06:50	07:22	06:58		14:21 (1)	07:19		14:36 (1)
	17:10	21	15:17 (1)		19:17	19:49	20:17	20:31	20:16	19:34	18:43	17:57	16:31	40	15:01 (1)	16:37	37	15:13 (1)
30	07:08		14:58 (1)		06:44	05:57	05:29	05:28	05:50	06:20	06:51	07:23	06:59		14:22 (1)	07:19		14:36 (1)
	17:11	18	15:16 (1)		19:18	19:50	20:18	20:31	20:15	19:33	18:41	17:56	16:30	39	15:01 (1)	16:37	37	15:13 (1)
31	07:07		15:01 (1)		06:43		05:28		05:51	06:21		07:24				07:20		14:36 (1)
	17:12	12	15:13 (1)		19:19		20:19		20:14	19:31		17:55				16:38	38	15:14 (1)
Potential sun hours	299			298	370	398	447	451	458	427	374	345	299			289		
Total, worst case		1080												655			1173	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
Brooklyn

Description:
Brooklyn Wind TEA

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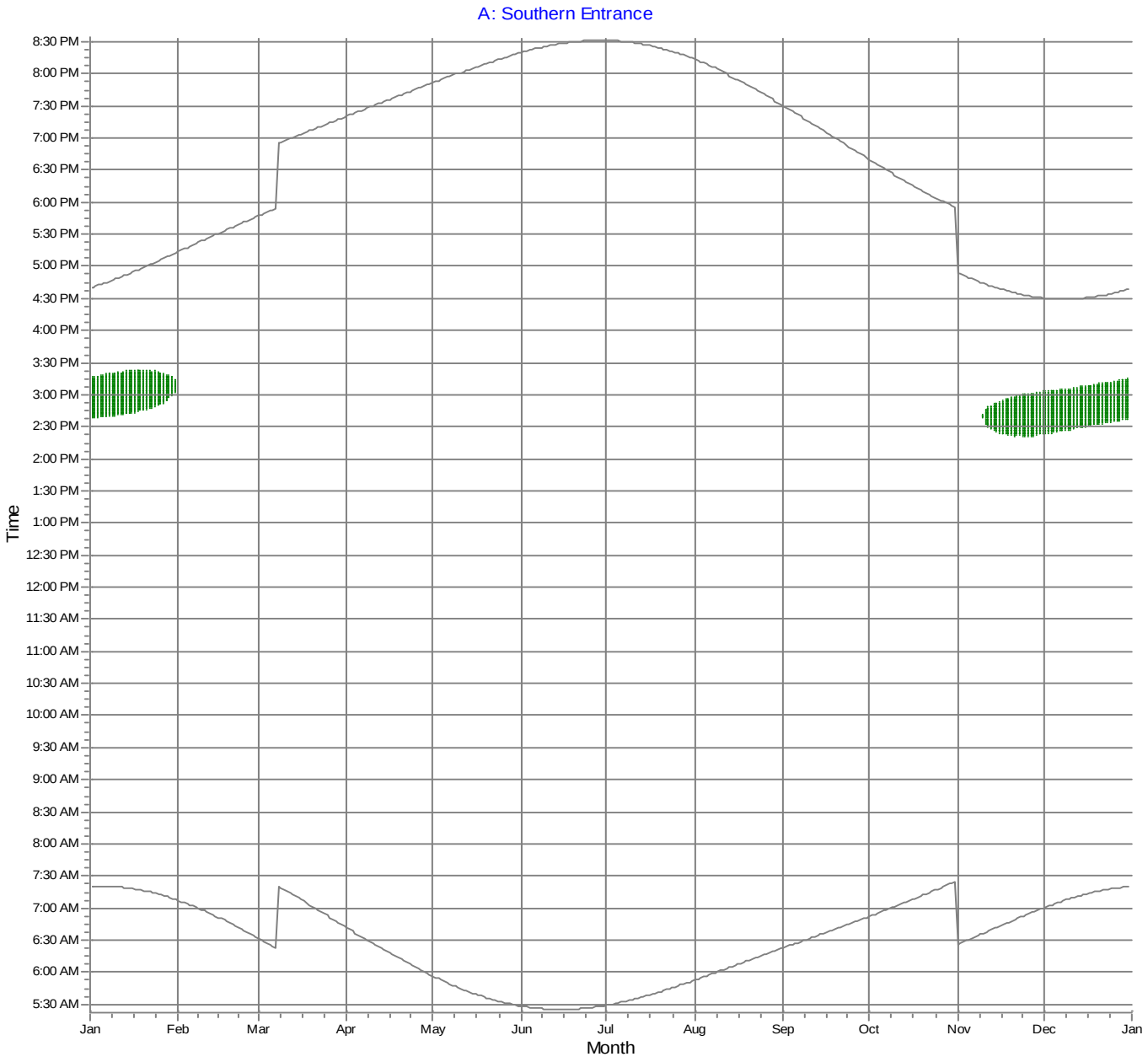
8/24/2012 1:43 PM / 1

Licensed user:
TEC Inc.
2496 Old Ivy Road, Suite 300
US-CHARLOTTESVILLE, VA 22903
5101
Chris Noddings / crnoddings@tecinc.com

Calculated:
8/24/2012 1:42 PM/2.7.486

SHADOW - Calendar, graphical

Calculation: Worst Case Scenario**Shadow receptor:** A - Southern Entrance



WTGs

1: Site 1

Project:
Brooklyn

Description:
Brooklyn Wind TEA

Printed/Page
8/24/2012 1:44 PM / 1

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Calculated:
8/24/2012 1:42 PM/2.7.486

SHADOW - Calendar per WTG

Calculation: Worst Case Scenario**WTG:** 1 - Site 1

Assumptions for shadow calculations

Maximum distance for influence	152	m
Minimum sun height over horizon for influence	3	°
Day step for calculation	1	days
Time step for calculation	1	minutes

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January		February	March	April	May	June	July	August	September	October	November		December	
1	07:20	14:36-15:14/38	07:07	06:31	06:41	05:56	05:28	05:29	05:52	06:22	06:52	06:25		07:00	14:22-15:02/40
	16:39		17:13	17:47	19:20	19:51	20:19	20:31	20:13	19:29	18:39	16:54		16:30	
2	07:20	14:37-15:15/38	07:06	06:30	06:39	05:55	05:27	05:29	05:53	06:23	06:53	06:26		07:01	14:22-15:02/40
	16:40		17:14	17:48	19:21	19:52	20:20	20:31	20:12	19:28	18:38	16:52		16:30	
3	07:20	14:37-15:15/38	07:05	06:28	06:38	05:53	05:27	05:30	05:54	06:24	06:54	06:28		07:02	14:23-15:02/39
	16:41		17:16	17:49	19:22	19:53	20:21	20:31	20:11	19:26	18:36	16:51		16:29	
4	07:20	14:37-15:16/39	07:04	06:27	06:36	05:52	05:27	05:30	05:55	06:25	06:55	06:29		07:03	14:23-15:03/40
	16:42		17:17	17:50	19:23	19:54	20:22	20:30	20:10	19:25	18:35	16:50		16:29	
5	07:20	14:38-15:17/39	07:03	06:25	06:34	05:51	05:26	05:31	05:56	06:26	06:56	06:30		07:04	14:24-15:03/39
	16:43		17:18	17:51	19:24	19:55	20:22	20:30	20:09	19:23	18:33	16:49		16:29	
6	07:20	14:38-15:17/39	07:02	06:23	06:33	05:50	05:26	05:31	05:57	06:27	06:57	06:31		07:05	14:24-15:03/39
	16:44		17:19	17:52	19:25	19:56	20:23	20:30	20:07	19:21	18:31	16:48		16:29	
7	07:20	14:38-15:18/40	07:00	06:22	06:31	05:49	05:26	05:32	05:58	06:28	06:58	06:32		07:05	14:25-15:04/39
	16:45		17:21	17:53	19:26	19:57	20:24	20:30	20:06	19:20	18:30	16:47		16:29	
8	07:20	14:39-15:19/40	06:59	07:20	06:30	05:47	05:25	05:33	05:59	06:29	06:59	06:34		07:06	14:25-15:04/39
	16:46		17:22	18:55	19:27	19:58	20:24	20:30	20:05	19:18	18:28	16:46		16:29	
9	07:20	14:39-15:18/39	06:58	07:19	06:28	05:46	05:25	05:33	06:00	06:30	07:00	06:35		07:07	14:26-15:04/38
	16:47		17:23	18:56	19:28	19:59	20:25	20:29	20:04	19:16	18:26	16:45		16:29	
10	07:19	14:39-15:19/40	06:57	07:17	06:26	05:45	05:25	05:34	06:01	06:31	07:01	06:36	14:37-14:40/3	07:08	14:26-15:04/38
	16:48		17:24	18:57	19:29	20:00	20:25	20:29	20:03	19:15	18:25	16:44		16:29	
11	07:19	14:40-15:20/40	06:56	07:15	06:25	05:44	05:25	05:35	06:02	06:32	07:02	06:37	14:31-14:45/14	07:09	14:26-15:04/38
	16:49		17:25	18:58	19:30	20:00	20:26	20:28	20:01	19:13	18:23	16:43		16:29	
12	07:19	14:40-15:19/39	06:55	07:14	06:23	05:43	05:25	05:35	06:03	06:33	07:03	06:38	14:29-14:47/18	07:10	14:27-15:05/38
	16:50		17:27	18:59	19:31	20:01	20:26	20:28	20:00	19:11	18:22	16:42		16:29	
13	07:19	14:40-15:20/40	06:53	07:12	06:22	05:42	05:25	05:36	06:04	06:34	07:04	06:39	14:27-14:48/21	07:11	14:28-15:05/37
	16:51		17:28	19:00	19:32	20:02	20:27	20:28	19:57	19:10	18:20	16:41		16:29	
14	07:18	14:41-15:21/40	06:52	07:11	06:20	05:41	05:25	05:37	06:05	06:35	07:05	06:41	14:26-14:50/24	07:11	14:29-15:06/37
	16:52		17:29	19:01	19:34	20:03	20:27	20:27	19:56	19:08	18:19	16:40		16:30	
15	07:18	14:41-15:21/40	06:51	07:09	06:19	05:40	05:25	05:37	06:06	06:36	07:06	06:42	14:24-14:51/27	07:12	14:28-15:06/38
	16:53		17:30	19:02	19:35	20:04	20:28	20:27	19:55	19:06	18:17	16:39		16:30	
16	07:18	14:42-15:21/39	06:50	07:07	06:17	05:39	05:25	05:38	06:07	06:37	07:07	06:43	14:23-14:52/29	07:13	14:29-15:06/37
	16:54		17:32	19:03	19:36	20:05	20:28	20:26	19:53	19:05	18:16	16:38		16:30	
17	07:17	14:42-15:21/39	06:48	07:06	06:16	05:38	05:25	05:39	06:08	06:38	07:08	06:44	14:22-14:53/31	07:13	14:30-15:07/37
	16:55		17:33	19:04	19:37	20:06	20:29	20:25	19:52	19:03	18:14	16:37		16:30	
18	07:17	14:43-15:22/39	06:47	07:04	06:14	05:37	05:25	05:40	06:09	06:39	07:10	06:45	14:22-14:55/33	07:14	14:30-15:07/37
	16:56		17:34	19:05	19:38	20:07	20:29	20:25	19:51	19:01	18:13	16:37		16:31	
19	07:16	14:44-15:21/37	06:46	07:02	06:13	05:36	05:25	05:41	06:10	06:40	07:11	06:46	14:21-14:55/34	07:15	14:31-15:08/37
	16:58		17:35	19:06	19:39	20:08	20:29	20:24	19:49	19:00	18:11	16:36		16:31	
20	07:16	14:44-15:21/37	06:44	07:01	06:11	05:36	05:25	05:41	06:11	06:41	07:12	06:48	14:21-14:56/35	07:15	14:31-15:08/37
	16:59		17:36	19:07	19:40	20:09	20:30	20:23	19:48	18:58	18:10	16:35		16:31	
21	07:15	14:45-15:21/36	06:43	06:59	06:10	05:35	05:25	05:42	06:12	06:42	07:13	06:49	14:20-14:56/36	07:16	14:32-15:09/37
	17:00		17:37	19:08	19:41	20:10	20:30	20:23	19:46	18:56	18:08	16:35		16:32	
22	07:14	14:46-15:21/35	06:41	06:57	06:08	05:34	05:25	05:43	06:13	06:43	07:14	06:50	14:21-14:58/37	07:16	14:32-15:09/37
	17:01		17:39	19:10	19:42	20:11	20:30	20:22	19:45	18:54	18:07	16:34		16:32	
23	07:14	14:46-15:20/34	06:40	06:56	06:07	05:33	05:26	05:44	06:14	06:44	07:15	06:51	14:21-14:58/37	07:17	14:33-15:10/37
	17:02		17:40	19:11	19:43	20:12	20:30	20:21	19:43	18:53	18:05	16:33		16:33	
24	07:13	14:48-15:21/33	06:38	06:54	06:05	05:32	05:26	05:45	06:15	06:45	07:16	06:52	14:20-14:59/39	07:17	14:33-15:10/37
	17:03		17:41	19:12	19:44	20:13	20:31	20:20	19:42	18:51	18:04	16:33		16:33	
25	07:12	14:49-15:20/31	06:37	06:53	06:04	05:32	05:26	05:46	06:16	06:46	07:17	06:53	14:20-14:59/39	07:18	14:33-15:10/37
	17:05		17:42	19:13	19:45	20:14	20:31	20:20	19:40	18:49	18:03	16:32		16:34	
26	07:12	14:50-15:19/29	06:36	06:51	06:03	05:31	05:27	05:47	06:17	06:47	07:18	06:54	14:20-14:59/39	07:18	14:34-15:11/37
	17:06		17:43	19:14	19:46	20:14	20:31	20:19	19:39	18:48	18:01	16:32		16:35	
27	07:11	14:51-15:18/27	06:34	06:49	06:01	05:31	05:27	05:48	06:18	06:48	07:20	06:55	14:20-15:00/40	07:18	14:34-15:11/37
	17:07		17:44	19:15	19:47	20:15	20:31	20:18	19:37	18:46	18:00	16:31		16:35	
28	07:10	14:53-15:17/24	06:33	06:48	06:00	05:30	05:27	05:49	06:19	06:49	07:21	06:56	14:20-15:00/40	07:19	14:34-15:12/38
	17:08		17:46	19:16	19:48	20:16	20:31	20:17	19:36	18:44	17:59	16:31		16:36	
29	07:09	14:56-15:17/21		06:46	05:59	05:29	05:28	05:49	06:19	06:50	07:22	06:58	14:21-15:01/40	07:19	14:36-15:13/37
	17:10			19:17	19:49	20:17	20:31	20:16	19:34	18:43	17:57	16:31		16:37	
30	07:08	14:58-15:16/18		06:44	05:57	05:29	05:28	05:50	06:20	06:51	07:23	06:59	14:22-15:01/39	07:19	14:36-15:13/37
	17:11			19:18	19:50	20:18	20:31	20:15	19:33	18:41	17:56	16:30		16:37	
31	07:07	15:01-15:13/12		06:43		05:28		05:51	06:21		07:24			07:20	14:36-15:14/38
	17:12			19:19		20:19		20:14	19:31		17:55			16:38	
Potential sun hours	299		298	370	398	447	451	458	427	374	345	299		289	
Sum of minutes with flicker		1080		0	0	0	0	0	0	0	0		655		1173

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Brooklyn

Description:
Brooklyn Wind TEA

Printed/Page
8/24/2012 1:44 PM / 2

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Chris Noddings / crnoddings@tecinc.com

Calculated:
8/24/2012 1:42 PM/2.7.486

SHADOW - Calendar per WTG

Calculation: Worst Case Scenario**WTG:** 2 - Site 2

Assumptions for shadow calculations

Maximum distance for influence	152	m
Minimum sun height over horizon for influence	3	°
Day step for calculation	1	days
Time step for calculation	1	minutes

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset

The rotor plane is always perpendicular to the line from the WTG to the sun

The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:20	07:07	06:31	06:41	05:56	05:28	05:29	05:52	06:22	06:52	06:25	07:00
	16:39	17:13	17:47	19:20	19:51	20:19	20:31	20:13	19:29	18:39	16:54	16:30
2	07:20	07:06	06:30	06:39	05:55	05:27	05:29	05:53	06:23	06:53	06:26	07:01
	16:40	17:14	17:48	19:21	19:52	20:20	20:31	20:12	19:28	18:38	16:52	16:30
3	07:20	07:05	06:28	06:38	05:53	05:27	05:30	05:54	06:24	06:54	06:28	07:02
	16:41	17:16	17:49	19:22	19:53	20:21	20:31	20:11	19:26	18:36	16:51	16:29
4	07:20	07:04	06:27	06:36	05:52	05:27	05:30	05:55	06:25	06:55	06:29	07:03
	16:42	17:17	17:50	19:23	19:54	20:22	20:30	20:10	19:25	18:35	16:50	16:29
5	07:20	07:03	06:25	06:34	05:51	05:26	05:31	05:56	06:26	06:56	06:30	07:04
	16:43	17:18	17:51	19:24	19:55	20:22	20:30	20:09	19:23	18:33	16:49	16:29
6	07:20	07:01	06:23	06:33	05:50	05:26	05:31	05:57	06:27	06:57	06:31	07:05
	16:44	17:19	17:52	19:25	19:56	20:23	20:30	20:07	19:21	18:31	16:48	16:29
7	07:20	07:00	06:22	06:31	05:49	05:26	05:32	05:58	06:28	06:58	06:32	07:05
	16:45	17:21	17:53	19:26	19:57	20:24	20:30	20:06	19:20	18:30	16:47	16:29
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	16:49	17:25	18:58	19:30	20:00	20:26	20:28	20:01	19:13	18:23	16:43	16:29
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20	07:16	06:44	07:01	06:11	05:36	05:25	05:41	06:11	06:41	07:12	06:48	07:15
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	17:00	17:37	19:08	19:41	20:10	20:30	20:23	19:46	18:56	18:08	16:35	16:32
22	07:14	06:41	06:57	06:08	05:34	05:25	05:43	06:13	06:43	07:14	06:50	07:16
	17:01	17:39	19:10	19:42	20:11	20:30	20:22	19:45	18:54	18:07	16:34	16:32
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	17:02	17:40	19:11	19:43	20:12	20:30	20:21	19:43	18:53	18:05	16:33	16:33
24	07:13	06:38	06:54	06:05	05:32	05:26	05:45	06:15	06:45	07:16	06:52	07:17
	17:03	17:41	19:12	19:44	20:13	20:31	20:20	19:42	18:51	18:04	16:33	16:33
25	07:12	06:37	06:53	06:04	05:32	05:26	05:46	06:16	06:46	07:17	06:53	07:18
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	17:06	17:43	19:14	19:46	20:14	20:31	20:19	19:39	18:48	18:01	16:32	16:35
27	07:11	06:34	06:49	06:01	05:31	05:27	05:48	06:18	06:48	07:20	06:55	07:18
	17:07	17:44	19:15	19:47	20:15	20:31	20:18	19:37	18:46	18:00	16:31	16:35
28	07:10	06:33	06:48	06:00	05:30	05:27	05:49	06:19	06:49	07:21	06:56	07:19
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29	07:09		06:46	05:59	05:29	05:28	05:49	06:19	06:50	07:22	06:58	07:19
	17:10		19:17	19:49	20:17	20:31	20:16	19:34	18:43	17:57	16:31	16:37
30	07:08		06:44	05:57	05:29	05:28	05:50	06:20	06:51	07:23	06:59	07:19
	17:11		19:18	19:50	20:18	20:31	20:15	19:33	18:41	17:56	16:30	16:37
31	07:07		06:43		05:28		05:51	06:21		07:24		07:19
	17:12		19:19		20:19		20:14	19:31		17:55		16:38
Potential sun hours	299	298	370	398	447	451	458	427	374	345	299	289
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Brooklyn

Description:
Brooklyn Wind TEA

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Calculated:
8/24/2012 1:42 PM/2.7.486

SHADOW - Calendar per WTG

Calculation: Worst Case Scenario**WTG:** 3 - Site 3

Assumptions for shadow calculations

Maximum distance for influence	152	m
Minimum sun height over horizon for influence	3	°
Day step for calculation	1	days
Time step for calculation	1	minutes

The calculated times are "worst case" given by the following assumptions:

The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:20	07:07	06:31	06:41	05:56	05:28	05:29	05:52	06:22	06:52	06:25	07:00
	16:39	17:13	17:47	19:20	19:51	20:19	20:31	20:13	19:29	18:39	16:54	16:30
2	07:20	07:06	06:30	06:39	05:55	05:27	05:29	05:53	06:23	06:53	06:26	07:01
	16:40	17:14	17:48	19:21	19:52	20:20	20:31	20:12	19:28	18:38	16:52	16:30
3	07:20	07:05	06:28	06:38	05:53	05:27	05:30	05:54	06:24	06:54	06:28	07:02
	16:41	17:16	17:49	19:22	19:53	20:21	20:31	20:11	19:26	18:36	16:51	16:29
4	07:20	07:04	06:27	06:36	05:52	05:27	05:30	05:55	06:25	06:55	06:29	07:03
	16:42	17:17	17:50	19:23	19:54	20:22	20:30	20:10	19:25	18:35	16:50	16:29
5	07:20	07:03	06:25	06:34	05:51	05:26	05:31	05:56	06:26	06:56	06:30	07:04
	16:43	17:18	17:51	19:24	19:55	20:22	20:30	20:09	19:23	18:33	16:49	16:29
6	07:20	07:01	06:23	06:33	05:50	05:26	05:31	05:57	06:27	06:57	06:31	07:05
	16:44	17:19	17:52	19:25	19:56	20:23	20:30	20:07	19:21	18:31	16:48	16:29
7	07:20	07:00	06:22	06:31	05:49	05:26	05:32	05:58	06:28	06:58	06:32	07:05
	16:45	17:21	17:53	19:26	19:57	20:24	20:30	20:06	19:20	18:30	16:47	16:29
8	07:20	06:59	07:20	06:30	05:47	05:25	05:33	05:59	06:29	06:59	06:34	07:06
	16:46	17:22	18:55	19:27	19:58	20:24	20:30	20:05	19:18	18:28	16:46	16:29
9	07:20	06:58	07:19	06:28	05:46	05:25	05:33	06:00	06:30	07:00	06:35	07:07
	16:47	17:23	18:56	19:28	19:59	20:25	20:29	20:04	19:16	18:26	16:45	16:29
10	07:19	06:57	07:17	06:26	05:45	05:25	05:34	06:01	06:31	07:01	06:36	07:08
	16:48	17:24	18:57	19:29	20:00	20:25	20:29	20:03	19:15	18:25	16:44	16:29
11	07:19	06:56	07:15	06:25	05:44	05:25	05:35	06:02	06:32	07:02	06:37	07:09
	16:49	17:25	18:58	19:30	20:00	20:26	20:28	20:01	19:13	18:23	16:43	16:29
12	07:19	06:55	07:14	06:23	05:43	05:25	05:35	06:03	06:33	07:03	06:38	07:10
	16:50	17:27	18:59	19:31	20:01	20:26	20:28	20:00	19:11	18:22	16:42	16:29
13	07:19	06:53	07:12	06:22	05:42	05:25	05:36	06:04	06:34	07:04	06:39	07:11
	16:51	17:28	19:00	19:32	20:02	20:27	20:28	19:57	19:10	18:20	16:41	16:29
14	07:18	06:52	07:11	06:20	05:41	05:25	05:37	06:05	06:35	07:05	06:41	07:11
	16:52	17:29	19:01	19:34	20:03	20:27	20:27	19:56	19:08	18:19	16:40	16:30
15	07:18	06:51	07:09	06:19	05:40	05:25	05:37	06:06	06:36	07:06	06:42	07:12
	16:53	17:30	19:02	19:35	20:04	20:28	20:27	19:55	19:06	18:17	16:39	16:30
16	07:18	06:50	07:07	06:17	05:39	05:25	05:38	06:07	06:37	07:07	06:43	07:13
	16:54	17:32	19:03	19:36	20:05	20:28	20:26	19:53	19:05	18:16	16:38	16:30
17	07:17	06:48	07:06	06:16	05:38	05:25	05:39	06:08	06:38	07:08	06:44	07:13
	16:55	17:33	19:04	19:37	20:06	20:29	20:25	19:52	19:03	18:14	16:37	16:30
18	07:17	06:47	07:04	06:14	05:37	05:25	05:40	06:09	06:39	07:10	06:45	07:14
	16:56	17:34	19:05	19:38	20:07	20:29	20:25	19:51	19:01	18:13	16:37	16:31
19	07:16	06:46	07:02	06:13	05:36	05:25	05:41	06:10	06:40	07:11	06:46	07:15
	16:58	17:35	19:06	19:39	20:08	20:29	20:24	19:49	19:00	18:11	16:36	16:31
20	07:16	06:44	07:01	06:11	05:36	05:25	05:41	06:11	06:41	07:12	06:48	07:15
	16:59	17:36	19:07	19:40	20:09	20:30	20:23	19:48	18:58	18:10	16:35	16:31
21	07:15	06:43	06:59	06:10	05:35	05:25	05:42	06:12	06:42	07:13	06:49	07:16
	17:00	17:37	19:08	19:41	20:10	20:30	20:23	19:46	18:56	18:08	16:35	16:32
22	07:14	06:41	06:57	06:08	05:34	05:25	05:43	06:13	06:43	07:14	06:50	07:16
	17:01	17:39	19:10	19:42	20:11	20:30	20:22	19:45	18:54	18:07	16:34	16:32
23	07:14	06:40	06:56	06:07	05:33	05:26	05:44	06:14	06:44	07:15	06:51	07:17
	17:02	17:40	19:11	19:43	20:12	20:30	20:21	19:43	18:53	18:05	16:33	16:33
24	07:13	06:38	06:54	06:05	05:32	05:26	05:45	06:15	06:45	07:16	06:52	07:17
	17:03	17:41	19:12	19:44	20:13	20:31	20:20	19:42	18:51	18:04	16:33	16:33
25	07:12	06:37	06:53	06:04	05:32	05:26	05:46	06:16	06:46	07:17	06:53	07:18
	17:05	17:42	19:13	19:45	20:14	20:31	20:20	19:40	18:49	18:03	16:32	16:34
26	07:12	06:36	06:51	06:03	05:31	05:27	05:47	06:17	06:47	07:18	06:54	07:18
	17:06	17:43	19:14	19:46	20:14	20:31	20:19	19:39	18:48	18:01	16:32	16:35
27	07:11	06:34	06:49	06:01	05:31	05:27	05:48	06:18	06:48	07:20	06:55	07:18
	17:07	17:44	19:15	19:47	20:15	20:31	20:18	19:37	18:46	18:00	16:31	16:35
28	07:10	06:33	06:48	06:00	05:30	05:27	05:49	06:19	06:49	07:21	06:56	07:19
	17:08	17:46	19:16	19:48	20:16	20:31	20:17	19:36	18:44	17:59	16:31	16:36
29	07:09		06:46	05:59	05:29	05:28	05:49	06:19	06:50	07:22	06:58	07:19
	17:10		19:17	19:49	20:17	20:31	20:16	19:34	18:43	17:57	16:31	16:37
30	07:08		06:44	05:57	05:29	05:28	05:50	06:20	06:51	07:23	06:59	07:19
	17:11		19:18	19:50	20:18	20:31	20:15	19:33	18:41	17:56	16:30	16:37
31	07:07		06:43		05:28		05:51	06:21		07:24		07:19
	17:12		19:19		20:19		20:14	19:31		17:55		16:38
Potential sun hours	299	298	370	398	447	451	458	427	374	345	299	289
Sum of minutes with flicker	0	0	0	0	0	0	0	0	0	0	0	0

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker
	Sun set (hh:mm)	First time (hh:mm) with flicker-Last time (hh:mm) with flicker/Minutes with flicker

Project:
Brooklyn

Description:
Brooklyn Wind TEA

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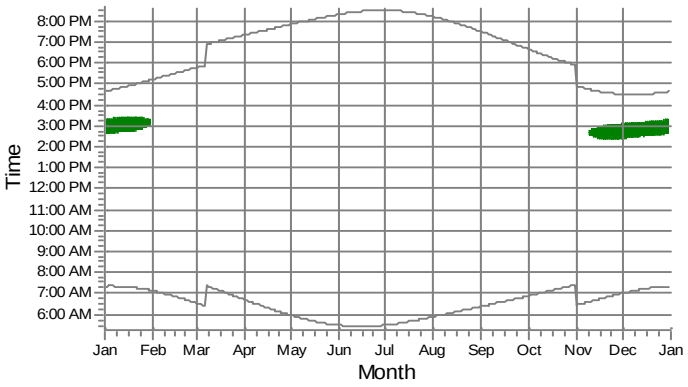
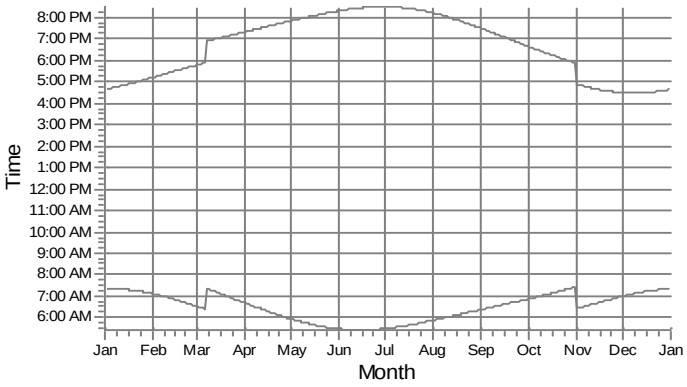
SHADOW - Calendar per WTG, graphical

Calculation: Worst Case Scenario

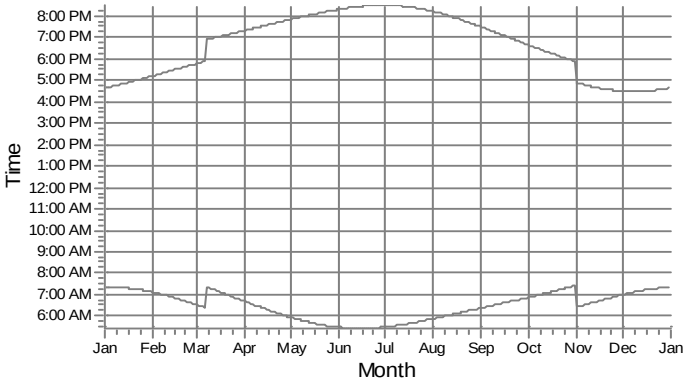
1: Site 1



2: Site 2



3: Site 3



Shadow receptor

A: Southern Entrance

Project:
Brooklyn

Description:
Brooklyn Wind TEA

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Calculated:
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SHADOW - Map

Calculation: Worst Case Scenario

Map: WindPRO map , Print scale 1:4,000, Map center Geo WGS 84 East: -73°53'02.55" North: 40°34'48.33"

New WTG
Shadow receptor

Isolines showing shadow in Hours per year, worst case

0 25 50 100

APPENDIX D
BIRD SURVEY DATA

Table A-3. Abundance and Species Richness by point count location at Floyd Bennett Field - winter 2010											
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**	**Frequency**	**Abundance**
American Black Duck	2								2	12.50%	0.25
American Crow		1		3	10		4	3	21	62.50%	2.63
American Robin		1							1	12.50%	0.13
American Wigeon		2	5						7	25.00%	0.88
Atlantic Brant	263	160	46		1	75		6	551	75.00%	68.88
Black-capped Chickadee					4		2		6	25.00%	0.75
Bufflehead		9			14	3			26	37.50%	3.25
Canada Goose	198	3			8	70			279	50.00%	34.88
Carolina Wren			1						1	12.50%	0.13
Dark-eyed Junco					7				7	12.50%	0.88
European Starling	2								2	12.50%	0.25
Great Black-backed Gull			1						1	12.50%	0.13
Greater Scaup						1			1	12.50%	0.13
Herring Gull	10	16	2	15	17	9	8	15	92	100.00%	11.50
Horned Grebe	1	2							3	25.00%	0.38
House Sparrow		4				10			14	25.00%	1.75
Long-tailed Duck					2				2	12.50%	0.25
Mallard		5							5	12.50%	0.63
Northern Mockingbird					1				1	12.50%	0.13
Red-breasted Merganser	6	5	7		34				52	50.00%	6.50
Ring-billed Gull	20	155		2	10	4		17	208	75.00%	26.00
Rock Pigeon						50	35		85	25.00%	10.63
Song Sparrow						2			2	12.50%	0.25
Unidentified Empidonax Flycatcher					1				1	12.50%	0.13
Unidentified Larus Gull		9			2		9	11	31	50.00%	3.88
White-throated Sparrow		2							2	12.50%	0.25
Yellow-rumped warbler							4		4	12.50%	0.50
Species Richness	**8**	**13**	**6**	**3**	**11**	**9**	**5**	**4**	**25**		
Number of observations	**502**	**374**	**62**	**20**	**111**	**224**	**62**	**52**	**1407**		**175.88**

Table B-3. Abundance and Species Richness by point count location at Floyd Bennett Field - Spring 2010															
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**	**Frequency**	**Abundance**
Alder Flycatcher						1	1	3				2	7	33.33%	0.58
American Crow	9	3	9	18	26	9	11	6	7	7	2	1	108	100.00%	9.00
American Goldfinch		3				2	10		5			7	27	41.67%	2.25
American Oystercatcher	12		5		3	10		4	4	19	16		73	66.67%	6.08
American Redstart							1					3	4	16.67%	0.33
American Robin	9	12	13	13	9	6	18	15	11	2	1	16	125	100.00%	10.42
Atlantic Brant	165	44	279	8	30	141		104	340	177	288		1576	83.33%	131.33
Baltimore Oriole							1					1	2	16.67%	0.17
Barn Swallow	2	3	12	2	9		8	1			2		39	66.67%	3.25
Black Skimmer	6												6	8.33%	0.50
Black-and-White Warbler							1						1	8.33%	0.08
Black-bellied Plover											1		1	8.33%	0.08
Black-capped Chickadee		5		1			2					3	11	33.33%	0.92
Black-throated Green Warbler												2	2	8.33%	0.17
Blue Jay		1	1	1			2					2	7	41.67%	0.58
Brown Thrasher			0					1		1	2	1	5	41.67%	0.42
Brown-headed Cowbird	6	13	12	12	9	3	14	9	4			13	95	83.33%	7.92
Bufflehead						8			12	12	6		38	33.33%	3.17
Canada Goose	8	2	6	26	41			22		6	2		113	66.67%	9.42
Carolina Wren		1	3				2					1	7	33.33%	0.58
Cedar Waxwing		1		8			4						13	25.00%	1.08
Chipping Sparrow		1	1	0			1						3	33.33%	0.25
Common Goldeneye										66			66	8.33%	5.50
Common Grackle	4		3	6	11	4	2	4					34	58.33%	2.83
Common Loon			1					2			2		5	25.00%	0.42
Common Tern	7		7			31		14	11	2	31		103	58.33%	8.58

Table B-3. Abundance and Species Richness by point count location at Floyd Bennett Field - Spring 2010

Species	1	2	3	4	5	6	7	8	9	10	11	12	Total	Frequency	Abundance
Common Yellowthroat		2	1	2		2	5	1	5		1	4	23	75.00%	1.92
Double-crested Cormorant	18	4	35	13		69		27	10	7	12		195	75.00%	16.25
Downy Woodpecker												1	1	8.33%	0.08
Eastern Kingbird		1											1	8.33%	0.08
Eastern Phoebe							1						1	8.33%	0.08
Eastern Towhee	3	5	6	9	3	3	6	1	4			6	46	83.33%	3.83
Eastern Tufted Titmouse							1						1	8.33%	0.08
European Starling	33	29	23	41	36	14	33	7	16	20		26	278	91.67%	23.17
Field Sparrow		1		6	1								8	25.00%	0.67
Fish Crow						1							1	8.33%	0.08
Forster's Tern	16					8		5		14			43	33.33%	3.58
Gray Catbird	1	4	4	3	1		3	3	3			3	25	75.00%	2.08
Great Black-backed Gull	6	1	5	2		9	2	21	9	10	15		80	83.33%	6.67
Great Blue Heron		6		6					4				16	25.00%	1.33
Great Egret						2		2	1		1		6	33.33%	0.50
Greater Scaup											25		25	8.33%	2.08
Greater Yellowlegs										1			1	8.33%	0.08
Hairy Woodpecker				1									1	8.33%	0.08
Herring Gull	82	20	40	17	38	69	23	87	50	99	109	10	644	100.00%	53.67
Horned Grebe										7	4		11	16.67%	0.92
House Sparrow	16	3	9	1	5	20	3		3				60	66.67%	5.00
House Wren												1	1	8.33%	0.08
Hudsonian Godwit					8								8	8.33%	0.67
Killdeer	8			2	1			1					12	33.33%	1.00
Laughing Gull	12	5	17	5	19	22	2	18	9	28	35	7	179	100.00%	14.92
Mallard					1	5		4		9	8	2	29	50.00%	2.42
Mourning Dove	4	3	3	2			4					6	22	50.00%	1.83

Table B-3. Abundance and Species Richness by point count location at Floyd Bennett Field - Spring 2010

Species	1	2	3	4	5	6	7	8	9	10	11	12	Total	Frequency	Abundance
Northern Cardinal	3	15	6	8	3	1	7	5	5			9	62	83.33%	5.17
Northern Flicker			1	3			1					3	8	33.33%	0.67
Northern Gannet	1										1		2	16.67%	0.17
Northern Mockingbird	7	14	8	15	6	5	7	6	8	4		12	92	91.67%	7.67
Northern Rough-winged Swallow					2								2	8.33%	0.17
Orchard Oriole				1			2					1	4	25.00%	0.33
Osprey			1	1		1		4					7	33.33%	0.58
Ovenbird									1				1	8.33%	0.08
Palm Warbler		1					2					1	4	25.00%	0.33
Peregrine Falcon		1											1	8.33%	0.08
Red-breasted Merganser			1					20	7	5	25		58	41.67%	4.83
Red-eyed Vireo									1				1	8.33%	0.08
Red-winged Blackbird	4	11	26	43	32	6	7	16	7	7	13	9	181	100.00%	15.08
Ring-billed Gull	11	7	4	4	31	27	3	16	6	8	7	2	126	100.00%	10.50
Rock Pigeon	25	9	5	39	20	244	46	2	20	42	11		463	91.67%	38.58
Savannah Sparrow	1	1			9								11	25.00%	0.92
Snowy Egret						1				1			2	16.67%	0.17
Song Sparrow	11	8	7	7	5	7	5	12	8	4	6	10	90	100.00%	7.50
Spotted Sandpiper											1		1	8.33%	0.08
Tree Swallow		4	2	8	55		3	18		1	1		92	66.67%	7.67
Turkey Vulture			2		2		1						5	25.00%	0.42
Unidentified Carpodacus Finch		1											1	8.33%	0.08
Unidentified Duck										10			10	8.33%	0.83
Unidentified Swallow				1									1	8.33%	0.08
Unidentified Tern										1			1	8.33%	0.08
Unidentified Warbler				2									2	8.33%	0.17
White-throated Sparrow		2										4	6	16.67%	0.50

Table B-3. Abundance and Species Richness by point count location at Floyd Bennett Field - Spring 2010															
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**	**Frequency**	**Abundance**
Willet										1			1	8.33%	0.08
Yellow Warbler		4	1	1		3	7	5	4	1		5	31	75.00%	2.58
Yellow-bellied Sapsucker												1	1	8.33%	0.08
Yellow-rumped warbler		1		1	1		3		2			3	11	50.00%	0.92
Species Richness	**29**	**38**	**36**	**37**	**29**	**31**	**39**	**34**	**30**	**29**	**28**	**34**	**79**		
Number of observations	**490**	**252**	**559**	**339**	**417**	**734**	**255**	**466**	**577**	**572**	**628**	**178**	**5467**		**455.58**

Table C-3. Abundance and Species Richness by point count location at Floyd Bennett Field - BBS 2010																	
Species	**1**	**2b**	**3**	**4**	**5b**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**Total**	**Frequency**	**Abundance**
Alder Flycatcher								1							1	7.14%	0.07
American Crow	3			1	5	3	3		5	6		3	1	6	36	71.43%	2.57
American Goldfinch		2	2	7			6			3		2			22	42.86%	1.57
American Oystercatcher						3					4				7	14.29%	0.50
American Robin	2	11	7	9	4	2	12	5	11	3		7	7	8	88	92.86%	6.29
Atlantic Brant	6		2			4		4	3	1	2				22	50.00%	1.57
Baltimore Oriole				1								1			2	14.29%	0.14
Barn Swallow		6							3			6			15	21.43%	1.07
Brown Thrasher		1					3								4	14.29%	0.29
Brown-headed Cowbird		3	3	8	3		2	2	2			4		2	29	64.29%	2.07
Carolina Wren			1												1	7.14%	0.07
Common Grackle								1							1	7.14%	0.07
Common Tern	8		3			4		7	3	2	1				28	50.00%	2.00
Common Yellowthroat		3	1			2	3	4	3			5			21	50.00%	1.50
Double-crested Cormorant	4		1	2		6	4	6		7	14				44	57.14%	3.14
Eastern Towhee		4	2	4		1	4					3			18	42.86%	1.29
European Starling		4	9	18	17		8		3			5	10	5	79	64.29%	5.64
Field Sparrow		3													3	7.14%	0.21
Forster's Tern	17					17		4							38	21.43%	2.71
Gray Catbird		1	2	2			5	1	2						13	42.86%	0.93
Great Black-backed Gull	6					4		3	1	4	8				26	42.86%	1.86
Great Blue Heron	1														1	7.14%	0.07
Great Egret						1		1							2	14.29%	0.14
Herring Gull	36	4	12	12	5	42	12	29	35	21	41	4	5	6	264	100.00%	18.86
House Sparrow	7	2	10	4	2	7	1	2	4				2	2	43	78.57%	3.07
House Wren		3	3	1			2	1				1			11	42.86%	0.79
Killdeer	4														4	7.14%	0.29

Table C-3. Abundance and Species Richness by point count location at Floyd Bennett Field - BBS 2010																	
Species	**1**	**2b**	**3**	**4**	**5b**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**Total**	**Frequency**	**Abundance**
Laughing Gull	14		4			13		7	3	4	9				54	50.00%	3.86
Mallard						2					2				4	14.29%	0.29
Mourning Dove	2	2		2		2	2					7		2	19	50.00%	1.36
Northern Cardinal		5	4	4			4	1	2			5			25	50.00%	1.79
Northern Mockingbird	1	5	3	4	2	1	6	3	6		1	5	3	3	43	92.86%	3.07
Osprey								1							1	7.14%	0.07
Red-winged Blackbird	2	5	2	2	4	5	4	10	5	3	6	6	4	4	62	100.00%	4.43
Rock Pigeon	7	2	7		12	67	4	35	49	11	7		12	4	217	85.71%	15.50
Savannah Sparrow					1								2		3	14.29%	0.21
Snowy Egret						1					1				2	14.29%	0.14
Song Sparrow	4	4	5	5	2	2	3	2	7	2	3	3	5	4	51	100.00%	3.64
Tree Swallow					15			9	3				14	8	49	35.71%	3.50
Turkey Vulture														2	2	7.14%	0.14
Unidentified Tern	2								2		2				6	21.43%	0.43
Willet	1							1		2					4	21.43%	0.29
Yellow Warbler		2	1			1	2	3	3			4			16	50.00%	1.14
Species Richness	**18**	**21**	**17**	**22**	**20**	**25**	**20**	**13**	**13**	**17**	**11**	**13**	**20**	**12**	**42**		
Number of observations	**127**	**72**	**84**	**86**	**72**	**190**	**90**	**143**	**155**	**69**	**101**	**71**	**65**	**56**	**1381**		**98.64**

Table D-3. Abundance and Species Richness by point count location at Floyd Bennett Field – summer 2010

Species	1	2	2b	3	4	5	5b	6	7	8	9	10	11	12	13	14	Total	Frequency	Abundance
Alder Flycatcher										3							3	6.25%	0.19
American Crow	6	13	2	6	25	16	2	13	18	5	15	10	3	9	3	3	149	100.00%	9.31
American Goldfinch		7	2	10	32	4	6	5	27	19	49			20	2		183	75.00%	11.44
American Oystercatcher	11							5				9	2				27	25.00%	1.69
American Robin	18	36	7	12	44	26	7	11	39	34	33	1	6	36	3	10	323	100.00%	20.19
Atlantic Brant	6			8				6		2	9	8	10				49	43.75%	3.06
Baltimore Oriole									1								1	6.25%	0.06
Barn Swallow	19	19	4	19	17	11			25		14		5	18	2	2	155	75.00%	9.69
Black Skimmer	1							2									3	12.50%	0.19
Black-capped Chickadee									2								2	6.25%	0.13
Black-crowned Night-Heron										1		1		1			3	18.75%	0.19
Blue Jay		2			3												5	12.50%	0.31
Bobolink						4											4	6.25%	0.25
Brown Thrasher		3		5	1				17	5	3			5			39	43.75%	2.44
Brown-headed Cowbird	3	24	7	12	24	8	2	4	24	21	6	2		16	4	5	162	93.75%	10.13
Canada Goose					2			8			8						18	18.75%	1.13
Carolina Wren		1		3	1				1					8			14	31.25%	0.88
Cedar Waxwing		4	3		2					9	2			1			21	37.50%	1.31
Chimney Swift						5											5	6.25%	0.31
Common Grackle	3		2	2	6					2				2	1		18	43.75%	1.13
Common Nighthawk					1												1	6.25%	0.06
Common Tern	4			17				21		23	1	20	11				97	43.75%	6.06
Common Yellowthroat		4	1	5	2				11	19	13		1	12			68	56.25%	4.25
Double-crested Cormorant	29	1	4	10	8			13	1	16	6	41	40	2			171	75.00%	10.69
Eastern Kingbird						2				3							5	12.50%	0.31
Eastern Towhee	3	8	5	9	22			10	16	8	13		2	21			117	68.75%	7.31

Table D-3. Abundance and Species Richness by point count location at Floyd Bennett Field – summer 2010

Species	1	2	2b	3	4	5	5b	6	7	8	9	10	11	12	13	14	Total	Frequency	Abundance
Eastern Tufted Titmouse			1														1	6.25%	0.06
European Starling	42	30	4	68	144	82	15	33	57	61	57	3		32	17	29	674	93.75%	42.13
Field Sparrow		5	1		8												14	18.75%	0.88
Fish Crow								2	1			1		1			5	25.00%	0.31
Forster's Tern	5							7		5		1	2				20	31.25%	1.25
Gray Catbird		15	4	8	10				17	7	10			14			85	50.00%	5.31
Great Black-backed Gull	38			11	1			22		16	9	24	32	1	1		155	62.50%	9.69
Great Blue Heron		1											1	1			3	18.75%	0.19
Great Egret	1						1			1							3	18.75%	0.19
Herring Gull	258	30	8	121	35	12	5	329	32	162	149	163	381	24	5	2	1716	100.00%	107.25
House Finch		16							2								18	12.50%	1.13
House Sparrow	30	19	6	24	10	18	5	45	14	1	33	2		2	4	8	221	93.75%	13.81
House Wren		11	1	2	10				14	7	1			8			54	50.00%	3.38
Killdeer	5					2											7	12.50%	0.44
Laughing Gull	48	16	1	45	3	3		74	7	43	54	52	50	14		2	412	87.50%	25.75
Mallard	2											38					40	12.50%	2.50
Mourning Dove	4	24	5	5	19		2		16		3	2		21		2	103	68.75%	6.44
Northern Cardinal	1	16	2	16	18				24	9	17		2	24			129	62.50%	8.06
Northern Flicker														1			1	6.25%	0.06
Northern Mockingbird	20	23	4	25	31	9	4	18	31	29	24	4	5	17	3	3	250	100.00%	15.63
Osprey										8		1					9	12.50%	0.56
Red-bellied Woodpecker														1			1	6.25%	0.06
Red-winged Blackbird	7	12	5	25	5	8	5	17	12	50	22	27	28	37	3	6	269	100.00%	16.81
Ring-billed Gull	27			2				19		10	6	7	32				103	43.75%	6.44
Rock Pigeon	66	3	2	52	81	61	2	487	62	194	79	20	95	35	6	14	1259	100.00%	78.69
Savannah Sparrow						11	2				1				2	1	17	31.25%	1.06

Table D-3. Abundance and Species Richness by point count location at Floyd Bennett Field – summer 2010

Species	1	2	2b	3	4	5	5b	6	7	8	9	10	11	12	13	14	Total	Frequency	Abundance
Semipalmated Plover													1				1	6.25%	0.06
Snowy Egret	1		1	1				2		5	1	1	2				14	50.00%	0.88
Song Sparrow	9	19	4	13	24	16	6	8	18	27	13	9	10	24	5	3	208	100.00%	13.00
Tree Swallow		5				62	13			46	27	6		9	10	8	186	56.25%	11.63
Turkey Vulture					7												7	6.25%	0.44
Unidentified Larus Gull		22		1	12	24		2	9	2	5	5	2	1			85	68.75%	5.31
Unidentified Tern				2				18			1		5				26	25.00%	1.63
Unidentified Warbler									1					1			2	12.50%	0.13
Willet												1					1	6.25%	0.06
Willow Flycatcher											1						1	6.25%	0.06
Yellow Warbler		2	1	1					8	6	1			8			27	43.75%	1.69
Species Richness	**28**	**29**	**29**	**30**	**19**	**24**	**27**	**34**	**32**	**26**	**22**	**32**	**16**	**15**	**26**	**15**	**60**		
Number of observations	**667**	**391**	**87**	**540**	**608**	**384**	**77**	**1181**	**507**	**859**	**686**	**459**	**728**	**427**	**71**	**98**	**7770**		**485.63**

Table E-2. Abundance and Species Richness by date location at Floyd Bennett Field – fall 2010		
Date	**Species Richness**	**Number of Individuals**
Total	**95**	**5581**

Table E-3. Abundance and Species Richness by point count location at Floyd Bennett Field- fall 2010

Species	1	2	3	4	5	6	7	8	9	10	11	12	Total	Frequency	Abundance
American Black Duck			2			1							3	16.67%	0.25
American Crow	5	18	3	13	33	3	14	12	17	7	1	9	135	100.00%	11.25
American Golden-Plover					8								8	8.33%	0.67
American Goldfinch		5	2				8	3	1	3		3	25	58.33%	2.08
American kestrel				2	14								16	16.67%	1.33
American Oystercatcher			1						4	33	3	2	43	41.67%	3.58
American Redstart							1						1	8.33%	0.08
American Robin	3	35	9	35	9	1	29	10	11	3	8	42	195	100.00%	16.25
Atlantic Brant						20		1	5	61	30	11	128	50.00%	10.67
Barn Swallow			4	1	7					6	4		22	41.67%	1.83
Belted Kingfisher			1					2	3				6	25.00%	0.50
Black-bellied Plover						1		8	10	96	16		131	41.67%	10.92
Blackburnian Warbler							1						1	8.33%	0.08
Black-capped Chickadee	1	7					11						19	25.00%	1.58
Blue Jay				5	1		1			1		2	10	41.67%	0.83
Brown Thrasher		2					1						3	16.67%	0.25
Brown-headed Cowbird				1									1	8.33%	0.08
Canada Goose	38		45	30	23	58		2	35		9		240	66.67%	20.00
Carolina Wren		2	8	1	1		4	1			2	10	29	66.67%	2.42
Cattle Egret									3				3	8.33%	0.25
Cedar Waxwing	2		1				2	5		1	1	8	20	58.33%	1.67
Chestnut-sided Warbler		1								1	1		3	25.00%	0.25
Chimney Swift				10	4							2	16	25.00%	1.33
Chipping Sparrow	1		2				2					1	6	33.33%	0.50
Common Grackle		7	8				2	2					19	33.33%	1.58
Common Nighthawk								1					1	8.33%	0.08
Common Tern	14		11			6		16	24	1	4	6	82	66.67%	6.83
Common Yellowthroat	1	4	2	1	1		5	6	1	2	2	3	28	91.67%	2.33
Cooper's Hawk												1	1	8.33%	0.08
Dark-eyed Junco				6									6	8.33%	0.50
Double-crested	26	1	107	2		15		9	6	15	42	8	231	83.33%	19.25

Table E-3. Abundance and Species Richness by point count location at Floyd Bennett Field- fall 2010

Species	1	2	3	4	5	6	7	8	9	10	11	12	Total	Frequency	Abundance
Cormorant															
Downy Woodpecker									1				1	8.33%	0.08
Dunlin										4	7		11	16.67%	0.92
Eastern Bluebird							1						1	8.33%	0.08
Eastern Phoebe					1								1	8.33%	0.08
Eastern Towhee		8	1	7	1	4	6		3	4		12	46	75.00%	3.83
Eastern Tufted Titmouse								1					1	8.33%	0.08
Eastern Wood-Pewee								1				1	2	16.67%	0.17
European Starling	123	42	45	97	276	14	15	40	9		11	51	723	91.67%	60.25
Fish Crow		1											1	8.33%	0.08
Golden-crowned Kinglet				1									1	8.33%	0.08
Gray Catbird	2	18	5	11	2		18	10	8	4	2	15	95	91.67%	7.92
Great Black-backed Gull	13	1	8		2	12		2	5	10	25		78	75.00%	6.50
Great Blue Heron											1		1	8.33%	0.08
Great Cormorant	4		44	1	3			1	1		1		55	58.33%	4.58
Great Crested Flycatcher							1						1	8.33%	0.08
Great Egret								1	3				4	16.67%	0.33
Greater Scaup								2		3			5	16.67%	0.42
Greater Yellowlegs											2		2	8.33%	0.17
Herring Gull	92	18	15	5	10	280	5	80	45	40	115	6	711	100.00%	59.25
House Finch		2											2	8.33%	0.17
House Sparrow	1	2	7		2	7	5		3				27	58.33%	2.25
House Wren		1						1					2	16.67%	0.17
Laughing Gull	270		22	3		117		12	29	9	37	15	514	75.00%	42.83
Lesser Yellowlegs						2							2	8.33%	0.17
Mallard						1				5	1		7	25.00%	0.58
Mourning Dove	4	4	13	13	6		8	1		2		7	58	75.00%	4.83
Mourning Warbler								1				1	2	16.67%	0.17
Mute Swan								2					2	8.33%	0.17
Northern Cardinal	1	11	4	2	1		5		4	1		4	33	75.00%	2.75
Northern Flicker				1			2						3	16.67%	0.25
Northern Harrier					3			3					6	16.67%	0.50
Northern Mockingbird	10	9	14	19	6	3	7	12	13	1	2	8	104	100.00%	8.67
Northern Parula							2						2	8.33%	0.17

Table E-3. Abundance and Species Richness by point count location at Floyd Bennett Field- fall 2010

Species	1	2	3	4	5	6	7	8	9	10	11	12	Total	Frequency	Abundance
Osprey						2	1	3	1	2	1	1	11	58.33%	0.92
Ovenbird		1											1	8.33%	0.08
Palm Warbler								7					7	8.33%	0.58
Peregrine Falcon		1				1							2	16.67%	0.17
Red Knot								2					2	8.33%	0.17
Red-breasted Nuthatch				7									7	8.33%	0.58
Red-tailed Hawk										1			1	8.33%	0.08
Red-winged Blackbird	15	4	10	5	18			2		2		2	58	66.67%	4.83
Ring-billed Gull	17	2	50	2	1	28	1	13	15	3	24		156	91.67%	13.00
Ring-necked Duck											2		2	8.33%	0.17
Rock Pigeon	27	17	35	24	35	479	19	35	29	2	12	17	731	100.00%	60.92
Ruby-crowned Kinglet												1	1	8.33%	0.08
Ruddy Turnstone	1									38	3		42	25.00%	3.50
Sanderling	10		1			1			4	56	34	5	111	58.33%	9.25
Savannah Sparrow					3								3	8.33%	0.25
Semipalmated Plover						3		2		27	12		44	33.33%	3.67
Sharp-shinned Hawk												1	1	8.33%	0.08
Snow Goose					1								1	8.33%	0.08
Snowy Egret						2		1	1	1			5	33.33%	0.42
Song Sparrow	4	9	2	6	3	2	4	17	4	1	2	7	61	100.00%	5.08
Spotted Sandpiper			2								1		3	16.67%	0.25
Tree Swallow	3		7	26	2	4	38					13	93	58.33%	7.75
Unidentified Empidonax Flycatcher												1	1	8.33%	0.08
Unidentified Larus Gull	4	9	1	2	3		1		79	6	62	1	168	83.33%	14.00
Unidentified Sparrow			1										1	8.33%	0.08
Unidentified Swallow			3				3						6	16.67%	0.50
Unidentified Teal	2												2	8.33%	0.17
Unidentified Tern								70					70	8.33%	5.83
Unidentified Warbler	4												4	8.33%	0.33
Western Sandpiper										2			2	8.33%	0.17
White-breasted Nuthatch				1								1	2	16.67%	0.17
White-crowned Sparrow												3	3	8.33%	0.25
White-eyed Vireo							1						1	8.33%	0.08
White-throated Sparrow		5						9	3			2	19	33.33%	1.58
Willet										6			6	8.33%	0.50

Table E-3. Abundance and Species Richness by point count location at Floyd Bennett Field- fall 2010															
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**	**Frequency**	**Abundance**
Winter Wren									1				1	8.33%	0.08
Yellow Warbler		1	2				2						5	25.00%	0.42
Yellow-rumped warbler		6					3					2	11	25.00%	0.92
Species Richness	**26**	**31**	**34**	**30**	**29**	**26**	**33**	**40**	**32**	**36**	**33**	**36**	**95**		
Number of observations	**698**	**254**	**498**	**340**	**480**	**1067**	**229**	**409**	**381**	**460**	**480**	**285**	**5581**		**465.08**

Table F-1. Species Totals, maximum, observations of within rotor-swept zone, frequencies and abundances per survey at Floyd Bennett Field - fall 2010				
Species	**Species Total**	**Number within rotor-swept zone**	**Frequency**	**Abundance**
Mourning Dove	13	0	41.67%	1.08
Northern Cardinal	31	0	83.33%	2.58
Northern Flicker	21	0	58.33%	1.75
Northern Harrier	3	0	25.00%	0.25
Northern Mockingbird	35	0	91.67%	2.92
Peregrine Falcon	1	0	8.33%	0.08
Red-breasted Merganser	229	5	100.00%	19.08
Red-tailed Hawk	6	0	41.67%	0.50
Red-throated Loon	1	240	8.33%	0.08
Ring-billed Gull	4769	65	100.00%	397.42
Rock Pigeon	293	0	83.33%	24.42
Ruddy Duck	98	0	25.00%	8.17
Savannah Sparrow	2	0	16.67%	0.17
Song Sparrow	56	19	83.33%	4.67
Unidentified Gull	24	0	66.67%	2.00
Unknown Scaup sp.	100	0	16.67%	8.33
White-throated Sparrow	84	0	100.00%	7.00
Yellow-bellied Sapsucker	1	0	8.33%	0.08
Yellow-rumped warbler	81	0	83.33%	6.75
Species Richness	**56**	**10**		
Total	**17,465**	**399**		**1455.42**

Table F-2. Abundance and Species Richness by date location at Floyd Bennett Field – winter 2010–11							
Date	12/24/2010	12/24/2010	12/24/2010	12/24/2010	12/24/2010	12/24/2010	**Total**
Species Richness	40	39	29	30	22	34	**56**
Total	2508	2366	4051	3077	2106	3357	**17,465**

Table F-3. Abundance and Species Richness by point count location at Floyd Bennett Field - winter 2010–11															
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**	**Frequency**	**Abundance**
American Black Duck			2		2	23			10	10			47	41.67%	3.92
American Crow	3	8	8	19	11	11	14	7	17	2	3	1	104	100.00%	8.67
American Goldfinch								9	8			5	22	25.00%	1.83
American Pipit					1								1	8.33%	0.08
American Tree Sparrow								8					8	8.33%	0.67

Table F-3. Abundance and Species Richness by point count location at Floyd Bennett Field - winter 2010–11

Species	1	2	3	4	5	6	7	8	9	10	11	12	Total	Frequency	Abundance
American Wigeon	2			2	2	12		1			2		21	50.00%	1.75
Atlantic Brant	4590		163		5	521	20	99	1015	101	450	8	6972	83.33%	581.00
Black Brant					1								1	8.33%	0.08
Black-capped Chickadee		6	2	10	2		15				1	11	47	58.33%	3.92
Blue Jay								2	2			2	6	25.00%	0.50
Brown-headed Cowbird								1					1	8.33%	0.08
Bufflehead	31	2	34		2	41		28	71	58	40		307	75.00%	25.58
Canada Goose	99				770	122	18	18	199	34	66		1326	66.67%	110.50
Carolina Wren												2	2	8.33%	0.17
Chipping Sparrow							1						1	8.33%	0.08
Common Goldeneye	85		41			85	2		42	62	18		335	58.33%	27.92
Common Loon									2				2	8.33%	0.17
Common Merganser								3					3	8.33%	0.25
Cooper's Hawk	1											1	2	16.67%	0.17
Dark-eyed Junco			2									2	4	16.67%	0.33
Double-crested Cormorant			3					1		2			6	25.00%	0.50
Downy Woodpecker							1					1	2	16.67%	0.17
European Starling		115	18	8	55	27	17	27	8			13	288	75.00%	24.00
Field Sparrow		3											3	8.33%	0.25
Fox Sparrow				1									1	8.33%	0.08
Gadwall	2	16						11	41				70	33.33%	5.83
Great Black-backed Gull	1		2					3	6	7	5		24	50.00%	2.00
Great Cormorant		1									1		2	16.67%	0.17
Greater Scaup									750	495			1245	16.67%	103.75
Herring Gull	53		24	1	1	143		23	26	16	57	4	348	83.33%	29.00
Horned Grebe	26					3			11	9	8		57	41.67%	4.75
Horned Lark					42	9			1				52	25.00%	4.33
House Finch		5											5	8.33%	0.42
House Sparrow	11	21	9	1		22	10		2	2		1	79	75.00%	6.58
Killdeer	2												2	8.33%	0.17
Lesser Scaup							200		1				201	16.67%	16.75
Long-tailed Duck									3	4			7	16.67%	0.58
Mallard	2									10			12	16.67%	1.00
Merlin		1											1	8.33%	0.08

Table F-3. Abundance and Species Richness by point count location at Floyd Bennett Field - winter 2010–11															
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Total**	**Frequency**	**Abundance**
Mourning Dove				2			3				2	6	13	33.33%	1.08
Northern Cardinal		10	2				6	1	2		1	9	31	58.33%	2.58
Northern Flicker		2					4	4	4		2	5	21	50.00%	1.75
Northern Harrier								1	2				3	16.67%	0.25
Northern Mockingbird	3	3	4	2	2	1	11	4	1		1	3	35	91.67%	2.92
Peregrine Falcon					1								1	8.33%	0.08
Red-breasted Merganser	48	2	7			14	3	7	72	30	46		229	75.00%	19.08
Red-tailed Hawk					1		1	2	1			1	6	41.67%	0.50
Red-throated Loon	1												1	8.33%	0.08
Ring-billed Gull	353		76	1	8	3430	3	139	252	136	369	2	4769	91.67%	397.42
Rock Pigeon	8	19	45	24	32	124	4	15	8	7		7	293	91.67%	24.42
Ruddy Duck									30	68			98	16.67%	8.17
Savannah Sparrow					2								2	8.33%	0.17
Song Sparrow		8	2	3	10		5	12	6			10	56	66.67%	4.67
Unidentified Gull		5	2	5	2	1	4	2		2	1		24	75.00%	2.00
Unknown Scaup sp.									100				100	8.33%	8.33
White-throated Sparrow	1	9	2	19			8	22	3			20	84	66.67%	7.00
Yellow-bellied Sapsucker												1	1	8.33%	0.08
Yellow-rumped warbler		9		24	1		7	21	2		3	14	81	66.67%	6.75
Species Richness	**20**	**18**	**19**	**14**	**20**	**16**	**21**	**26**	**31**	**18**	**18**	**22**	**56**		
Number of observations	**5322**	**245**	**448**	**122**	**953**	**4589**	**357**	**471**	**2698**	**1055**	**1076**	**129**	**17,465**		**1455.42**

Table G-3. Abundance and Species Richness by point count location at Floyd Bennett Field – 2010–11

Species	1	2	2b	3	4	5	5b	6	7	8	9	10	11	12	13	14	Total	Frequency	Abundance
Alder Flycatcher								1	1	7				2			11	25.00%	0.69
American Black Duck	2			4		2		24			10	10					52	37.50%	3.25
American Crow	26	43	2	26	79	96	7	39	64	33	61	32	9	23	4	9	553	100.00%	34.56
American Golden-Plover						8											8	6.25%	0.50
American Goldfinch		15	4	14	39	4	6	7	51	31	63	6		37	2		279	81.25%	17.44
American kestrel					2	14											16	12.50%	1.00
American Oystercatcher	23			6		3		18		4	8	61	25	2			150	56.25%	9.38
American Pipit						1											1	6.25%	0.06
American Redstart									2					3			5	12.50%	0.31
American Robin	32	84	18	41	101	44	11	20	98	64	66	9	15	101	10	18	732	100.00%	45.75
American Tree Sparrow										8							8	6.25%	0.50
American Wigeon	2	2		5	2	2		12		1			2				28	50.00%	1.75
Atlantic Brant	5030	204		498	8	36		767	20	216	1372	348	780	19			9298	75.00%	581.13
Baltimore Oriole					1				2					2			5	18.75%	0.31
Barn Swallow	21	22	10	35	20	27			33	1	17	6	11	24	2	2	231	87.50%	14.44
Belted Kingfisher				1						2	3						6	18.75%	0.38
Black Brant						1											1	6.25%	0.06
Black Skimmer	7							2									9	12.50%	0.56
Black-and-White Warbler									1								1	6.25%	0.06
Black-bellied Plover								1		8	10	96	17				132	31.25%	8.25
Blackburnian Warbler									1								1	6.25%	0.06
Black-capped Chickadee	1	18		2	11	6			32				1	14			85	50.00%	5.31
Black-crowned Night-Heron										1		1		1			3	18.75%	0.19
Black-throated Green Warbler														2			2	6.25%	0.13
Blue Jay		3		1	9	1			3	2	2	1		6			28	56.25%	1.75
Bobolink						4											4	6.25%	0.25
Brown Thrasher		5	1	5	1				21	6	3	1	2	6			51	62.50%	3.19

Table G-3. Abundance and Species Richness by point count location at Floyd Bennett Field – 2010–11

Species	1	2	2b	3	4	5	5b	6	7	8	9	10	11	12	13	14	Total	Frequency	Abundance
Brown-headed Cowbird	9	37	10	27	45	17	5	7	40	33	12	2		33	4	7	288	93.75%	18.00
Bufflehead	31	11		34		16		52		28	83	70	46				371	56.25%	23.19
Canada Goose	343	5		51	58	842		258	18	42	242	40	77				1976	68.75%	123.50
Carolina Wren		4		16	2	1			7	1			2	21			54	50.00%	3.38
Cattle Egret											3						3	6.25%	0.19
Cedar Waxwing	2	5	3	1	10				6	14	2	1	1	9			54	68.75%	3.38
Chestnut-sided Warbler		1										1	1				3	18.75%	0.19
Chimney Swift					10	9								2			21	18.75%	1.31
Chipping Sparrow	1	1		3	0				4					1			10	37.50%	0.63
Common Goldeneye	85			41				85	2		42	128	18				401	43.75%	25.06
Common Grackle	7	7	2	13	12	11		4	4	9				2	1		72	68.75%	4.50
Common Loon				1						2	2		2				7	25.00%	0.44
Common Merganser										3							3	6.25%	0.19
Common Nighthawk					1					1							2	12.50%	0.13
Common Tern	33			38				62		60	39	25	47	6			310	50.00%	19.38
Common Yellowthroat	1	10	4	9	5	1		4	24	30	22	2	4	24			140	81.25%	8.75
Cooper's Hawk	1													2			3	12.50%	0.19
Dark-eyed Junco				2	6	7								2			17	25.00%	1.06
Double-crested Cormorant	77	6	4	156	25			103	5	59	22	72	108	10			647	75.00%	40.44
Downy Woodpecker									1		1			2			4	18.75%	0.25
Dunlin												4	7				11	12.50%	0.69
Eastern Bluebird									1								1	6.25%	0.06
Eastern Kingbird		1				2				3							6	18.75%	0.38
Eastern Phoebe						1			1								2	12.50%	0.13
Eastern Towhee	6	21	9	18	42	4		18	32	9	20	4	2	42			227	81.25%	14.19
Eastern Tufted Titmouse			1						1	1							3	18.75%	0.19
Eastern Wood-Pewee										1				1			2	12.50%	0.13

Table G-3. Abundance and Species Richness by point count location at Floyd Bennett Field – 2010–11

Species	1	2	2b	3	4	5	5b	6	7	8	9	10	11	12	13	14	Total	Frequency	Abundance
European Starling	200	216	8	163	308	449	32	88	130	135	93	23	11	127	27	34	2044	100.00%	127.75
Field Sparrow		9	4		14	1											28	25.00%	1.75
Fish Crow		1						3	1			1		1			7	31.25%	0.44
Forster's Tern	38							32		14		15	2				101	31.25%	6.31
Fox Sparrow					1												1	6.25%	0.06
Gadwall	2	16								11	41						70	25.00%	4.38
Golden-crowned Kinglet					1												1	6.25%	0.06
Gray Catbird	3	37	5	19	26	3			43	21	23	4	2	32			218	75.00%	13.63
Great Black-backed Gull	64	2		27	3	2		47	2	45	30	55	85	1	1		364	81.25%	22.75
Great Blue Heron	1	7			6						4		2	1			21	37.50%	1.31
Great Cormorant	4	1		44	1	3				1	1		2				57	50.00%	3.56
Great Crested Flycatcher									1								1	6.25%	0.06
Great Egret	1						1	3		5	4		1				15	37.50%	0.94
Greater Scaup								1		2	750	498	25				1276	31.25%	79.75
Greater Yellowlegs												1	2				3	12.50%	0.19
Hairy Woodpecker					1												1	6.25%	0.06
Herring Gull	531	84	12	214	85	78	10	872	80	396	305	339	703	48	10	8	3775	100.00%	235.94
Horned Grebe	27	2						3			11	16	12				71	37.50%	4.44
Horned Lark						42		9			1						52	18.75%	3.25
House Finch		23							2								25	12.50%	1.56
House Sparrow	65	49	8	59	16	25	7	111	33	3	45	4		3	6	10	444	93.75%	27.75
House Wren		12	4	5	11				16	9	1			10			68	50.00%	4.25
Hudsonian Godwit						8											8	6.25%	0.50
Killdeer	19				2	3				1							25	25.00%	1.56
Laughing Gull	344	21	1	88	11	22		226	9	80	95	93	131	36		2	1159	87.50%	72.44
Lesser Scaup									200		1						201	12.50%	12.56
Lesser Yellowlegs								2									2	6.25%	0.13

Table G-3. Abundance and Species Richness by point count location at Floyd Bennett Field – 2010–11

Species	1	2	2b	3	4	5	5b	6	7	8	9	10	11	12	13	14	Total	Frequency	Abundance
Long-tailed Duck						2					3	4					9	18.75%	0.56
Mallard	4	5				1		8		4		62	11	2			97	50.00%	6.06
Merlin		1															1	6.25%	0.06
Mourning Dove	14	31	7	21	38	6	2	2	33	1	3	4	2	47		4	215	93.75%	13.44
Mourning Warbler										1				1			2	12.50%	0.13
Mute Swan										2							2	6.25%	0.13
Northern Cardinal	5	52	7	32	32	4		1	46	16	30	1	3	51			280	81.25%	17.50
Northern Flicker		2		1	4				7	4	4		2	9			33	50.00%	2.06
Northern Gannet	1												1				2	12.50%	0.13
Northern Harrier						3				4	2						9	18.75%	0.56
Northern Mockingbird	41	49	9	54	71	24	6	28	62	54	52	9	9	45	6	6	525	100.00%	32.81
Northern Parula									2								2	6.25%	0.13
Northern Rough-winged Swallow						2											2	6.25%	0.13
Orchard Oriole					1				2					1			4	18.75%	0.25
Osprey				1	1			3	1	16	1	3	1	1			28	56.25%	1.75
Ovenbird		1									1						2	12.50%	0.13
Palm Warbler		1							2	7				1			11	25.00%	0.69
Peregrine Falcon		2				1		1									4	18.75%	0.25
Red Knot										2							2	6.25%	0.13
Red-bellied Woodpecker														1			1	6.25%	0.06
Red-breasted Merganser	54	7		15		34		14	3	27	79	35	71				339	62.50%	21.19
Red-breasted Nuthatch					7												7	6.25%	0.44
Red-eyed Vireo											1						1	6.25%	0.06
Red-tailed Hawk						1			1	2	1	1		1			7	37.50%	0.44
Red-throated Loon	1																1	6.25%	0.06
Red-winged Blackbird	28	27	10	63	55	58	9	28	23	78	34	39	47	54	7	10	570	100.00%	35.63
Ring-billed Gull	428	164		132	9	50		3508	7	195	279	154	432	4			5362	75.00%	335.13

Table G-3. Abundance and Species Richness by point count location at Floyd Bennett Field – 2010–11

Species	1	2	2b	3	4	5	5b	6	7	8	9	10	11	12	13	14	Total	Frequency	Abundance
Ring-necked Duck													2				2	6.25%	0.13
Rock Pigeon	133	48	4	144	168	148	14	1451	170	281	185	82	125	59	18	18	3048	100.00%	190.50
Ruby-crowned Kinglet														1			1	6.25%	0.06
Ruddy Duck											30	68					98	12.50%	6.13
Ruddy Turnstone	1											38	3				42	18.75%	2.63
Sanderling	10			1				1			4	56	34	5			111	43.75%	6.94
Savannah Sparrow	1	1				25	3				1				4	1	36	43.75%	2.25
Semipalmated Plover								3		2		27	13				45	25.00%	2.81
Sharp-shinned Hawk														1			1	6.25%	0.06
Snow Goose						1											1	6.25%	0.06
Snowy Egret	1		1	1				6		6	2	3	3				23	50.00%	1.44
Song Sparrow	28	44	8	29	45	34	8	21	35	70	38	16	21	54	10	7	468	100.00%	29.25
Spotted Sandpiper				2									2				4	12.50%	0.25
Tree Swallow	3	9		9	34	119	28	4	41	73	30	7	1	22	24	16	420	93.75%	26.25
Turkey Vulture				2	7	2			1							2	14	31.25%	0.88
Unidentified Carpodacus Finch		1															1	6.25%	0.06
Unidentified Duck												10					10	6.25%	0.63
Unidentified Empidonax Flycatcher						1								1			2	12.50%	0.13
Unidentified Gull		5		2	5	2		1	4	2		2	1				24	56.25%	1.50
Unidentified Larus Gull	4	40		2	14	29		2	19	13	84	11	64	2			284	75.00%	17.75
Unidentified Sparrow				1													1	6.25%	0.06
Unidentified Swallow				3	1				3								7	18.75%	0.44
Unidentified Teal	2																2	6.25%	0.13
Unidentified Tern	2			2				18		70	3	1	7				103	43.75%	6.44
Unidentified Warbler	4				2				1					1			8	25.00%	0.50
Unknown Scaup sp.											100						100	6.25%	6.25
Western Sandpiper												2					2	6.25%	0.13

Table G-3. Abundance and Species Richness by point count location at Floyd Bennett Field – 2010–11

Species	1	2	2b	3	4	5	5b	6	7	8	9	10	11	12	13	14	Total	Frequency	Abundance
White-breasted Nuthatch					1									1			2	12.50%	0.13
White-crowned Sparrow														3			3	6.25%	0.19
White-eyed Vireo									1								1	6.25%	0.06
White-throated Sparrow	1	18		2	19				8	31	6			26			111	50.00%	6.94
Willet	1									1		10					12	18.75%	0.75
Willow Flycatcher											1						1	6.25%	0.06
Winter Wren											1						1	6.25%	0.06
Yellow Warbler		7	3	5	1			4	19	14	8	1		17			79	62.50%	4.94
Yellow-bellied Sapsucker														2			2	6.25%	0.13
Yellow-rumped warbler		16			25	2			17	21	4		3	19			107	50.00%	6.69
Species Richness	**52**	**54**	**27**	**51**	**54**	**56**	**15**	**47**	**58**	**67**	**63**	**54**	**53**	**62**	**16**	**16**	**134**		
Number of observations	**7806**	**1516**	**159**	**2191**	**1515**	**2345**	**149**	**7985**	**1500**	**2400**	**4497**	**2615**	**3013**	**1090**	**136**	**154**	**39071**		**2441.94**