VERDANT POWER

Before the United States of America
Federal Energy Regulatory Commission

ROOSEVELT ISLAND TIDAL ENERGY PROJECT

FERC No. 12611

Final Kinetic Hydropower
Pilot License Application

Volume 2 of 4
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Verdant Power, LLC
New York, NY

PILOT LICENSE APPLICATION
ROOSEVELT ISLAND TIDAL ENERGY PROJECT
FERC NO. 12611

EXHIBIT E
ENVIRONMENTAL REPORT

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LIST OF ACRONYMS

USACE	United States Army Corps of Engineers
ADCP	Acoustic Doppler Current Profiler
BA	Biological Assessment
BO	Biological Opinion
CEII	Critical Energy Infrastructure Information
CEQ	Council on Environmental Quality
Commission	Federal Energy Regulatory Commission
CO-OPS	Center for Operational Oceanographic Products and Services
CORE	Cornwall Ontario River Energy
CR	Control Room
CZMA	Coastal Zone Management Act
D	diameter
DOE	Department of Energy
DTI	UK Department of Trade & Industry
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
EPB	Environmental Policy Board
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FMPP	Fish Monitoring and Protection Plan
ft	feet/foot
GHG	Greenhouse Gases
GHT	Gorlov Helical Turbine
ICD	Initial Consultation Document
IHA	Incidental Harassment Authorization
ILP	Integrated Licensing Process
INEEL	Idaho National Engineering and Environmental Laboratory
KHPS	Kinetic Hydropower System
LOA	Incidental Harassment Authorization
LPC	Landmarks Preservation Commission
m	meter
MMPA	Marine Mammal Protection Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NYC	New York City
NYCLPC	New York City Landmark Preservation Commission
NYDOS	New York State Department of State

LIST OF ACRONYMS *(continued)*

NHPA	National Historic Preservation Act
NYSDEC	New York State Department of Environmental Conservation
NYSEP	New York State Energy Plan
NYSERDA	New York State Energy Research and Development Authority
NYU	New York University
PATONS	Public Aids to Navigation
ppt	parts per thousand
RIBS	Rotating Intensive Basin Studies
RIOC	Roosevelt Island Operating Company
RITE	Roosevelt Island Tidal Energy
RTE	Rare, Threatened and Endangered
s	second
SFMP	Seasonal Fishery Monitoring Plan
SHPO	State Historic Preservation Office
TEV	Test Evaluation Vessel
TLP	Traditional Licensing Process
TMDL	Total Maximum Daily Load
UNFCCC	United Nations Framework Convention on Climate Change
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USNSRDC	United States Navy's David Taylor Model Basin
Verdant Power	Verdant Power, LLC
WI/PWL	Waterbody Inventory and Priority Waterbody List

4.3.4 Terrestrial Resources

4.3.4.1 Affected Environment

Botanical Resources

The proposed RITE Project will be located in the East River in the Manhattan Borough of New York City, New York County, New York. Manhattan Island and Roosevelt Island are developed with residential and commercial development. Due to its location and extent of urban development, the upland plant communities are predominately landscaped parks and greenways. The extent and size of natural botanical communities are significantly limited. Wetland community types include tidal wetlands and submerged aquatic macrophyte vegetation communities. Upland plant communities on Roosevelt Island and Manhattan Island are dominated by urban landscaped species and invasive species. Natural communities are limited.

Wetland Plant Communities

Wetland plant communities in the immediate project area around Roosevelt Island and is limited by the extensive shoreline development (including docks, piers, *etc*.) and various forms of armoring (riprap, bulkheads, *etc*.) that have been constructed.

Significant Ecological Communities

No significant ecological communities have been identified along the East River in the immediate vicinity of Roosevelt Island. The upper East River/Long Island Sound area is designated as a Special Natural Waterfront Area by the New York City Office of Planning Waterfront Revitalization Program. The USFWS has identified significant habitats in The Narrows and Lower Hudson River Estuary Complexes of the New York/New Jersey Harbor Bight Watershed; however, none are proximate to the proposed project area (Verdant Power, 2003; USFWS, 1997). No rare, threatened, or endangered plant species have been identified in the immediate project area through consultations with resource agencies.

Wildlife Resources

Because of the dense urban development, the availability of wildlife habitat within the Urban Core of the New York/New Jersey Bight watershed, particularly in the New York City vicinity, is relatively limited. However, there are nearby complexes that provide valuable habitats, particularly for migratory species (Verdant Power, 2003; USFWS, 1997).

The fragmentation of habitats that occurs in urban project areas limits the terrestrial wildlife species that may occur to primarily those opportunistic species that have adapted to living in very urbanized settings. Habitat for herptile species is also limited due to fragmentation and the lack of freshwater habitats in the project area. No threatened or endangered wildlife species have been identified in the area through consultations to date.

Avian Species

Habitats for birds are more diverse and available because the nearby New York/New Jersey Estuary, Long Island Sound Estuary, and small pockets of forests and fields that provide habitat for many species year round. The table contained in the ICD (pages 84-90) listed about 200 species of birds in the New York County region that could inhabit the project area. Agencies have commented that a number of birds may use the East River for feeding or resting. Dominant species identified so far are the double-crested cormorant (*Phalacrocorax auritus*) and a variety of gulls. The agencies were also interested in better understanding the use of the project area by other birds that may use the area during migration. Diving ducks, cormorants, and terns migrate through the area from late March through mid-May. The fall migration of species such as the brown pelican (*Pelecanus occidentalis*) or double-crested cormorant may peak in October, but species such as loons (*Gavia spp*.), northern gannets (*Morus bassanus*), scaup (*Aythya spp*.), and ring-necked ducks (*Aythya collaris*), may peak in November through mid-December, and many tern species (*Sterna hirundo*, *S. forsteri*, *S. nilotica*) migrate

through the area in September. A New York State threatened species, the peregrine falcon, is known to nest on bridges near the project area.

During consultation with agencies and stakeholders about the RITE Demonstration Project and this Pilot License Application, the main issues raised about impacts on terrestrial resources were concerns for avian species. As a result, Verdant Power, in consultation with the resource agencies, developed a Bird Observation Study protocol that was executed during the RITE demonstration project from 2005 to 2008 to meet these goals.

The two main objectives of the Bird Observation Study were:

- To observe birds around the project to determine if the KHPS units adversely impact diving birds associated with the East River; and
- To show whether the operation of KHPS units attracts diving birds to the site, an indicator of impacts to fish or a shift in fish swimming patterns.

A tertiary concern − one that was added through later consultations − considered the temporal and spatial distribution and seasonal migration patterns of migratory bird communities in relationship to the project area.

Verdant Power personnel and other local birders and consultants collected the data in accordance with the study plan. Tables 4.3.4.1-1 and 4.3.4.1-2 summarize this observation period and the data collected; representing 290 hours of bird observation to date. The log includes information such as:

- Observation period time of day;
- Number and species of birds;
- Feeding, resting or diving activities;
- Proximity to the KHPS array field, and operational status of the KHPS units;

- Tidal direction; and
- Any notes or observations that would indicate interaction with the study units.

Sparrows, gulls, and pigeons were not recorded as a part of this study, although these species are routinely present at the site. Gull species were not included in the bird observation study because the study was developed, in conjunction with agencies and stakeholders, to focus on impacts to diving species of birds. Gulls are not diving birds; although they are known to congregate when surface food is present. While it is recognized that gull activity could be an indicator of KHPS unit-induced fish injury or mortality, specific observation was not recommended by the agencies during study plan development.

However, from the bird observation study data and transient Verdant Power personnel observations in the East River for 3 years, it appears that gull feeding patterns have been unchanged as a result of the RITE demonstration turbines in the water, either operational or not. The protocol for bird observation specifically included instruction t to note anything "unusual" (from any species of birds, recreation, etc) occurring above or around the RITE demonstration field. Logs from these observations note no entries of changes to species or gull populations, or their activity. Anecdotal evidence by observers note that the observed feeding patterns of gulls in and around the RITE demonstration project has been limited to on- or near-shore wading, specifically for crabs found in the rip rap at the waters' edge.

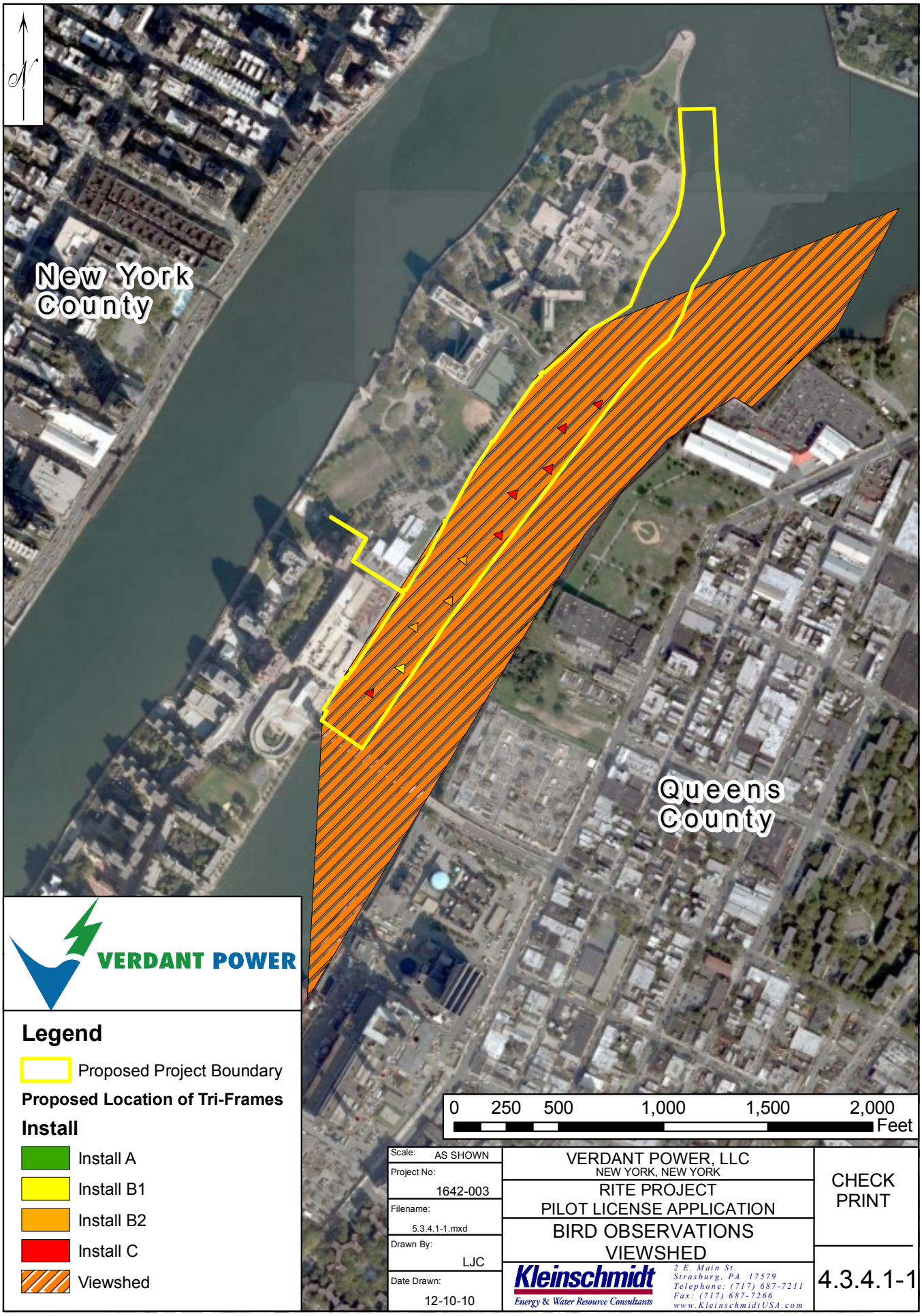
All observations were made from the shore adjacent to the deployment area (see Figure 4.3.4.1-1). The observer was equipped with binoculars, the bird book "The Sibley Field Guide to Birds of Eastern North America" (Sibley, 2003) and a camera. Photographs were taken as available; however, the photographs are intended to supplement the observations and the recorded data, the observer was not responsible for photo documenting every bird observed. Photo 4.3.4.1-1 and 4.3.4.1-2 were taken during

bird watching.

The photos and Figure 4.3.4.1-1 show the viewshed of the birder while watching birds. The photos were taken from shore at the birding spot next to the control room of the Verdant Power Demonstration Project. During observations it was noted that the Roosevelt Island Bridge and the caissons of the bridge attracted birds and specifically double-crested cormorants.

Photo 4.3.4.1-1. Photograph of bird at RITE Project.

Photo 4.3.4.1-2. Photo mosaic of viewshed for birding.



Scale: AS SHOWN	VERDANT POWER, LLC NEW YORK, NEW YORK	CHECK PRINT
Project No: 1642-003	RITE PROJECT PILOT LICENSE APPLICATION	
Filename: 5.3.4.1-1.mxd	BIRD OBSERVATIONS VIEWSHED	
Drawn By: LJC		
Date Drawn: 12-10-10	Kleinschmidt Energy & Water Resource Consultants	4.3.4.1-1

2 E. Main St.
Strasburg, PA 17579
Telephone: (717) 687-7211
Fax: (717) 687-7266
www.KleinschmidtUSA.com

A summary of all data taken is shown in Table 4.3.4.1-2 that combines reporting from previous Verdant submissions with data taken through December 2008.

Table 4.3.4.1-1. RITE - Summary of Bird observation Periods (pre- and post-) during all three KHPS deployments.

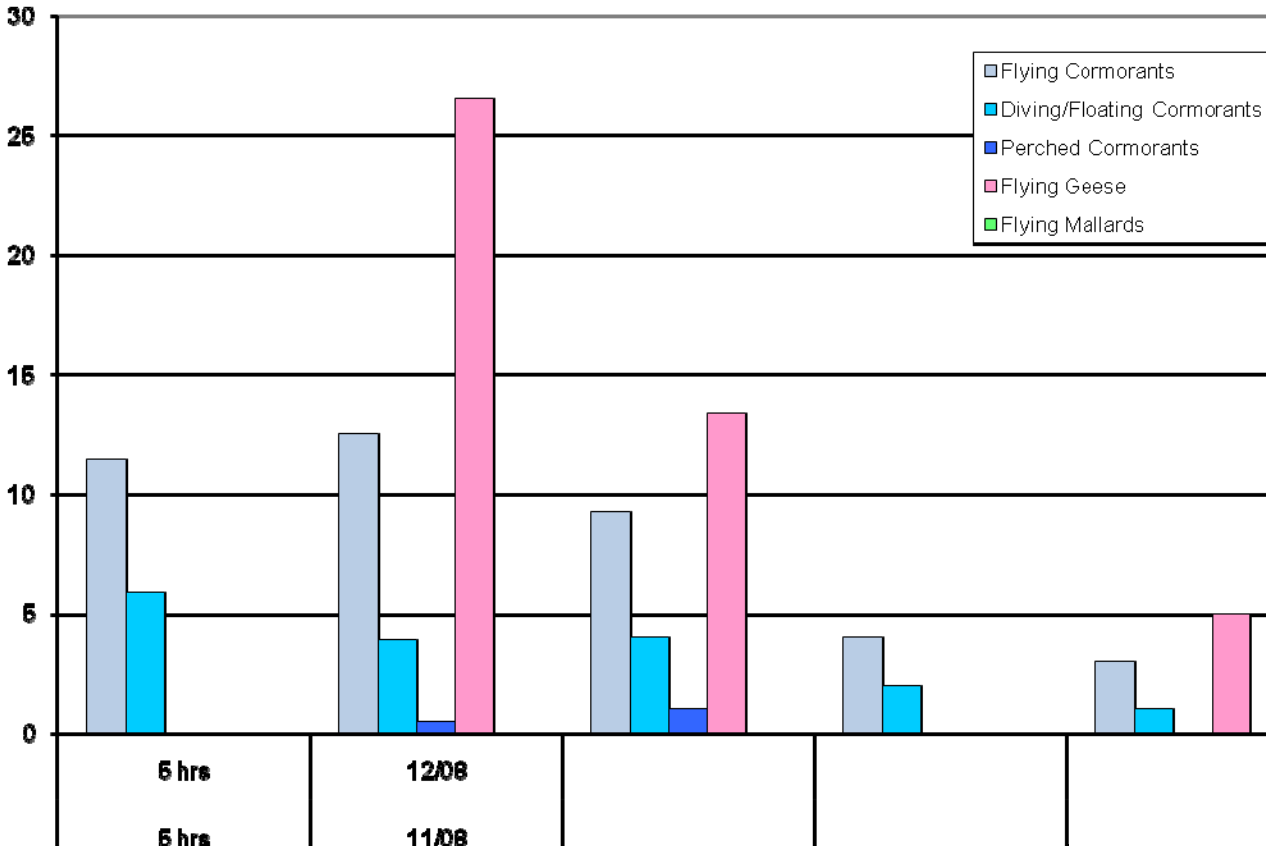
	Birding Hours	Birding Period	Birding Days	Significance	Published
2006					
	50 hrs	3/13/06 – 3/17/06	5	Spring Migration	60-Day Report, 2007
Deploy 1 – 12/2006: T1-P1, T2-P2					
2007					
	50 hrs	4/6/07 – 4/22/07	5	Pre-Deploy 2	July 11, 2007 Agency Filing
Deploy 2 – 4/2007: T1-P1, T2-P2, T3-P3, T4-P4, T5-P5, T6-P6					
	50 hrs	5/6/07 – 5/26/07	5	Post-Deploy 2	July 11, 2007 Agency Filing
2008					
	50 hrs	8/12/08 – 9/07/08	7	Pre-Deploy 3	New Data Pursuant to FMPP 7.5
Deploy 3 – 9/2008: T5-P5, T6-P1					
	50 hrs	9/17/08 – 9/22/08	6	Post-Deploy 3	New Data Pursuant to FMPP 7.5
	40 hrs	10/16/08 –10/30/08	4	Fall Migration	New Data Pursuant to FMPP 7.5

As noted in the Tables 4.3.4.1-1 and 4.3.4.1-2, Verdant Power collected data on bird activity both pre-and post-deployment of KHPS units in the East Channel. Observations were also made during Deployment #2 and #3 of the RITE Demonstration period. In addition, fall migration and spring migration periods were observed. Figure 4.3.4.1-1 illustrates the bird observation distribution for the entire study period.

Table 4.3.4.1-2. RITE Project - Bird Observation Study; data 2006 - 2008.

			Double Crested Cormorants			Canada Geese	Mallard Ducks
Birding History	**Days**	**Hours**	**Flying**	**Dive/Float**	**Perched**	**Flying**	**Flying**
Spring Migration–2006	5	50	3	2	0	12	0
Pre-D2 – 2007 - April	5	50	83	32	0	16	0
Post-D2 – 2007 - May	5	50	81	7	1	7	2
Pre-D3 – 2008 - Aug	7	50	105	53	2	60	0
Post-D3 – 2008 - Sept	6	50	138	39	4	285	0
Fall Migration - 2008	4	40	74	32	1	180	0

Figure 4.3.4.1-2. RITE Demonstration Project bird data by month normalized over 5 hours.



Almost all sightings consisted of double-crested cormorants and Canada geese *(Branta canadensis)*. Other species discussed in agency meetings were not seen around the demonstration project area (see Table 4.3.4.1-3).

Table 4.3.4.1-3. Species common to the New York region - observations near the RITE Demonstration Project.

Species	Resident	Spring Migration	Fall Migration	Observed at RITE
Double Crested Cormorant (Phalacrocorax auritus)	Yes	No	No	Yes
Diving Ducks (Mallards)	No	March to Mid May	November	2 sightings total – NOT DIVING
Tern species (Sterna hirundo, Sforsteri, S nilotica) .	No	Late April to Early May	September	Not Observed
Brown Pelican (Pelecanus occidentalis)	No	Not Known	October	Not Observed
Loons (Gavia spp.),	No	March	November to Mid December	Not Observed
Gannets (Morus bassanus),	No	March	November to Mid December	Not Observed
Scaup (Aythya spp.), and ring-necked ducks (Aythya collaris)	No	March to April	November to Mid December	Not Observed
Canada Geese	No	March to May	October	Yes - flying

In addition to the post-deployment survey observations, Verdant Power specifically performed 5 days of spring migration observations in 2006 and 4 days of bird observations during fall migration in 2008. The surveys were performed on March 13 to 17, 2006 without the KHPS units operating. Fall migration surveys were then performed again on October 16, 17, 29, 30 (2008) when KHPS units were rotating.

The purpose of these additional observations was to obtain additional data during potential migration periods. Spring and fall migration also coincided with other bird observations in April 2007 (pre-deployment), May 2007 (post-deployment) and September 2008 (pre-deployment). Double-crested cormorants were the only birds observed (no specific migratory species were observed).

4.3.4.2 Environmental Effects

No potential effects to botanical or wildlife resources have been identified or are expected due to the lack of resources in the project area and the fact that the majority of the project is underwater with a minimal land footprint on already developed area.

The Project has the potential to affect diving birds in and around the turbine area. Throughout 2006-2008, as discussed above, Verdant Power logged approximately 290 hours of bird observations before and during deployment of the RITE Demonstration Project KHPS units. Birds were observed around the demonstration project to determine if the KHPS units adversely impact diving birds associated with the East River; Verdant Power believes that the body of developed knowledge does not show any signs of impact on diving birds. This detailed effort in and around the RITE project demonstration site and the general area of the proposed RITE Pilot License did not show any material difference in pre-and post-operation bird activity. The presence of more geese flying through the area in post-deployment during the fall of 2008 can be attributed to seasonal migration patterns. Observations during the operation of the RITE Demonstration KHPS units also did not indicate any increased attraction of diving birds to the site which may have been expected if the turbines impacted fish in the area. Anecdotal evidence suggests double-crested cormorants, the only diving birds observed at the site, swim/float with the current and only dive during or close to slack tide when the turbines are not rotating.

Based on the observations made at the RITE demonstration project over an intermittent period from December 2006 through and including November 2008 Verdant

Power does not believe that the project area is a particularly significant bird migration pathway for resting or feeding because of the urban nature of the location, the limited amount of green space, and the fast currents present.

4.3.4.3 Proposed Pilot License Monitoring Plan

Verdant Power believes that the data collected during the RITE Demonstration Project during a 2-year period represents a baseline understanding of the relationship of operating KHPS units with the resident and migratory bird community in the East River. However, Verdant Power recognizes that extending this observation to a 30 turbine field of 17 acres will require some level of ongoing monitoring to validate the demonstration results for a larger field. Therefore, Verdant Power has proposed an ongoing Bird Observation Monitoring Plan as part of this license application to observe seasonal migratory activity during March to May and September to November in three consecutive years when operating KHPS units are present including before and after Install B-2. The details of the proposed plan are included in Volume 4 of the draft License Application and are summarized in the Table 4.3.4.3-1 below.

Table 4.3.4.3-1. RMEE-5 Bird Observation.

	Install A (2 KHPS)	**Install B-1 (3 KHPS)**	**Install B-2 (9-12 KHPS)**	**Install C (30 KHPS)**
Bird Observation	None proposed	1 Year Seasonal Spring and Fall 11 days	2 years Seasonal Spring and Fall 11 days	None proposed

4.3.4.4 Unavoidable Adverse Impacts

No unavoidable adverse impacts to terrestrial or avian species have been identified.

4.3.4.5 No Action Alternative

As in the proposed alternative, the no action alternative would not affect botanical or wildlife resources, including birds.

4.3.4.6 Sources

Bird and Nature. 2008. North American Migration Flyways Maps. [Online] URL: http://www.birdnature.com/flyways.html. Accessed December 2, 2010.

Sibley, David Allen. 2003. "The Sibley Field Guide to Birds of Eastern North America", Alfred A Knopf, Inc., New York, NY.

Verdant Power, Inc. 2008. Birding Logs -September 2005 -October 2008 (unpublished data).

Verdant Power, Inc. 2003. Initial Consultation Document for the Roosevelt Island Tidal Energy Project (ICD), FERC Project Number 12178. October 2003. Prepared by Devine Tarbell and Associates.

4.3.5 Rare, Threatened, and Endangered Species

4.3.5.1 Affected Environment

A population of the federally endangered shortnose sturgeon (*Acipenser brevirostrun*) occurs in the Hudson River and has been documented from the Troy Dam to the waters near Staten Island in New York Harbor. Shortnose sturgeon have been captured near the confluence of the East River and New York Harbor and at least two shortnose sturgeon tagged in the Hudson River have been recaptured in the Connecticut River, It is unknown whether these fish traveled through the East River and through Long Island Sound or exited New York Harbor into the Atlantic Ocean and swam around southern Long Island and back into Long Island Sound. The East River is not likely to be a high use area for sturgeon and there have been no documented captures of shortnose sturgeon in this waterbody. However, the best available information indicates that at least occasional transient shortnose sturgeon may be present in the East River.

Listed sea turtles also occur seasonally in New York waters and are known to be present in western Long Island Sound and in the New York Harbor complex. The sea turtles in these waters are typically small juveniles with the most abundant being the federally threatened loggerhead (*Caretta caretta*) followed by the federally endangered Kemp's ridley (*Lepidochelys kempi*). New York waters have also been found to be warm enough to support federally endangered green sea turtles (*Chelonia mydas*) from June through October. While federally endangered leatherback sea turtles (*Dermochelys coriaceø*) may be found in the waters off Long Island during the warmer months as well, this species is less likely to occur in the action area for this project as it is typically found in more offshore waters. Like the shortnose sturgeon, there have been no documented captures of sea turtles in the East River, and it is not likely to be a high use area for these species. However, as sea turtles are known to occur in the waterbodies surrounding the East River, it is likely that occasional transient sea turtles occur in the East River. The best available information indicates that listed species may at least occasionally occur in the project area (NOAA, 2008).

Based on the consultation and information collected to date, Atlantic sturgeon (a candidate species for ESA listing), bald eagles, and peregrine falcons could also be present in the area of the proposed RITE Project.

4.3.5.2 Life History Information on Identified Species of Concern

Shortnose Sturgeon (*Acipenser brevirostrum)* from NYDEC, 2008

The federal and state-listed shortnose sturgeon is the smallest of New York's sturgeons, rarely exceeding 3.5 feet in length and 14 pounds in weight. The shortnose sturgeon's life history is complex. The shortnose sturgeon is anadromous, migrating from salt water to spawn in freshwater. In the Hudson River, it spawns from April-May. Adult sturgeon migrate upriver from their mid-Hudson overwintering areas to freshwater spawning sites north of Coxsackie. Unlike most fish species, spawning is not a yearly

event for most shortnose sturgeon. Newly-hatched fry are poor swimmers and drift with the currents along the bottom. As they grow and mature, the fish move downriver into the most brackish parts of the lower Hudson. Shortnose sturgeon are long-lived. The oldest known female reached 67 years of age and the oldest known male was 32. Bottom feeders, shortnose sturgeon eat a variety of organisms. Using their barbels to locate food and their extendable mouths to then vacuum it up, they eat sludge worms, aquatic insect larvae, plants, snails, shrimp, and crayfish. Riverwide population estimates in the 1990s showed the spawning population had increased substantially from that observed in the 1970s. A detailed shortnose sturgeon life history discussion is included in the shortnose sturgeon biological assessment located in Volume 4 of this Pilot License Application.

Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*)

The Atlantic sturgeon are similar to the shortnose sturgeon as a long-lived anadromous species, however, they are larger than shortnose sturgeon (Scott and Crossman, 1973). Spawning adults migrate upriver in spring, from April to May. Following spawning, males may remain in the river or lower estuary until the fall, while females typically exit within 4-6 weeks (NOAA 2008). Adults forage on benthic invertebrates while young sturgeon eat a wide variety of bottom-dwelling plant and animal material (Scott and Crossman, 1973). A detailed Atlantic sturgeon life history discussion is included in the Atlantic sturgeon biological assessment located in Volume 4 of this Pilot License Application.

Sea Turtle General Overview

Most of the feeding and nesting range for the loggerhead, Kemp's ridley, and leatherback turtles is generally in the warm tropics. The annual reproductive cycle for female sea turtles includes migration to the reproductive area, the nesting period, remigration from the nesting beach to the feeding range, and a period of active foraging. Females may nest anywhere from every year to every 7 years. Sea turtles are long-lived

animals that depend on multiple nesting seasons to perpetuate the populations. The survival rate of hatchling sea turtles is low due to high predation. Adults and juveniles are free swimming but hatchlings often drift with mats of Sargassum in the sea currents. Adult and juvenile sea turtles are known to travel several thousand miles from nesting locations to foraging habitat (Ernst *et al.*, 1994).

It is during the foraging period that these sea turtles may wander north to find food beyond the tropical waters. This foraging period comprises the longest phase of a sea turtles life cycle. In the northern latitudes the foraging period may also include a period of hibernation. For the smaller hard-shelled sea turtles such as the loggerhead, green, and Kemp's ridley the foraging habitat can include bays, lagoons, salt marshes, creeks, and the mouth of large rivers. The diurnal activity cycle of the hard-shelled sea turtles includes foraging in the shallows during midmorning and mid-afternoon, and resting in deeper waters midday. The leatherback turtle is generally found in the open ocean (Ernst *et al.*, 1994).

Loggerhead Turtle (*Caretta caretta*)

The loggerhead turtle is the most abundant sea turtle in North America; however, it is listed as federally threatened in the Endangered Species Act (ESA) (NMFS, 2008). It is also the largest living hard-shelled turtle, commonly growing a shell of more than 3 feet in length. The turtle can be found in the Pacific, Atlantic, and Indian Oceans. Peak loggerhead turtle nesting occurs from May to July. It is the only sea turtle that has a nesting range beyond the tropics. It has been found nesting as far north as New Jersey. Loggerheads are omnivores but invertebrates make up a dominant portion of their diet (Ernst *et al.*, 1994). A detailed loggerhead turtle life history discussion is included in the sea turtle biological assessment located in Volume 4 of this Pilot License Application.

Kemp's Ridley Turtle (*Lepidochelyes kempii*)

The Kemp's ridley turtle is also a federally endangered species. It is the smallest sea turtle reaching a maximum shell length of about 2.5 feet. Adult Kemp's Ridley turtles are rarely found beyond the boundaries of the Gulf of Mexico. Juvenile turtles have wandered along the eastern United States as far north as the Long Island Sound, New York. This species prefers shallow water typically less than 160 feet deep. Nesting occurs from April to July. The Kemp's ridley turtle is primarily carnivorous and feeds mostly on crabs (Ernst *et al.*, 1994). A detailed Kemp's Ridley turtle life history discussion is included in the sea turtle biological assessment located in Volume 4 of this Pilot License Application.

Leatherback Turtle (*Dermochelys coriacea*)

The leatherback turtle is likely the most widely distributed reptile in the world but it is an endangered species (NMFS, 2008). The average shell size of a mature leatherback sea turtle is approximately 5 feet. The species is rarely observed in shallow waters of bays and estuaries. The turtles spend the majority of their lives following drifting schools of jellyfish in the open and coastal waters of the ocean. High concentrations of these turtles can be found where food is in abundance. The leatherback reaches New England in late spring in time to capitalize on concentrations of jellyfish. One of two relatively high summer abundances of these turtles occurs south of Long Island. Leatherbacks migrate to nesting habitat in tropical waters of several different continents. Only rare occurrences of nesting have been reported along the Atlantic coast and no known nests occur north of Georgia. The nesting season on the Atlantic coast lasts from April to July (Ernst *et al.*, 1994). Critical habitat for the leatherback was designated for the coastal waters adjacent to Sandy Point, St. Croix, U.S. Virgin Islands (NMFS, 2008). A detailed leatherback turtle life history discussion is included in the sea turtle biological assessment located in Volume 4 of this Pilot License Application.

Peregrine Falcon (*Falco peregrinus*)

The peregrine falcon is a New York state threatened species. This species was once extirpated from the state but has since made a remarkable recovery. The population decline has been attributed to the use of chemical pesticides such as DDT. Since this chemical was banned the population of this species has been increasing. These birds can be found in many different habitats including tundra, savannah, seacoasts, high mountains, forests, and cities. In urban areas the birds nest on ledges created by tall buildings or artificial nest sites on bridges (NYDEC, 2008). The peregrine feeds on a variety of birds but especially doves and pigeons (Ehrlich *et al*., 1998). The abundant source of pigeons is a likely source of forage for the peregrine in urban habitat.

Bald Eagle (*Haliaeetus leucocephalus*)

On August 8, 2007, the bald eagle (*Haliaeetus leucocephalus*) was removed from the Federal Endangered Species list and is no longer protected under Section 7 of the Federal Endangered Species Act; however, bald eagles remain on the New York State list as a State-listed threatened species. Bald eagles are also protected under the Migratory Bird Treaty Act (16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755) and the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). Bald eagles have previously been released by New York City Parks approximately 6 miles from the proposed project (Inwood Hill Park) as part of their Urban Park Ranger Eagle Program. If bald eagles are found within the project area, Verdant Power will follow the USFWS Bald Eagle Management Guidelines prior to commencement of work.

4.3.5.3 Environmental Effects

Throughout the last several years, Verdant Power has implemented a formal procedure for observations of protected species to be recorded during the bird observation and on and near water activities associated with the operation of the RITE demonstration project and during execution of on-water studies. Verdant Power also attempted to

evaluate the occurrence of RTE species in conjunction with performing the Fish Movement and Protection Study with the fixed hydroacoustics in January to June 2007, in conjunction with the deployment of the study units. While it was recognized that evaluating the occurrence of a rare species was difficult; Verdant Power attempted using the hydroacoustics to observe large, slow moving targets (representative of a rare sea turtle). This technique did not yield any observations and this protocol was abandoned by mutual agency consent in August 2007.

In addition to the fixed hydroacoustics, Verdant Power also made efforts to conduct incidental observations of RTE species in conjunction with other field studies -- namely monthly mobile hydroacoustic studies (pre-2005; and post-deployment for 6 months in January through June 2007) and during execution of the bird observation hours. No occurrences were logged. Verdant Power personnel operating during the three deployments (December 2006 through and including November 2008; discontinuous) were also asked to observe and record any unusual aquatic observances and the control room logs show no recorded data related to RTE. No incidental observations of rare species were made concurrent with the other >500 hours of other field studies conducted. A review of other intake data from area power plants; specifically Ravenswood and Astoria yielded no observations in the 17 years of historical record reviewed except for two shortnose sturgeon juveniles that were impinged at Astoria in 1993. Verdant Power has also collected operational data such as turbine blade rotational speed and water velocity measurements in and around the turbines to better understand the potential for impact.

NMFS has based some of their recently stated concerns with respect to sturgeon impacts based on reported injuries and deaths of Atlantic sturgeon at the Annapolis tidal project in Nova Scotia, Canada. However, as indicated in NMFS's letters there are substantial differences between the Annapolis River project and the RITE Project. Of particular importance is the fact that a tidal barrage system, like that used at the

Annapolis Project, directs all outgoing tidal flows through an intake structure and associated turbines while the open design of Verdant Power's KHPS units affects a relatively small percentage of the cross-sectional tidal flow and has the potential to be avoided by most fish species. The concern raised by NMFS about the potential for tidal turbines to affect sturgeon species by disrupting migration or other essential behaviors also does not appear applicable to this type of system, in which the river is not blocked.

Based on known information, the potential for sea turtles to be in the project area is likely to be low. The loggerhead or juvenile Kemp's ridley may occasionally be in the area, but the leatherback would not be expected to be present at any time. The lack of suitable feeding habitat in the area of the turbines would further limit the likelihood of sea turtles being in and around the proposed Project.

The largest potential for the pilot project to affect any of the endangered species mentioned would be if a species moving through the area was directly struck by a turbine blade, potentially causing injury or mortality. Boat propeller strikes have been reported to cause injury or mortality to sturgeon and sea turtles. However, operational data confirms that the blades on Verdant Power's KHPS units rotate at speeds of 40 rpm, orders of magnitude slower than boat propellers. Boats traveling 30-40 miles per hour have propellers capable of turning at speeds of up to approximately 2000 rpm (to approximately 600 rpm for larger commercial ships), this appears to be a very different situation than a stationary turbine rotating at normal loaded operating condition.

Peregrine Falcons would not be likely to be affected by the project operation as they do not feed in the water where the turbines would be located. Peregrine Falcons do nest on bridges in the project area but construction and maintenance activities should not affect nesting behavior as it would be similar to other boat traffic on the river.

Though Verdant Power believes the potential for the proposed project to effect any of aforementioned endangered species appears low, Verdant Power requested and was granted FERC designation as the non-Federal representative to pursue consultation under the ESA with respect to this Pilot License Application. Verdant Power has consulted with NMFS and prepared a Biological Assessments on shortnose sturgeon, Atlantic sturgeon, sea turtles, which are included in Volume 4 of this Pilot License Application.

Proposed Monitoring Plan - RTE- RITE Pilot

As part of the RITE Monitoring of Environmental Effects (RMEE) proposed plan, Verdant Power has proposed to install hydrophones in the East River on both sides of Roosevelt Island to monitor for tagged sturgeon that have been tagged as part of various efforts along the East Coast. More details on this plan are included in Volume 4 of this License Application. Verdant Power will also continue to observe all species activities and migration including RTE species. Verdant Power will continue to record any incidental observational data that would support providing new information on known species occurrences during the pilot period. These studies should provide additional information on the potential for the turbines to impact any fish species as well document the occurrence of any of these endangered species in the project area.

4.3.5.4 Unavoidable Adverse Effects

No unavoidable adverse effects to any RTE species have been identified. This will be the subject of ongoing consultations with resource agencies.

4.3.5.5 No Action Alternative

While the risks of the proposed KHPS units on RTE species is limited, under the No Action Alternative, new turbines would not be installed and therefore no additional risk would be posed to RTE species.

4.3.5.6 Sources

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4.3.6 Recreational Resources

In the 2005 preliminary permit application, Verdant Power proposed development of a full field of underwater kinetic hydropower turbines throughout the eastern channel of the East River, up to 400 turbines. However, it became clear early in the consultation process that certain recreational, commercial and federal navigation interests were in conflict with this initial plan. Verdant Power, in April 2007, filed for an amended preliminary permit project boundary that was in concert with these consultations. Much of the recreational consultation discussed below is the process that Verdant Power took to arrive at the current proposed East Channel field project boundary for 30 KHPS units.

4.3.6.1 Affected Environment

As detailed in the RITE Project ICD and Recreation study group plan (December 2006), the East River was a popular spot for swimming, fishing, and rowing in the first

half of the twentieth century. This resource declined in recreational importance as new roadways cut off public access to the water and the river became increasingly polluted with industrial wastes. Water quality in the New York harbor has, however, markedly improved over the past few decades. Initiatives of the New York City Department of Environmental Protection and the USACE have reduced floatable debris in the waters of the New York harbor, while improved sewage treatment has reduced nutrient and pathogen concentrations. Levels of contaminants such as PCBs, dioxins, and mercury have decreased under the Clean Water Act, though these contaminants are still concentrated at high enough levels in fish tissue to warrant consumption advisories for many species in the area.

Improved water quality has spurred a recreational renaissance in the New York harbor and nationwide. There are roughly 8 million kayakers in the U.S. today, nearly twice as many as there were 6 years ago, and in New York City several new boathouses that provide free kayaks to the public have opened over the past few years (NYT, July 31, 2005). The recovery of commercially and recreationally valuable fish species like striped bass and bluefish in the East River, a phenomenon documented in the popular book by John Waldman, Heartbeats in the Muck, has given rise to a growing number of urban anglers.

Groups such as the Metropolitan Water Alliance, the New York League of Conservation Voters Waterfront Park Coalition, the Astoria and Long Island City Waterfront Group, and the Trust for Public Land are bringing together citizens and other stakeholders to articulate new visions of waterfront development and provide public access to the waters of the New York Harbor. At the same time, communities such as Roosevelt Island are facing the loss of open space due to the development of private waterfront properties. Recreation competes with other uses of urban waterways and waterfronts, especially commerce, industry, and transportation.

In order to assess the current level of usage of the project area for recreational opportunities and the effects of the RITE Project (both demonstration and pilot project buildouts) Verdant Power conducted an assessment to evaluate and characterize existing recreational opportunities and use in the RITE project area.

The specific objectives of the recreational resource assessment were to:

- Review existing information regarding recreation in the vicinity of the Project and describe the existing uses, particularly as related to public and facility safety, including illustration by maps, drawings of existing recreation and other uses.
- Consult with groups and individuals who may have interests in recreation in the East River to develop current and future recreation needs from existing state or regional plans and proximity to any other recreational or management lands.
- Identify potential impacts to recreation associated with the RITE Project, and as necessary, develop measures to minimize or mitigate such impacts.

As part of the consultation regarding the recreational resource development, Verdant Power met with several federal and state resource agencies and community groups to discuss the proposed RITE Project beginning in 2003. These meetings supported the development of the ICD (2003), which contained available information regarding recreational resources associated with the East Channel of the East River. Subsequent to the ICD, Verdant Power developed a RITE Recreational Study Group that met twice during early 2007 to discuss the project. The broad-based recreational study group was made up of several federal agencies as well as community groups such as the Roosevelt Island Residents' Association, Riverkeeper, and the Queensborough neighborhood. At the meetings, participants reviewed the scope of Verdant Power's larger buildout project as it related to recreational resources. These consultations resulted

in a good understanding of recreational issues, needs and potential conflicts as discussed below.

State and Nationally Designated Recreation Areas

The RITE Project's location within the East Channel is not proximate to any marine sanctuaries, government-protected coastal/marine areas, or state-protected river segments. There are no project lands under study for inclusion in the National Trails System or as a Wilderness Area. There are no state parks on Roosevelt Island or across the East Channel in Queens. Regionally and nationally, there are important recreation areas within New York Harbor; however, none of these are impacted by the RITE Project.

Parks and Sanctuaries

The ICD (2003) contains a brief description of land-based recreational resources on Roosevelt Island, including Octagon Park, Lighthouse Park, Blackwell Park, and Manhattan Park as shown on Figure 4.3.6.1-1. The popular waterfront promenade, locally called Riverwalk, encircles the island north of the Queensboro Bridge and offers views of Manhattan and the river. The Riverwalk provides opportunities for pleasure walking, running, and biking. Although the walkway is elevated above the shore, there are areas that can be used for shoreline fishing**.** Additionally, since the production of the ICD, the Roosevelt Island Operating Corporation has teamed with the Trust for Public Land to develop a 10-acre park on the southern tip of the island called Southpoint Park.

Recreation in the Proposed Project Boundary

Fishing

Regarding fishing in or near the project area, Verdant Power made contact with several local fishing organizations, 29 local anglers, and fishing guides to discuss both the demonstration project and the larger buildout Project. Many noted that they do not

fish in the general area of the study units, although some indicated that they sometimes or regularly fish in the vicinity. Based on consultation with local anglers in the vicinity of the RITE East Channel Field, Verdant Power concluded that while most shoreline fishing in the East Channel along Roosevelt Island was concentrated near the northern and southern tips of the island, some recreational and commercial/charter fishermen do fish from boats in the RITE demonstration project area. After active consultation with local fishermen from December 2004 through June 2005, Verdant Power learned that the fishing community's primary concern regarding the project was not physical impacts of the kinetic hydropower turbines on fish (*i.e.*, potential fish strikes), but the loss of public fishing areas.

Swimming/Boating

With respect to other forms of river recreation, swimming is prohibited at all East River waterfronts (NYCDH, 2002). Verdant Power has not yet identified any past or present swimming events in the immediate project area, although there is an annual swim around Manhattan and other similar events that may or may not overlap with the project area. Verdant Power did not observe or have any issues with this type of recreational event in the 2-year demonstration period.

Based on consultation with the Recreational Study Group in 2007, boat traffic is generally limited to the West Channel of the East River, with several exceptions. Boaters drop anchor in the vicinity of the Project to watch fireworks on Independence Day; however, during the 2-year demonstration period, Verdant Power observed that all boaters dropped anchor at the southern tip of Roosevelt Island in order to maximize their view. The fireworks during Independence Day on the East River were canceled in 2009 and 2010. Because of the recession, fireworks are being held only on the Hudson River. Verdant Power does not know if this was temporary or if it is a permanent cancellation.

Also, during certain UN meetings, boating traffic, both recreational and

commercial, is diverted to the East Channel from the West Channel. Kayaking, sailing, and speed boating seemed to be more common in the West Channel than the East Channel of the East River, during the 2-year demonstration period.

Verdant Power has a motion-activated video surveillance of 100% of the RITE Pilot Field, with cameras aimed north towards Hallet's Cove, straight across the river and south towards the Roosevelt Island Bridge. The cameras are attached to the control room. The video surveillance recordings record over each other when the hard-drive memory is at capacity; therefore, video is only kept for about two weeks for after-the-fact review of footage. In order to quantify the kayak use in the East Channel of the East River near the RITE Project, Verdant Power archived some of its video surveillance to observe boaters. The video saved and reviewed consisted of known heavy boat traffic days – weekends and holidays during warm months.

During 2009 and 2010, Verdant Power was able to observe the following number of boaters in the vicinity of the RITE Project.

Table 4.3.6.1.-1. Number of boaters in vicinity of RITE Project.

	Small Boat, Sailboat	Jet Ski[7]	Medium Boat	Kayak/Canoe	Circle Line	Water Taxi	Large Boat, TUG, TUG with Barge
9/19/09	30	5	0	0	0	0	
10/10/09	8	9	2	7	1	0	0
8/14/10	55	13	1	16	1	0	0
9/6/10	54	23	3	0	0	0	0
9/11/10	37	30	3	2	1	0	0
9/22/10	59	2	18	0	0	3	13
9/23/10	50	0	22	0	2	3	12
9/24/10	77	19	20	0	1	4	15
10/9/10	35	0	1	13	0	0	0
10/11/10	19	2	1	2	0	0	0

[7] Note that the jet skis counted were likely counted multiple times, as they went up and down the Channel.

Generally, the observed kayaks traveled in groups. On 10/10/09, 5 kayaks were seen together and two were seen as individuals; on 8/14/10, all 16 kayaks were seen together; on 9/11/10, 2 canoes were seen; on 10/9/10, 11 kayaks were seen together and two were seen as individuals; and on 10/11/10, two kayaks were seen together. The kayaks tended to hug the shoreline of Roosevelt Island. When they approached the buoys they would hug the buoys and then head back towards shore at the end of the exclusion zone.

One point to note about the data above: The boats were counted as they were seen travel through the camera field of view. Some boats could have been counted twice and even multiple times if they traveled back through the camera's field of view.

Verdant Power employees also physically went to Hallet's Cove to observe kayakers midday on the Saturday of Memorial Day Weekend (May 23), 2009 and midday on Saturday, August 8, 2010. On August 8, 2010, there were 4 kayakers on the water in and around the cove. On May 23, 2009 there were two kayakers getting ready to go into the water. There were no kayakers in the water near Hallet's Cove or in the vicinity of the RITE Project. Below are two photos from that day, one of Hallet's Cove (Photo 4.3.6.1-1) and one at the RITE Control Room (Photo 4.3.6.1-2), looking north towards Hallet's Cove.

Photo 4.3.6.1-1. Kayakers at Hallet's Cove

Photo 4.3.6.1-2. From RITE Control Room, looking toward Hallet's Cove

Verdant did identify several community kayak groups who maintain boathouses on the East River and/or may potentially paddle in the project area including:

- East River Kayak Club
- Long Island City Community Boathouse
- Floating the Apple
- Greenpoint Canoe and Kayak Club
- East River CREW
- Urban Divers
- Inwood Canoe Club
- Delaware & Hudson Canoe and Kayak Club

The closest boathouse to the project site is the Long Island City Community Boathouse.

Additional Recreation Adjacent to the Project Boundary

In addition to recreation opportunities in the East River, nearby waterways, including the Hudson River and New York/New Jersey Harbor, provide extensive opportunities for recreational boating, fishing, and swimming.

Table 4.3.6.1-1 provides summary information on the recreational use and management within, and adjacent to, the project boundary. A further requirement for consideration is the location of the project proximate to federal navigation (shipping) channels under the jurisdiction of the U.S. Coast Guard and plans for water taxis from Roosevelt Island to Manhattan at the 35th Street landing.

Public Safety

As required by the joint USACE/NYSDEC permit for the RITE demonstration Project, for safety purposes the area around the submerged six study units was marked by buoys and closed to boat traffic, fishing, and swimming. This requirement was made primarily due to the limited clearance of about 2 meters to mean low water level.

For the pilot project buildout at the RITE East Channel Field, Verdant Power proposes the same restriction for public safety, since the water depth, boat draft, and turbine height, is inconsistent with navigational access. This buoyed restriction area is estimated at approximately 21.2 acres.

Further discussion of these safeguard plans as required under the FERC hydrokinetic pilot license application guidance are contained in Volume 3 and are protected as protected as Critical Energy Infrastructure Information (CEII) though they are being shared with relevant resource agencies.

Scale: AS SHOWN	VERDANT POWER, LLC NEW YORK, NEW YORK	CHECK PRINT
Project No: 1642-003	RITE PROJECT PILOT LICENSE APPLICATION	
Filename: 5.3.6.1-1.mxd	RECREATIONAL RESOURCES	
Drawn By: LJC		4.3.6.1-1
Date Drawn: 12-10-10	Kleinschmidt Energy & Water Resource Consultants 2 E. Main St. Strasburg, PA 17579 Telephone: (717) 687-7211 Fax: (717) 687-7266 www.KleinschmidtUSA.com	

Table 4.3.6.1-2. Recreational resources and their relation to the RITE project site.

Parks/Boating	Jurisdiction	Acres	Minimum Distance from Site	Water Access
Octagon Park	RIOC	15	100 meters	No
Lighthouse Park	RIOC	2.8	70 meters	No
Blackwell Park	RIOC	3	500 meters	No
Manhattan Park	RIOC	1.34	180 meters	No
Waterfront Promenade	RIOC	N/A	Visible	No
Southpoint Park	RIOC	10	150 meters	No
Hallets Cove	NYC Parks	5.7	200 meters	Yes
LIC Community Boathouse	Private	N/A	560 meters	Yes
Water-Based Fishing Spots		**Minimum Distance from Site**		
Under Roosevelt Island Bridge		75 meters		
59th Street Bridge		500 meters		
Northern Tip of Roosevelt Island		120 meters		
Land-Based Fishing Spots				
Northern Tip of Roosevelt Island		120 meters		
Southern Tip of Roosevelt Island		150 meters		

N/A = Not Available

4.3.6.2 Environmental Effects

Based on this extensive research and consultation, Verdant Power concluded that because of the strong currents and restricted points of public access to the East Channel of the East River along Roosevelt Island, this portion of the East River provided minimal recreational opportunities (*e.g.*, swimming, boating, fishing) for local residents and that recreational activities associated with the project area do not appear to provide significant economic benefits to the local community. This view was discussed in a June 9, 2004 joint agency/public study review meeting and subsequently discussed in Recreational

Study group calls in 2007. Over the course of the consultation history, participants raised the following points relevant to recreational resources and Verdant Power has addressed these concerns as follows:

- The proposed project buildout does not impede kayaking, sailing, or speed boating use in the East River. The majority of recreational boating occurs in the West Channel and will not be affected by the project. The limited boating that occurs in the East Channel will be restricted from the 18.8-acre exclusion zone; however, this will have limited impact on boating use because the proposed layout allows for a 140 foot wide, 21 foot deep navigation channel around the project area, per recommendation of the U.S. Coast Guard.
- The shoreline access point at Hallet's Cove is outside the project area and will not be disturbed. The visual impacts of the proposed buoy system on kayakers using the Hallet's Cove beach will include approximately one of the six buoys required by the U.S. Coast Guard for the RITE Project. The buoys would be white, a color which aesthetically blends into the skyline, especially at a distance. At night, the buoy would appear lighted ad stand about three feet above the waters' surface, appearing very similar to a boat's light in the distance.
- Boating traffic (recreational and commercial) is diverted to the East Channel during certain United Nations meetings. This issue is addressed in the section on Navigation and Security; however, working with the
- U.S. Coast Guard over the course of the demonstration project, the UN meetings have proved not to be an issue and are of short duration (2-3 days out of the year).
- Land-based anglers sometimes use the northern and southern ends of Roosevelt Island, but not the proposed project area, for fishing. The RITE project buildout does not encompass these northern and southern areas. In addition, the closest turbine to shore under the proposed Project would be 17 meters from shore; Verdant Power does not believe that this would interfere with any shoreline

fishing that may occur in the study area in the future.

- Commercial fishing from boats would only be affected in the 18.8-acre exclusion zone. In consultation with the commercial fishing operations, the exclusion area was not noted as having any particular importance to the fishing operation. The remaining waters in the East Channel see little traffic and would provide adequate area for the commercial and charter fishing operations.
- The RITE East Channel exclusion area would not likely impact an event such as an organized swim around Manhattan or other similar swimming events for several reasons. First, swimming would likely occur mainly along the Queens shoreline as there is currently access at Hallet's Cove (along the Queens shoreline) but not from the Roosevelt Island shoreline. In addition, the portion of the river outside of the exclusion zone sees very little boating traffic, so crowding of boaters and swimmers would not become an issue.
- Boaters drop anchors in the project area to watch fireworks on Independence Day. During the 2-year RITE demonstration this was not an issue and Verdant Power observed that all boaters drop anchor at the southern tip of Roosevelt Island in order to maximize their view. With the appropriate designation of the exclusion zone by buoys, this singular event would not be impacted by the Project.
- South Point Park is currently undergoing a series of renovations. A potential improvement to South Point Park may include shoreline access; if access is added, additional recreational boaters and/or swimmers may use water in the vicinity of the proposed Project. However, Verdant Power's project boundary does not go south of the Roosevelt Island Bridge, so the Project would not likely impact recreation in and around South Point Park.
- Several members of the group then pointed out areas of particular interest including discussion regarding the northern end of DeMarco Park, which is north of Astoria Park, the area around Hell Gate to the Triborough Bridge, Lighthouse

Point, the Astoria, Queens area, and under the 59th Street Bridge as popular fishing spots. The area near the 59th Street Bridge and the pier just to the north of the bridge was also noted. Several members of the group expressed recreational interests regarding Hallet's Cove, as groups like the East River Crew and Long Island City Community Boathouse kayak and access the East River from this area. Verdant Power's project boundary does not encroach on any of these areas, and therefore the proposed project will not affect these areas.

- It was suggested by one of the group members that this study may need to address larger patterns of water-based recreation in the New York City area, to provide greater context for specific concerns and comments. An angler was asked about favorite fishing spots and listed eight specific fishing areas: (1) Battery; (2) Poor House Flats (outside of East 23rd Street Marina); (3) U Thant Island; (4) under the 59th Street Bridge; (5) Roosevelt Island Bridge; (6) north end of Roosevelt Island; (7) New York City Fire Academy; and (8) Lawrence Point (near the ConEd plant). Verdant Power's project boundary does not encroach on these areas with the possible exception of 5) the Roosevelt Island Bridge and 6) the north end of Roosevelt Island. In planning the RITE East Channel field, Verdant Power has adjusted the project boundary to allow for shoreline fishing near and under the Roosevelt Island Bridge and to not include the very north end of Roosevelt Island.
- With regard to kayaking in the vicinity of Hallet's Cove and Astoria Park, it was stated that kayakers tend to hug the Queens side of the channel in order to avoid tug and barge traffic. It was also stated that a group member had sometimes seen kayakers leaving from Hallet's Cove cross the channel to Roosevelt Island during LIC Community Boathouse's Paddle Days (Sundays from 1 p.m. to 5 p.m.). Also, there is a beach at Hallet's Cove where many recreational boaters stop to rest. The RITE project boundary does not encroach on these areas, nor restrict the activity. As the RITE exclusion zone does not impact the Queens-side shoreline of the river, kayakers will still be able to hug

that shoreline as it was stated they tend to do. For those periodic occasions when kayakers wanted to cross over to Roosevelt Island from Hallet's Cove, they would still be able to do so directly from Hallet's Cove. This is because, although the RITE project boundary extends close to the northern tip of Roosevelt Island and thus lies directly across from Hallet's Cove, the turbine field (and exclusion zone) will end at the "bulge" of Roosevelt Island, which is actually south of Hallet's Cove. Please see Exhibit F for the proposed turbine array and exclusion zone. Therefore, a direct line for channel crossing will be available to kayakers at Hallet's Cove.

- Kayakers will also be able to cross the channel at a point south of the exclusion zone. For this, kayakers would hug the shoreline in Queens for approximately three fifths of a kilometer until they could cross the channel to Roosevelt Island near the Roosevelt Island Bridge.
- It was added that there was a storage facility for kayaks and canoes (in addition to the LIC Community Boathouse) proposed for installation near Hallet's Cove and noted that the RITE Project may affect this in some way. Since no project facilities are in this vicinity, this is unlikely.
- The project buildout does not interfere with proposed water taxis at the southern end of Roosevelt Island and West Channel landings.
- The project buildout does not interfere with recreational activities at Hallet's Cove.
- The Manhattan Island Foundation sponsors swims around the New York City region. According to the Manhattan Island Foundation's website there are no swims that go into the East Channel of the East River. After consultation with the Foundation, Verdant Power was told that there were no future plans for use of the East Channel of the East River by the Manhattan Island Foundation.

In addition to these design modifications, Verdant Power will provide an information kiosk at or near the RITE Project in the East Channel field for informational purposes.

Based on this consultation and observations during the period 2003-2009, the Verdant Power RITE Project in the East Channel should have minimal impact on recreational resources. Table 4.3.6.2-1 summarizes effects of the proposed Project.

Table 4.3.6.2-1. Summary of effects of RITE Project on recreational facilities.

	RITE East Channel
Existing and Planned Parks	No effects
Shore-Based Fishing	Not feasible at site
Water-Based Fishing	Minimal exclusion zone for KHPS array - minor effects
Recreational Boating	Minimal exclusion zone for KHPS array - minor effects
Annual Events	No current anchoring for July 4th fireworks - not an issue
Public Shoreline Access	Not available currently
Water Taxi Service	No effects

Since all the stakeholder concerns have been addressed by prudent reconfiguration of the RITE East Channel buildout field, no further recreational monitoring or studies are proposed for the pilot license term.

4.3.6.3 Unavoidable Adverse Effects

The need to provide an exclusion zone around the 18.8-acre area proposed for the East Channel Pilot Project will necessarily restrict use of this area for recreational boating and fishing. However, this area currently receives minimal use and ample boating and fishing opportunities will continue to exist throughout the remainder of the East Channel.

4.3.6.4 No Action Alternative

Under the No Action Alternative, no changes in the existing recreational resources would occur. The restriction zone for recreational use, including boating, would not be expanded to cover the full proposed field.

4.3.6.5 Sources

Verdant Power, Inc. 2003. Initial Consultation Document for the Roosevelt Island Tidal Energy Project (ICD), FERC Project Number 12178. October 2003. Prepared by Devine Tarbell and Associates.

4.3.7 Navigation and Land Use

4.3.7.1 Affected Environment

The waters of the New York Harbor provide vital commercial, industrial, recreational, and ecological services to New York City. The Port of New York-New Jersey is the busiest port on the eastern seaboard. The waterways of the New York harbor support water-based recreation such as fishing and boating, as well as transportation. Activities in and adjacent to the New York Harbor are regulated by federal, state, and local authorities, including the U.S. Army Corps of Engineers, U.S. Coast Guard, the New York Department of State, the New York Metropolitan Transportation Authority, the Port Authority of New York and New Jersey, the New York City Department of Transportation, Office of Emergency Management, and Department of City Planning.

Verdant Power initially conducted Internet research on the navigational activity of the East River within and adjacent to the project boundary. Figures 4.3.7.1-1 and 4.3.7.1-2 depict the federal/commercial navigation channel, restricted zones, and water taxi routes in relation to the RITE Project demonstration.

Federal Navigation Channel

The East River is the main artery connecting the Upper New York Bay and the Long Island Sound. With an entire length of 16 miles, the East River is spanned by eight bridges and thirteen tunnels and supports heavy vehicular traffic, as well as commercial and recreational water-based traffic. In the upper portion of the river, the West Channel between Manhattan and Roosevelt Island is more heavily used for transportation and recreational boating. NOAA's ENC Direct mapping system shows that the West Channel of the East River is a commercial navigation channel, though the exact location is not fully described in the GIS system. The West Channel also has restrictions as a security zone directly located in front of the UN building on the Manhattan side of the river at all times.

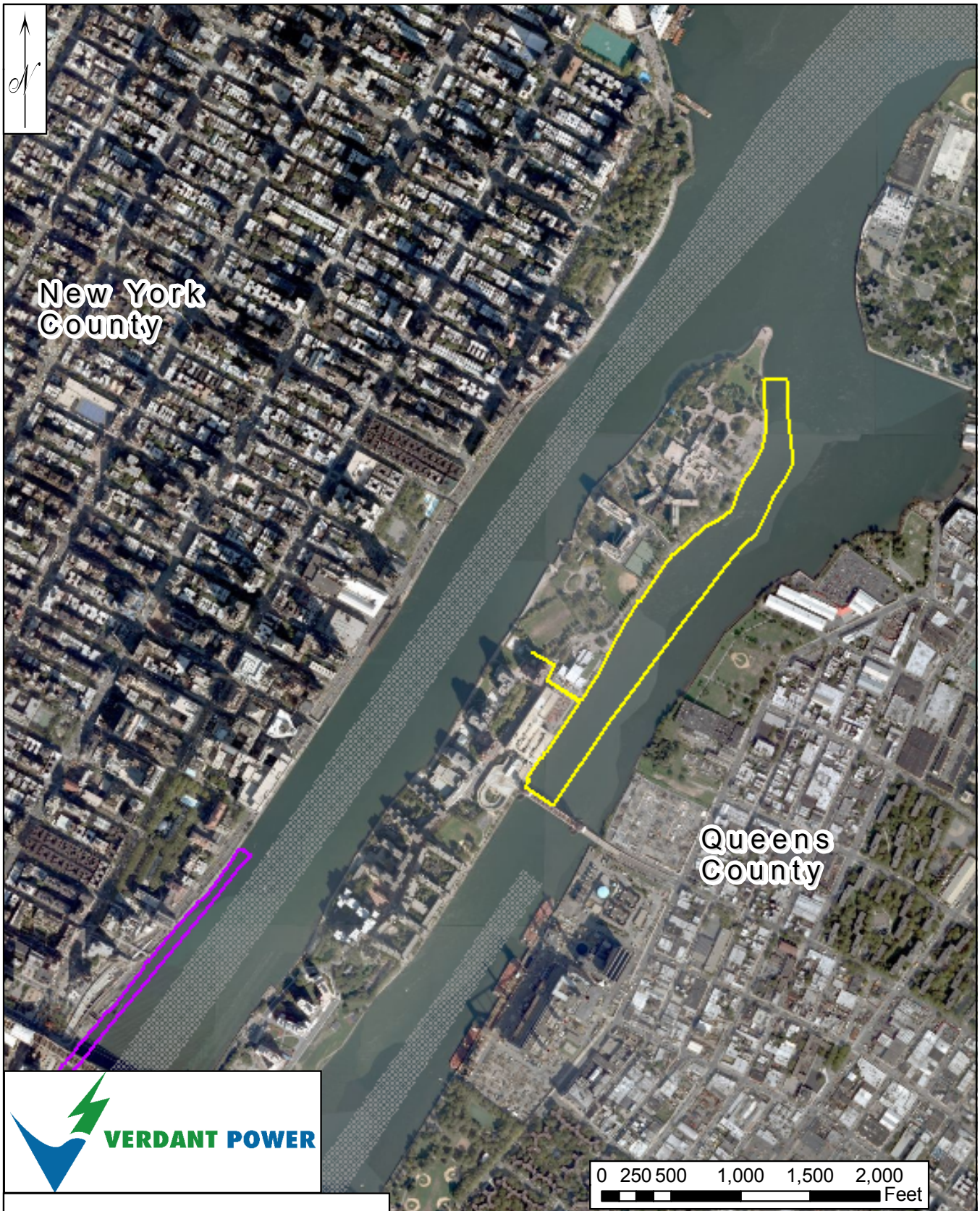
In the vicinity of the RITE Project, the East Channel north of the Roosevelt Island Bridge is too narrow and shallow for larger, deep draft vessels to pass through, though the Roosevelt Island Bridge can be opened to allow larger ships to pass. However, the U.S. Coast Guard advised Verdant Power that in the event of an emergency in the West Channel, navigation traffic would be routed through the East Channel. Also, during a 2-week window each year when the UN Security Council is in session, it is standard operating policy to restrict navigation in the West Channel and use the East Channel.

North of Roosevelt Island, the East River is joined by the Harlem River, the Bronx River, and the Bronx Kill as it is divided again by Ward's Island. Along the east of Ward's Island the river narrows into the channel known as Hell Gate before passing through a narrow straight bounded by Astoria, Queens to the east and ending in the Long Island Sound.

This passage is also designated as the federal navigation channel.

Water Taxis

Water taxis are a common form of transportation for New Yorkers. Currently, there is one active route in the East River that stops at E. 34th Street, Hunters Point, Long Island City, Williamsburg Schaefer Landing/South 10th Street, DUMBO Fulton Ferry Landing, and Wall Street Pier 11. All current taxi stops are well outside the RITE pilot project boundary. A license application for a water taxi stop on Roosevelt Island, on a dock near the Octagon, was approved by the U.S. Army Corps of Engineers on December 7, 2007. The dock near the Octagon is on the West Channel of the East River, outside the RITE project boundary. There has been no further advancement of this project since the approval of the license.



VERDANT POWER

Legend

- NOAA Safety Zone
- Federal Navigation Channel
- Proposed Project Boundary

Scale:	AS SHOWN
Project No:	1642-003
Filename:	5.3.7.2-1.mxd
Drawn By:	LJC
Date Drawn:	12-10-10

VERDANT POWER, LLC
NEW YORK, NEW YORK

RITE PROJECT
PILOT LICENSE APPLICATION

NAVIGATION ZONES

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Energy & Water Resource Consultants
2 E. Main St.
Strasburg, PA 17579
Telephone: (717) 687-7211
Fax: (717) 687-7266
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4.3.7.1-1

Data Source: Coastguard

Scale:	AS SHOWN
Project No:	1642-003
Filename:	Project_Location.mxd
Drawn By:	LJC
Date Drawn:	12-10-10

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RITE PROJECT
PILOT LICENSE APPLICATION

WATER TAXI STATIONS

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2 E. Main St.
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Telephone: (717) 687-7211
Fax: (717) 687-7266
www.KleinschmidtUSA.com

4.3.7.1-2

Data Source: NYC Water Taxi

Land Use

The proposed Project will have some facilities along the east shore of Roosevelt Island. Roosevelt Island is a 147-acre island operated by the RIOC, which manages and plans the residential and commercial development of the island. Existing land uses are predominantly urban residential, commercial, and industrial development. Detailed descriptions of land use and zoning were included in the project ICD (Verdant Power, 2003).

Since most of the project components are underwater, shoreline land requirements are minimal consisting of the footprint of the existing control room, a storage container for equipment, and five planned shoreline vaults. These land-based easements are under discussion with the Roosevelt Island Operating Company (RIOC).

4.3.7.2 Environmental Effects

As part of the consultation process, Verdant Power executed an assessment to evaluate potential impacts to navigation and security associated with the deployment and operation of the RITE Project. The specific objectives of the navigation and security assessment were to:

- Review existing information regarding boat traffic and security practices in the vicinity of the Project.
- Consult with groups and individuals who may have interests in navigation and security on the East River.
- Identify potential impacts to navigation and security associated with the RITE Project, and as necessary, develop measures to minimize or mitigate such impacts.

The development of the Pilot RITE Project of underwater kinetic hydropower turbines in the East River could potentially restrict some navigation in the upper East River. Based on the consultation below Verdant Power has confined the deployment area of the pilot projects to areas pre-approved by the stakeholders, thereby having minimal effects on navigation through the East River. In addition, Verdant Power has developed a Navigation and Security Plan as presented in Volume 3 that addresses navigation safety and security.

Navigation and Safety Group Consultation

A navigational study plan was developed in 2006 which included consultation with the U.S. Coast Guard and other navigational stakeholders about recreational and non-recreational use and management within and adjacent to the project boundary as well as observations in this area.

Verdant Power developed the proposed project boundary from this consultation process. As part of its 2-year preliminary permit consultation Verdant Power established and met with a navigation and security work group to discuss commercial buildout plans. The navigation and security work group participants included the U.S. Coast Guard, Keyspan, Sandy Hook Pilots, Moran Towing, NYC Planning, Hudson River Coalition, Maritime Association and other navigational stakeholders. The first teleconference was held on January 22, 2007. During the call, study group participants noted potential conflicts with the following areas:

- South of the 36th Avenue Bridge (due to barges associated with the KeySpan Plant);
- The Federal Channel between Hell Gate and Lawrence Point due to the river's currents and barge traffic;
- The difficulty of navigation through Hallet's Point would further

complicate navigation if turbines were there;

- Proximity of the project footprint to the (federal) navigation channels;
- The difficulty of navigation through the Hell Gate area and up through to Lawrence Point and Pot's Cove;
- Commuter ferries may potentially use the East Channel; and
- The East Channel is important to recreational groups because they used it to avoid commercial boat traffic that is typically in the West Channel.

The second navigational work group meeting was held in the Verdant Power offices on March 1, 2007. The meeting was attended by the U.S. Coast Guard and others within the Harbor operations group. The U.S. Coast Guard provided maps which were labeled with sites they found acceptable for Verdant Power's turbines, which include the areas shown in Figures 4.3.7.2-1 and 4.3.7.2-2.

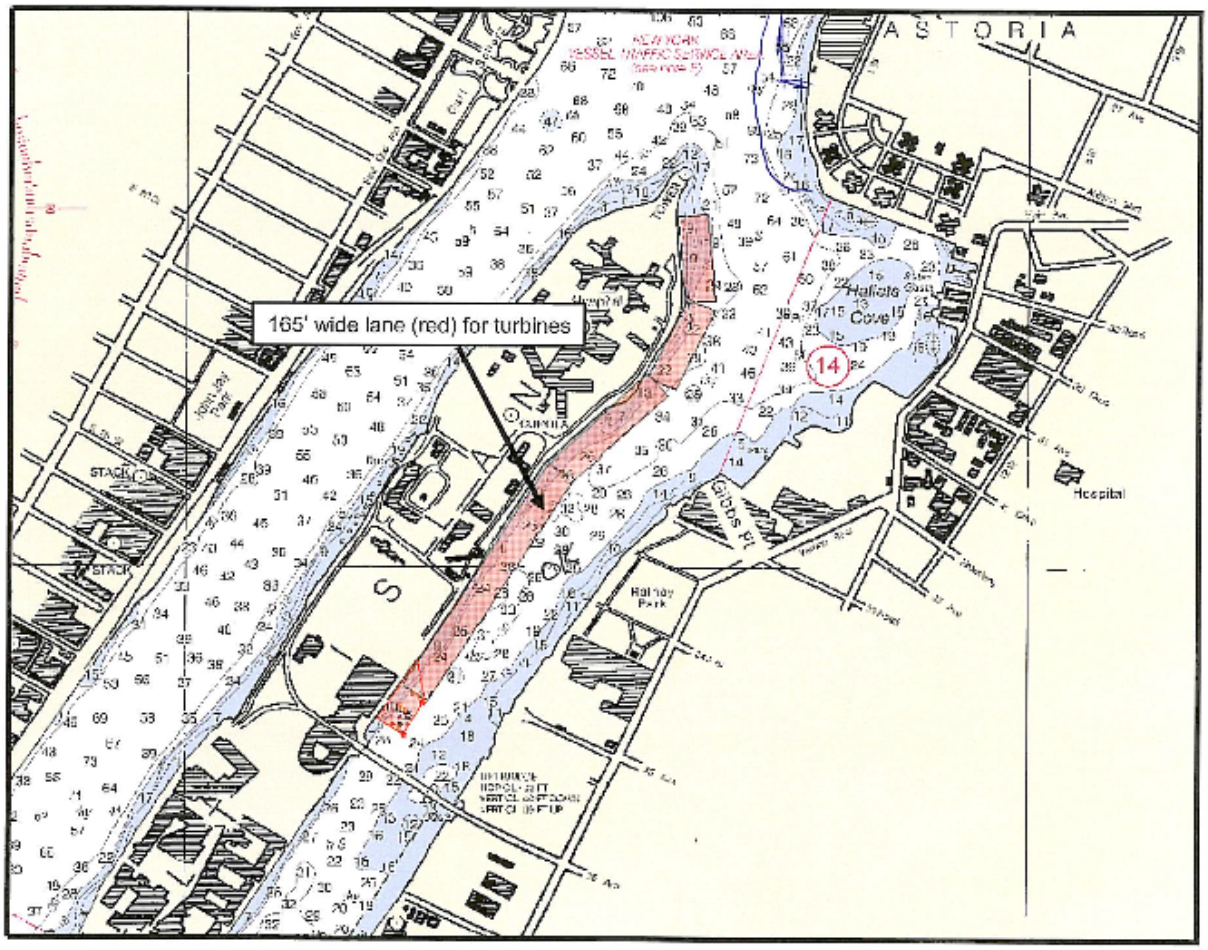
Other concerns noted during the March 2007 meeting included:

- The U.S. Coast Guard (USCG) would allow siting of Verdant Power KHPS buildout field only in areas designated by them so as not to impact recreational and commercial traffic;
- The occasional and temporary closure of the main federal navigation channel (West Channel of East River) requires use of the East Channel for navigation; thus all operation and maintenance of the buildout field must be coordinated with the USCG during these periods;
- KHPS units could not be built-out in the area between the Roosevelt Island Bridge and the Queensboro Bridge due to interference with regular oil barge deliveries to the Ravenswood generation station and restricted navigation width in that reach of the East Channel of the East River; and

- RITE buildout fields could not interfere with plans for water taxi service from Roosevelt Island to Manhattan.

As part of the RITE project boundary (see Exhibit G) and under directive from both the March 2007 and November 2008 consultation meetings from the U.S. Coast Guard, the Project will occupy an exclusion area as designated by the USCG:

Figure 4.3.7.2-1. USCG allowable area - RITE project buildout.



Verdant Power believes that the plans developed in this Pilot Application are consistent with the concerns of the Navigation and Security Work Group and has confined the RITE East Channel buildout project boundaries to the areas under the

general advice of the U.S. Coast Guard in March 2007, as updated in November 2008. Some further consultation with the USCG and the harbor operations Committee was held in January 2009 to finalize the project layout and PATON locations as shown on Exhibit G.

As a result of the January 2009 comments, Verdant Power participated in a U.S. Coast Guard Harbor Operations Committee meeting on January 21, 2009 to present an update about the proposed Pilot Project in the East Channel of the East River. At this meeting it was clearly stated that the near-term focus was the approval of the East Channel Pilot location.

To specifically address and clarify DonJon Marine Company, Inc. and United Marine Division International Longshoremen's Association, Local 333's concerns, on February 11, 2009, Verdant Power sent a letter suggesting that a meeting be held at Verdant Power Office to further discuss navigation in the East Channel of the East River. The letter was sent to the following parties:

- Chief Waterways Oversight Branch, USCG
- Waterways Management Coordinator, USCG
- DonJon Marine Company, Inc.
- United Marine Division International Longshoremen's Association, Local 333

After phone conversations about Verdant Power's proposed meeting, United Marine Division, Local 333 decided that it would send a letter to FERC stating that it had no objections to the RITE Project in the East Channel. The letter to this effect was sent to FERC on March 5, 2009 and posted to the RITE project docket on March 19, 2009. DonJon Marine was not able to attend Verdant Power's proposed meeting and representatives from the company stated it would rather send correspondence to FERC to clarify its comments on the project in lieu of attending a meeting.

The proposed Project has a very minimal footprint on land area (existing control room and proposed transmission vaults) so impacts to existing land uses are believed to be minimal.

4.3.7.3 Unavoidable Adverse Effects

Some minor land use for the existing control room and shoreline vaults would be needed. There would also be some increased risk of navigation safety concerns from the proposed exclusion zone and from deployment and maintenance activities, including during the short construction period when large surface vessels are present; however, the vessels will be extremely well marked and a "Notice to Mariners" will be issued. In addition, these risks would be minimized through close coordination with the USCG for all in-water activities. Once the KHPS units are installed – and Private Aids to Navigation (PATONs) (buoys) are installed – there will be significantly lower surface risk.

4.3.7.4 No Action Alternative

Under the No Action Alternative, the proposed buildout would not be completed. Therefore, no additional impacts to navigation or land use would occur.

4.3.7.5 Sources

Verdant Power, Inc. 2003. Initial Consultation Document for the Roosevelt Island Tidal Energy Project (ICD), FERC Project Number 12178. October 2003. Prepared by Devine Tarbell and Associates.

Roosevelt Island 360 Blogspot. 2008. [Online] URL: http://rooseveltisland360.blogspot.com/2007/12/new-water-taxi-dock-comments-from-bruce.html. Accessed December 2, 2010.

4.3.8 Aesthetic Resources

4.3.8.1 Affected Environment

As described in the ICD, the proposed RITE Project is located in one of the most densely populated urban regions of the country. Accordingly, the viewshed from the project area is primarily urban with a mix of residential, commercial, and industrial settings. The aesthetic resources of the project area include the working waterfront of the East River and manmade scenery such as the famous Manhattan skyline and several bridges. Natural scenic areas occur north of Roosevelt Island within the upper East River/Long Island Sound and southwest of the project area within New York/New Jersey Harbor (Verdant Power, 2003).

The installation of the RITE 6-pack demonstration field within this urban environment provides an opportunity to understand the elements of a somewhat larger RITE East Channel buildout that is the subject of this pilot license application. As such, the photos of the existing RITE 6-pack serve as excellent representations of the visual and aesthetic aspects of the Project.

The visible components of the RITE Demonstration Project included:

The surface buoy system that protects the underwater KHPS turbine array (Photo 4.3.8.1-1); and

- The existing small control room/equipment shelter (Photo 4.3.8.1-2).
- The storage container that is next to the control room (Photo 4.3.8.1-3)

Photo 4.3.8.1-1. Verdant Power RITE Demonstration Site, buoy system, control room, and nearby steam tunnel vaults.

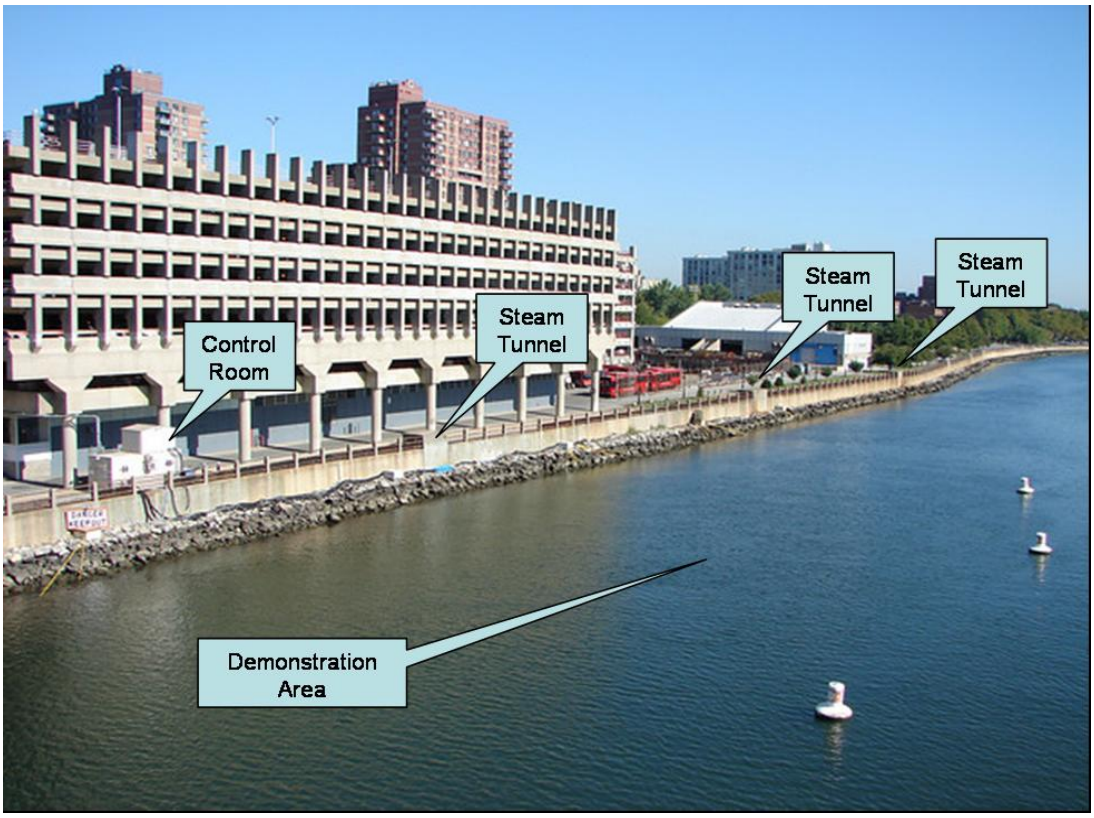


Photo 4.3.8.1-2. Verdant Power's control room and associated equipment at the RITE Demonstration Site.

Photo 4.3.8.1-3. The storage container that is next to the control room.

4.3.8.2 Environmental Effects

The proposed buildout would have only minimal additional aesthetic effects than the Demonstration Project. Verdant Power will install a buoy system to designate a boating and recreation exclusion zone. The buoys are necessary for navigation and recreation safety. This buoy system will look similar to the existing buoy system (see Photo 4.3.8.1-1) but will cover a wider area. In addition, a "Danger Keep Out" sign is located in the area of the control room.

Verdant Power will install five small shoreline utility vaults to house the switchgear and cable to bring the power from the turbines to the shore (Photo 4.3.8.2-1). Verdant Power has designed the shoreline switchgear and cable vaults to blend in with the existing shoreline by mimicking the circa 1975 steam tunnel vents which are currently located between 135 ft and 185 ft apart along the shore (Photo 4.3.8.1-1). These

land-based facilities would be designed as relatively low profile structures, thus minimizing any aesthetic impact.

In addition, Verdant Power will install an informational kiosk similar to the poster on the existing control room for the demonstration Project**.** The kiosk will provide educational information regarding KHPS unit technology and the Project.

The urban setting of the RITE buildout project includes numerous sources for ambient sound; including the traffic (vehicular and commercial navigation), proximity to an operating natural gas peaking station (Ravenswood) and subway train route, as further detailed in the aquatic resources section. The acoustic characteristics of the project vicinity would not be likely to be impacted by the presence of the project.

Verdant Power does not expect any significant impact to the aesthetic resources from the pilot project buildout. Because of the minimal above-water infrastructure required by the RITE Project, no further aesthetic monitoring or studies are proposed for the pilot license term.

Photo 4.3.8.2-1. Typical existing steam tunnel vent.

4.3.8.3 Unavoidable Adverse Effects

The buoys in the project exclusion zone, the danger signs associated with the project, and the shoreline vaults will need to be new features of the local viewshed. Because these have been designed to have minimal aesthetic effect and are similar to other features along this waterway, these effects are expected to be minimal.

4.3.8.4 No Action Alternative

Under the No Action Alternative, no additional effects to the aesthetics would occur. The cable vaults and informational kiosk would not be constructed. Buoys would not exclude a wider area of the water surface.

4.3.9 Cultural Resources

4.3.9.1 Affected Environment

Under Section 106 of the National Historic Preservation Act of 1966, federal agencies must take into account the effects of federal actions on historic properties and give the Advisory Council on Historic Preservation opportunity to comment on actions and decisions. Consultation related to historic properties is done with state historic preservation offices. Also, under the National Historic Preservation Act (as amended in 1992), federally recognized Native American Indian tribes can assume the position of a state historic preservation officer for any activities affecting tribal lands.

Because the RITE Project is to be located in the City of New York, the Project is also subject to environmental review by the City of New York Landmarks Preservation Commission (LPC).

To describe the affected environment, Verdant Power conducted a literature review and desktop study for the preparation of the ICD (Verdant Power, 2003) and compiled a list of National Register Historic Properties and Landmarks on Roosevelt Island. This was in response to a request from the City of New York LPC for additional information about the Project for the purposes of environmental review. In this information request, the City of New York LPC indicated that designated New York City Landmarks and properties listed on the National Register of Historic Places were located within the vicinity of the Project, and that the project area may be archaeologically significant. Based on the review and as summarized on Table 4.3.9.1-1 and Figure 4.3.9.1-1; none of these properties, or other notable land-based historic sites, are proximate to the proposed RITE Project.

Table 4.3.9.1-1. National Register of historic places and the Landmarks Preservation Commission on Roosevelt Island.

SITE	DESCRIPTION
Roosevelt Island Lighthouse	Located on the north end of the island, the lighthouse was designed by architect James Renwick, Jr. and built in 1872. The lighthouse was built using inmate labor from the island's prisons.
City Hospital and The Octagon	Listed separately on the National Register these two sites were originally part of the first New York City mental health hospital, built in 1835. Designed by architect Alexander James Davis, the building was one of New York's finest buildings in its time. The facility was renamed Metropolitan Hospital in the 1890s, and remained in use until the 1950s when the hospital was moved to newer buildings in Harlem. Most of the original hospital was demolished in the 1970s, and what remained of it was damaged by fires in 1982 and 1999. Today the Octagon remains and has been incorporated into the new Octagon Building (offices of Verdant Power), Apartments and Ecological Park.
Chapel of the Good Shepherd	Designed by Frederick Clark Withers the chapel was built in 1888 and later donated to the Episcopal City Mission Society. The mission served the imprisoned and infirmed of the island. Today the building houses the Good Shepherd Community Center.
Blackwell House	The Blackwell House was built in 1794 and is the fifth oldest wooden house in all of New York City.
Smallpox Hospital	Also designed by James Renwick Jr., the Smallpox Hospital was constructed in 1854 to house highly contagious smallpox patients on the island from the majority of the city's population.
Strecker Laboratory	Built in 1892 and designed by architects Withers and Dickson, Strecker Laboratory was built as a pathology lab for the City Hospital. It later housed the well known Russel Sage Institute of Pathology.

Source: Verdant Power, 2003.

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Legend

- Landmarks
- Proposed Project Boundary

Scale:	AS SHOWN
Project No:	1642-003
Filename:	5.3.9.1-1.mxd
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Date Drawn:	12-10-10

VERDANT POWER, LLC
NEW YORK, NEW YORK

RITE PROJECT
PILOT LICENSE APPLICATION

CULTURAL RESOURCES

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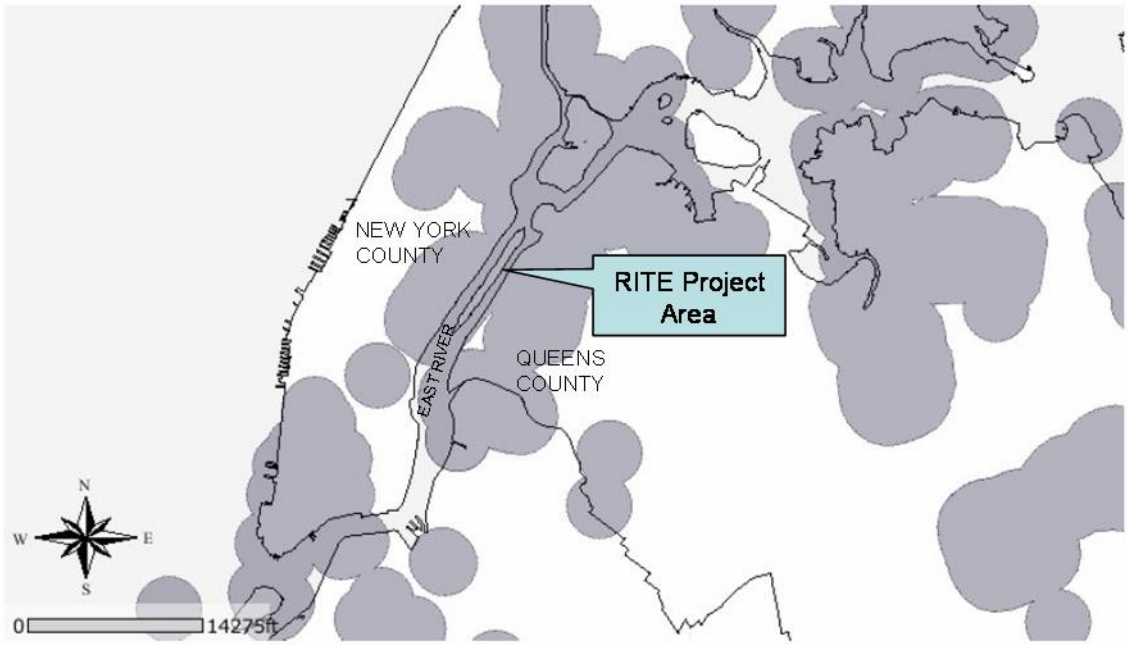
Kleinschmidt
Energy & Water Resource Consultants
2 E. Main St.
Strasburg, PA 17579
Telephone: (717) 687-7211
Fax: (717) 687-7266
www.KleinschmidtUSA.com

4.3.9.1-1

Data Source: NYC Open Accessible Space Info System

The New York State Historic Preservation Office (SHPO) maintains archaeological sensitive maps for New York State. These maps display all known archaeological sites. Like much of Manhattan and the surrounding New York boroughs, Roosevelt Island, Astoria, and the East River in the vicinity of the Project are located within a generally archaeologically sensitive buffer zone, as is much of Manhattan and Queens (see Figure 4.3.9.1-2). To refine this general mapping, Verdant conducted the April 2007 detailed side-scan sonar of the RITE East Channel buildout area, and provides the results as below.

Figure 4.3.9.1-2. Archaeological sensitive buffer zones (shaded) in the vicinity of the Project (Verdant, 2003).



In consultation with the agencies during the preliminary permit period, the focus of the cultural and historic concerns was with the underwater and shoreline potentially affected resources.

During the course of the preliminary permit and the RITE Demonstration Project, Verdant conducted an assessment to evaluate potential impacts to historical and cultural resources associated with the deployment and operation of a field of KHPS turbines in the East Channel of East River.

Verdant developed a plan for a Cultural Resources Assessment, in conjunction with this license application, which was reviewed at the Joint Agency/Public Meetings on December 15, 2003 and again at the study review meeting on June 9, 2004. The Cultural Resources Assessment included:

- A review of existing information regarding historical and cultural resources in the vicinity of the Project, as documented in the ICD;
- Two geophysical surveys conducted to identify potential underwater "wreckages"; conducted February 2005 and April 2007; and
- Ongoing consultation with the New York SHPO.

In February 2004, FERC designated Verdant Power as the Commission's non-federal representative for Section 106 consultation. Verdant Power is thus authorized to initiate and conduct day-to-day consultation with the New York SHPO, appropriate Native American tribes, and other parties regarding the proposed RITE Project. During consultation associated with deployment of the 6-pack demonstration project, the SHPO concluded that no known historical properties (*e.g.*, shipwrecks, sites eligible for the National Register of Historic Places, *etc.*) would be affected by the deployment and operation of the RITE project 6-pack demonstration study units, and the demonstration could proceed as planned.

In February 2005, Verdant Power conducted a geophysical investigation to document surficial and subsurface riverbed features in the East Channel in the area of the

RITE Demonstration 6-pack project. Among other surveys, a side-scan sonar survey was conducted using a high-resolution side-scan sonar device at frequencies of 500-kHz and 100-kHz respectively. Detailed images of the riverbed features were generated from data collected during the two surveys and were included in the report, "Acoustic Remote Sensing Survey for Roosevelt Island Tidal Energy Project." These images allowed for a detailed inspection of bottom features, including shipwrecks or historical structures. While this study was conducted to characterize sediment and aid in the engineering of Verdant's technology and help the monitoring plans, this study also supported the cultural resource assessment because shipwrecks or historical structures on the riverbed would have been detectable by the side-scan sonar survey images. No cultural structures were detected, and Verdant proceeded with the Demonstration Project.

In December 2006, to evaluate a larger RITE East Channel Buildout Project, Verdant Power proposed a second remote sensing effort, which was agreed to by the agencies.

In April 2007, Verdant Power conducted an extended geophysical investigation of the East River from the Roosevelt Island Bridge to the northern tip of Roosevelt Island, which included a bathymetric survey, sub-bottom sonar survey, magnetometer survey, and a side-scan sonar survey (CR Environmental, 2007). Side-scan sonar data was collected using a 384-kHz signal (nominally 500-kHz). Additional transects were collected using a 100 kHz signal and various ranges. Magnetic survey data were collected using a magnetometer simultaneously during the bathymetric survey along the same set of survey transects. A magnetometer was used to identify ferrous objects and "fired" objects[8] both above and below the sediment surface, and to determine if features identified by side scan sonar (above the sediment surface) contained iron.

[8] The molecules of certain minerals, when heated to sufficiently high temperatures during processes such as brick making, realign to match the Earth's magnetic field and may be registered by a magnetometer.

The magnetic contour maps developed from this field study identified the three possible wreckage locations. All three features are consistent with nautical charts of the area and outside the RITE project boundary for the East Channel field. There was strong coincidence between the side-scan sonar and magnetic data at one of the wreckage sites. At least three areas of possible wreckages were identified on the side-scan sonar records, depicted in Figures 4.3.9.1-3 and 4.3.9.1-4.

- Feature 1 is located along the northern coast of Hallet's Cove and appears to consist of three parallel structures oriented oblique to the shoreline. These objects likely represent sunken piers or barges. The nautical chart for this area identifies wreckage approximately co-located with these features.
- Feature 2, a potential wreckage, was identified in the eastern portion of Hallet's Cove. This feature is approximately 40 ft long and 30 ft wide and is surrounded by other debris, including numerous tires. The nautical chart for this area identifies a wreckage that looks to be the same location as this feature.
- Feature 3 was identified in the southeastern portion of Hallet's Cove at Gibbs Point. This feature is best characterized as a field of irregularly shaped debris covering an approximately 70 by 100 ft area adjacent to an iron retaining wall. The nautical chart for this area shows piers and suggests a former docking/shipping facility.

Figure 4.3.9.1-3. Contour map of total field magnetism, East Channel of the East River New York.

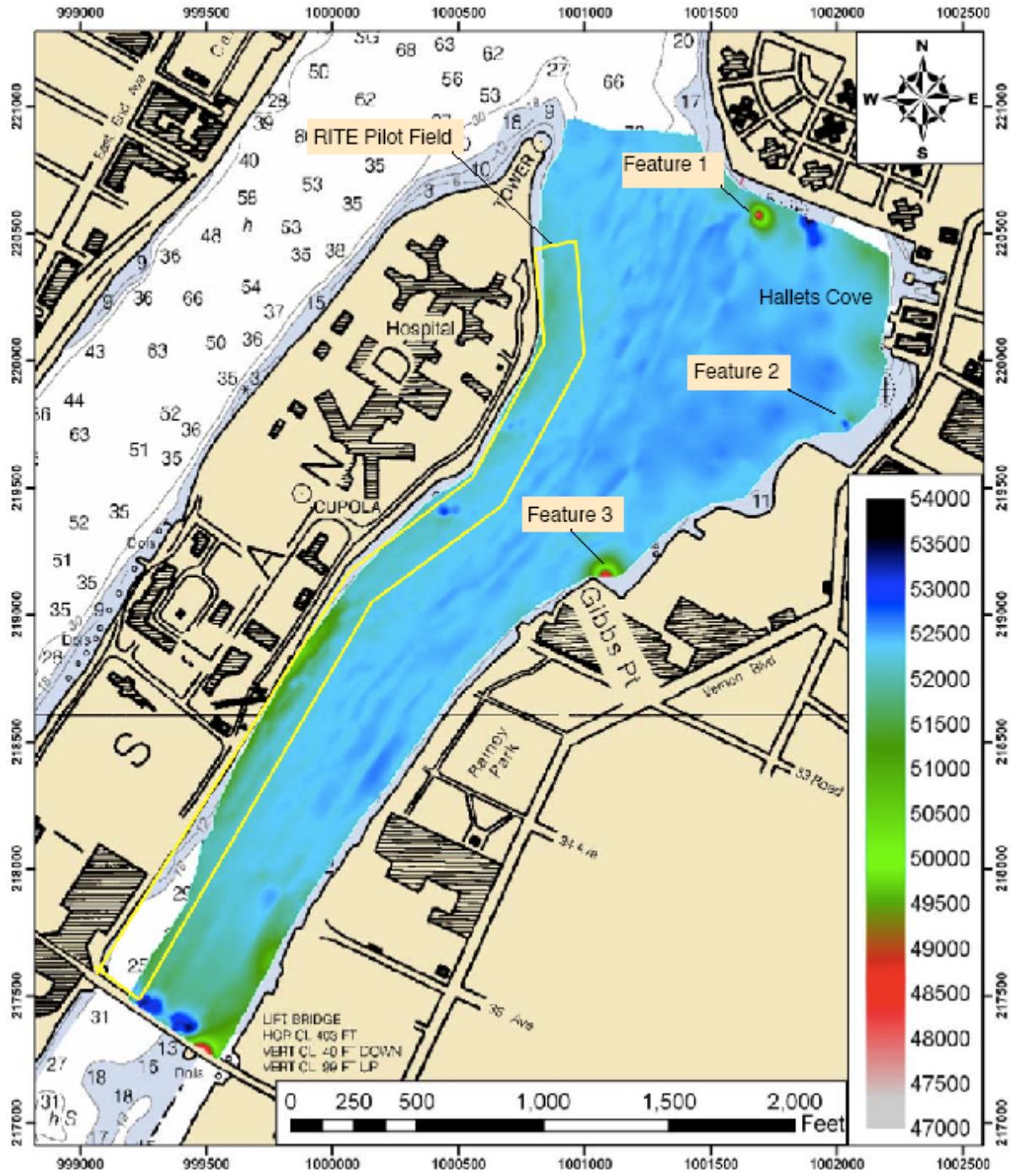
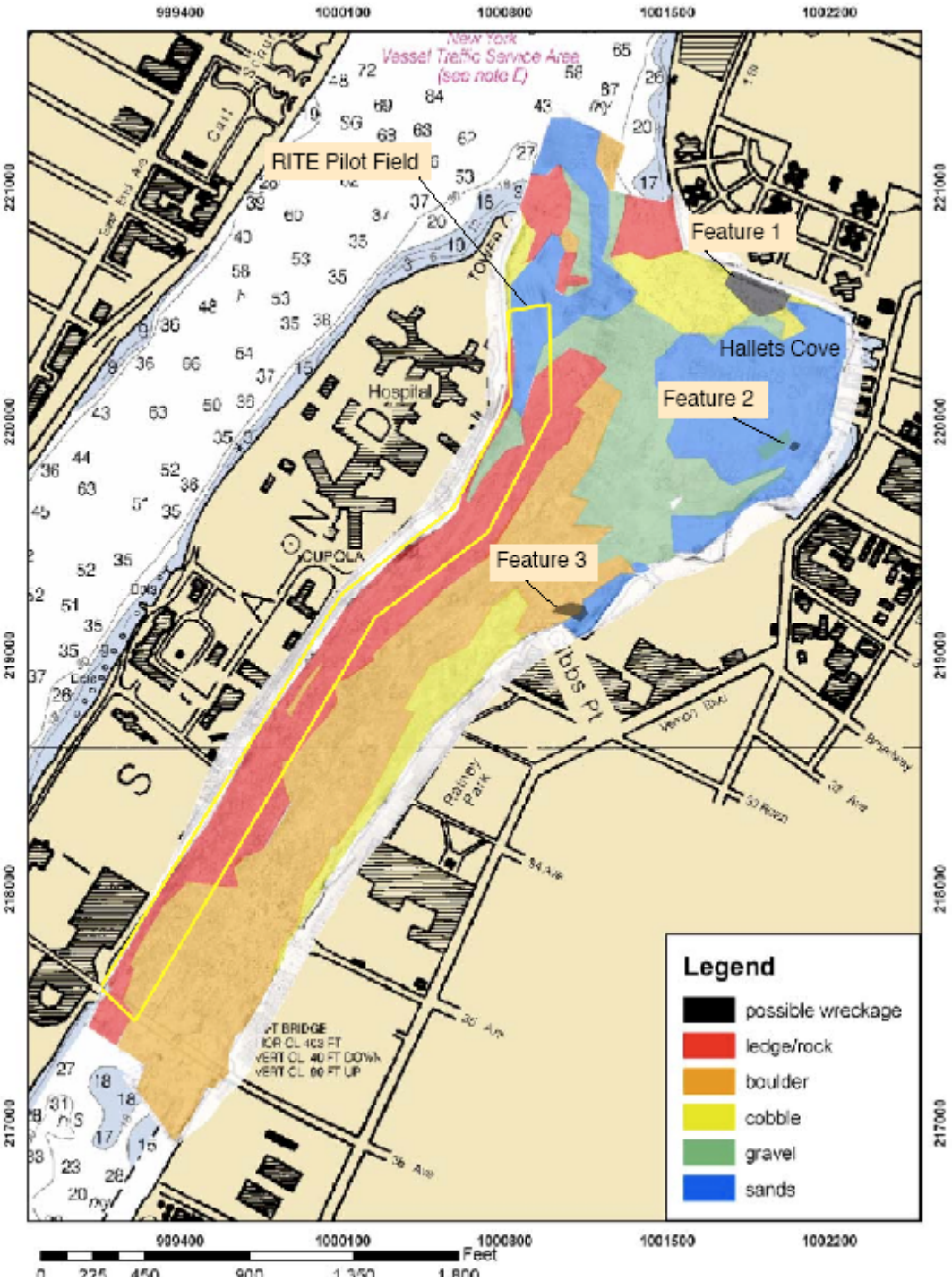


Figure 4.3.9.1-4. Distribution of dominate surficial substrate classes based on side scan sonar data, East Channel of the East River, New York.



4.3.9.2 Environmental Effects

The USACE and the City of New York LPC raised concerns that the proposed action may impact or disturb sunken cultural artifacts. However, the above-detailed field studies verify that there are no sunken ships in either the RITE demonstration study area or the RITE East Channel buildout field. Based on the data collected in the field survey, the proposed action will not disturb sunken artifacts.

Furthermore, the land-based features of the RITE East Channel Project do not affect any sites listed on the National Register of Historic Places. In a letter dated December 22, 2008, the New York State SHPO stated that "the project will have No Adverse Effect on cultural and historical resources eligible for or listed on the National Register of Historic Places." Based on these findings, we believe that a Historic Properties Management Plan (HPMP) for the RITE East Channel Project, if needed, would primarily be focused on notification if something unexpected is discovered during construction activities.

Based on detailed investigations of the field array site and land-based components within the project boundary, Verdant Power concludes that no further studies or mitigation is required besides normal construction precautions in the vicinity of the RITE East Channel buildout. In the event that an archeologically or culturally sensitive artifact is discovered during construction, Verdant Power will cease ground-disturbing activities and the appropriate group (*i.e.* Tribe, SHPO, etc.) will be promptly notified.

4.3.9.3 Unavoidable Adverse Effects

None Identified.

4.3.9.4 No Action Alternative

If the proposed RITE buildout Project is not constructed, no potential impacts to undiscovered cultural resources, if present, would occur.

4.3.9.5 Sources

CR Environmental, Inc. 2007. 2007 Expanded Geophysical Survey Roosevelt Island Tidal Energy Project. April 2007.

Verdant Power, Inc. 2003. Initial Consultation Document for the Roosevelt Island Tidal Energy Project (ICD), FERC Project Number 12178. October 2003. Prepared by Devine Tarbell and Associates.

4.3.10 Tribal Resources

4.3.10.1 Affected Environment

Based on the preliminary review of available information for the ICD, Verdant Power determined that there are no federally listed Native American Indian tribes with interests in the project site or prehistoric archaeological sites near the Project. In accordance with FERC procedures, the FERC tribal consultation process was initiated by FERC by letter on April 11, 2007 to the three Native American tribal liaisons:

- The Delaware Nation in Anadarko, OK;
- The Stockbridge Munsee Community of Wisconsin, Bowler, WI; and
- The St. Regis Mohawk Tribe, Akwesasne, NY.

These tribes were contacted to solicit participation in the licensing process for the RITE project, identified by FERC as Native American Indian Tribes possibly affected by deployment and/or operation of the RITE Project. The Delaware Nation submitted a letter in January 6, 2008 stating that the location of the project does not endanger known sites of interest to the Delaware Nation though they requested that they be notified if any archeological sites or objects were inadvertently uncovered. No response from other tribes has been received as of this writing (December 2010).

4.3.10.2 Environmental Effects

To date no further direction for consultation has been received by Verdant Power. To Verdant Power's knowledge, no concerns about the effects of project construction and

operations on water resources, fish and aquatic resources, wildlife and botanical resources, wetland, rare species, recreation and land use, aesthetic resources, cultural resources and socio-economic resources have been raised from tribal cultural or economic interests. Further consultation under the FERC pilot project process will take place regarding any potential historical or cultural properties associated with the project if any sensitive resources are detected. In the event that an archeologically or culturally sensitive artifact is discovered during construction, Verdant Power will cease ground-disturbing activities and the appropriate group (*i.e.* Tribe, SHPO, etc.) will be promptly notified.

4.3.10.3 Unavoidable Adverse Effects

None identified.

4.3.10.4 No Action Alternative

Under the No Action Alternative, no activities that would potentially disturb tribal resources would occur. Therefore, there would be no impact to tribal resources.

4.3.11 Socioeconomic Resources

4.3.11.1 Affected Environment

The RITE Project is located in New York, New York. New York City is the largest urban area in the United States and the fifth largest metropolitan area in the world (including surrounding NYC metropolitan area) (World Atlas, 2008). New York City is recognized as a global hub for commerce, finance, international relations and cultural activity. According to the U.S. Census Bureau, the population of New York City was 8,302,659 in 2009. This was an increase of 3.7% from the population size in 2000 (8,008,278)[9]. The following tables summarize data regarding the population and industries in New York City.

[9] U.S. Census Bureau, 2005-2009 American Community Survey 5-Year Estimates

Table 4.3.11.1-1. Population distribution (2005-2009).

By Age:	
Under 5 Years Old	6.9%
18 Years and Over	77.1%
65 Years and Over	12.1%
Median Age (Years)	35.6
By Gender:	
Male	47.7%
Female	52.3%
By Race:	
One Race	97.9%
White	45.4%
Black or African American	25.1%
American Indian or Alaska Native	0.3%
Asian	11.7%
Native Hawaiian and Other Pacific Islander	0.0%
Other	15.3%
Two or More Races	2.1%
Hispanic or Latino (of any race)	27.4%

Table 4.3.11.1-2. Household information (2005-2009).

Median Household Income	***** $50,173
Total Housing Units	3,329,572
Owner-Occupied Housing Units	1,032,277
Renter-Occupied Housing Units	2,014,878
Vacant Housing Units	282,417

***** 2009 inflation-adjusted

Table 4.3.11.1-3. Economic Sectors (2007)[10].

Sector	Number of Establishments	Sales, Shipments, Receipts ($1,000)
Manufacturing	6,626	10,411,572
Retail Trade	31,459	78,206,482
Information	5,729	Not Available
Real Estate and Rental and Leasing	18,792	36,279,097
Professional, Scientific, and Technical Services	25,138	78,440,396
Administrative and Support and Waste Mgmt and Remediation	8,539	25,027,661
Educational Services	1,946	3,212,957
Health Care and Social Assistance	20,839	62,555,079
Arts, Entertainment, and Recreation	5,322	14,487,525
Accommodation and Food Services	17,494	22,095,094
Other Services (except Public Administration)	19,105	26,308,524

[10] U.S. Census Bureau: State and County QuickFacts. Data derived from Population Estimates, 2000 Census of Population and Housing, 1990 Census of Population and Housing, Small Area Income and Poverty Estimates, County Business Patterns, 2002 Economic Census, Minority- and Women-Owned Business, Building Permits, Consolidated Federal Funds Report, Census of Governments

Table 4.3.11.1-4. Employment (2005-2009)[11].

Civilian Employed Population 16 Years and Over	**3,808,779**
OCCUPATION	
Management, Professional, and Related Service	37.5%
Service	21.4%
Sales and Office	25.0%
Farming, Fishing, and Forestry	0.1%
Construction, Extraction, Maintenance, and Repair	6.8%
Production, Transportation, and Material Moving	9.2%
INDUSTRY	
Agriculture, Forestry, Fishing and Hunting, and Mining	0.1%
Construction	5.4%
Manufacturing	4.5%
Wholesale Trade	2.7%
Retail Trade	9.4%
Transportation and Warehousing, and Utilities	6.2%
Information	4.2%
Finance and Insurance, and Real Estate and Rental and Leasing	10.6%
Professional, Scientific, and Management, and Administrative and Waste Management Services	12.3%
Educational Services, and Health Care and Social Assistance	25.4%
Arts, Entertainment, and Recreation, and Accommodation and Food Services	9.4%
Other Services, Except Public Administration	5.6%
Public Administration	4.2%
CLASS OF WORKER	
Private Wage and Salary	78.3%
Government	15.1%
Self-Employed in own not incorporated business	6.5%
Unpaid Family Workers	0.1%

[11] U.S. Census Bureau, 2007 Economic Census

4.3.11.2 Environmental Effects

The Pilot Project would not likely have any negative impact to the local economy but rather would likely benefit the local economy largely through job creation and business opportunities in the construction, manufacturing, and utilities industries. Verdant Power has utilized the U.S. Department of Energy National Renewable Energy Laboratory's *Job and Economic Development Impact (JEDI)* model, recently developed in beta for hydrokinetics, to estimate the potential economic development benefits, including job creation that would result from the development of the 1-MW RITE East Channel Pilot:

Table 4.3.11.2-1. Estimated Economic Benefits

	Jobs	**Earnings ($MM)**	**Output ($MM)**
During Construction Period:	136	$9.1	$25.8
During Operating Years (Annual):	12	$0.8	$1.6

Additionally, the world-first nature of the RITE Project has not only generated a great deal of publicity for Verdant Power, but also for New York, which too has become viewed as a world leader in kinetic hydropower technology. Coupled with this public awareness is a growing number of local firms providing support to the RITE Project and thus gaining industry-leading expertise in kinetic hydropower systems manufacture and installation. This positions New York City and New York State as a hydrokinetic industry cluster – both for local project development as well as the exportation of goods and expertise globally – which will result in continued and significant economic benefits for the area.

Based on our experience with the RITE Demonstration over a period of 2006-2010, Verdant Power has projected the following capital construction and long-term O&M costs associated with the RITE East Channel Pilot:

Table 4.3.11.2-2. Estimated costs of construction.

RITE Project Cost Component	Install A	Install B-1	Install B-2	Install C	TOTALS
Land and land rights	$50,000	$50,000	$75,000	$100,000	**$275,000**
KHPS turbines and generators	$1,700,000	$300,000	$2,700,000	$4,500,000	**$9,200,000**
Assembly, Installation and Commissioning (including underwater cabling)	$850,000	$450,000	$1,125,000	$1,800,000	**$4,225,000**
Accessory electric equipment; relay; instrumentation and data acquisition	Included Above	Included Above	$1,200,000	$1,350,000	**$2,550,000**
Environmental Monitoring/Regulatory Requirements	$600,000	$600,000	$800,000	$350,000	**$2,350,000**
Interconnection Costs	Included Above	Included Above	$400,000	$600,000	**$1,000,000**
Total Capital Costs	**$3,200,000**	**$1,400,000**	**$6,300,000**	**$8,700,000**	**$19,600,000**
Annual O&M	**$400,000**	**$800,000**	**$875,000**	**$900,000**[12]	

The estimated ongoing Operation and Maintenance (O&M) needs for the project area based on experience with in-water O&M expenses associated with the RITE Demonstration, and also include many one-time, first-time startup costs associated with operating an array of KHPS for an extended period of time. The estimates were based on the FERC code of accounts and include all costs for both operation and maintenance of

[12] Represents 7-year average cost assuming two O&M cycles and allowances for relicensing/decommissioning at the end of the FERC license.

hydraulic plant and O&M of transmission facilities. Implicit in the O&M costs for Install C is a full O&M cycle on the entire field of turbines in Years 5 and 8 of operation. Also included are the capital and O&M costs for ongoing environmental (RMEE) plans, safeguard plans, and financial assurances, including either relicensing or removal at the end of the license terms. It should be noted that these cost estimates represent projections of an entry-level commercial, kinetic hydropower project, and as such include, from experience, high contingencies associated with first-time applications and regulatory uncertainties.

The value of alternative power in the New York City region varies by the type of alternative power being provided. Verdant Power has estimated the value of the tidal power that would be generated at the RITE East Channel Pilot by taking the following specific value components into account:

Table 4.3.11.2-a. Values of alternative energy in NYC.

Source	**Amount**
New York City Wholesale Price of Electricity (October 2012 Average)[13]	$58.86/MWh
Renewable Energy Certificate	$82.50/MWh
Total	**$141.36/MWh**

For the "Renewable Energy Certificate" figure included in this estimate, Verdant Power has used a blended amount based on the average values of renewable energy certificates provided to Tier 1 and Tier 2 participants in New York State's Renewable Portfolio Standard (RPS) program ($15/MWh and $150/MWh respectively[14]). While "tidal turbines" are currently categorized as a Tier 1 generation type in New York State,

[13] NYISO Monthly Report, October 2010.

[14] Estimated Value of Compliance REC Markets through 2010, New York; Emerging Markets for Renewable Energy Certificates, National Renewable Energy Laboratory; January 2005.

Verdant Power feels that a case could be made that the small installation size of the East Channel Pilot (1 MW) could qualify it for Tier 2 support, which is intended for "facilities that are not economically competitive with Main Tier technologies." Tier 2 generation types currently include small wind turbines and solar photovoltaics, among other sources. Verdant Power will work with the New York State Energy Research and Development Authority (NYSERDA), which administers the NYS RPS program, as well as the New York Public Service Commission, to determine the appropriate role for the RITE East Channel Pilot in the NYS RPS program.

Additionally, any economic analysis of the RITE East Channel Pilot must take into account that the KHPS unit technology and the RITE project are unprecedented and thus the capital costs associated with this preliminary installation are not indicative of future and larger-scale installations and projects. The capital costs included in the Verdant Power Draft License Application are premised on the RITE Project being the world's first installation, thus benefiting from few economies of scale. In addition, there are significant fixed costs, regardless of the relatively small size of the installation, for the groundbreaking environmental, regulatory and manufacturing technology advances required by the project. In fact, the permitting and environmental costs associated with the RITE Project have far exceeded the fabrication and installation costs of the underlying system.

In order to help manage these early project capital costs, Verdant Power has been working to build a coalition of public and private partners to participate in a capital buy-down subsidy.

4.3.11.3 No Action Alternative

Under the No Action Alternative, the economic benefits of job creation would not be realized. The role of New York City and New York State in terms of becoming a leader in kinetic hydropower technology would be limited to the testing that has already

taken place.

4.3.11.4 Sources

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4.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2) of the Federal Power Act (FPA) requires the Commission to consider whether or not, and under what conditions, the project would be consistent with relevant comprehensive plans on the Commission's Comprehensive Plan List (last updated in July 2010).

Verdant Power has reviewed the following plans we believe to be relevant to this project for consistency and are aware of no conflicts noted to date in any of the consultations.

New York

- New York State Office of Parks, Recreation, and Historic Preservation. 1983. People, resources, recreation. Albany, New York. March 1983. 353 pp. and appendices.

United States

- Atlantic States Marine Fisheries Commission. 1998. Interstate fishery management plan for Atlantic striped bass. (Report No. 34). January 1998.
- Atlantic States Marine Fisheries Commission. 1992. Fishery management plan for inshore stocks of winter flounder. (Report No. 21). May 1992
- National Marine Fisheries Service. 1998. Final Amendment #11 to the Northeast Multi-species Fishery Management Plan; Amendment #9 to the Atlantic sea scallop Fishery Management Plan; Amendment #1 to the monkfish Fishery Management Plan; Amendment #1 to the Atlantic salmon Fishery Management Plan; and Components of the proposed Atlantic herring Fishery Management Plan for Essential Fish Habitat. Volume 1. October 7, 1998.
- National Marine Fisheries Service. 2000. Fishery Management Report No. 36 of the Atlantic States Marine Fisheries Commission: Interstate Fishery Management Plan for American eel (*Anguilla rostrata*). Prepared by the American Eel Plan Development Team. April 2000. 78 pages.
- National Marine Fisheries Service. 1999. Fishery Management Report No. 35 of the Atlantic States Marine Fisheries Commission: Shad and river herring [includes alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), Alabama shad (*Alosa alabamae*), American shad (*Alosa sapidissima*), and Hickory shad (*Alosa mediocris*)] - Amendment 1 to the

Interstate Fishery Management Plan for shad and river herring. April 1999. 77 pages.

- National Marine Fisheries Service. 2000. Technical Addendum 1 to Amendment 1 of the Interstate Fishery Management Plan for shad and river herring. February 9, 2000. 6 pages.
- National Marine Fisheries Service. 1998. Fishery Management Report No. 31 of the Atlantic States Marine Fisheries Commission. Amendment 1 to the Interstate Fishery Management Plan for Atlantic sturgeon (*Acipenser oxyrhynchus*). July 1998. 43 pages.
- U.S. Fish and Wildlife Service. No date. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, D.C. 11 pp.

The NYSDEC April 30 2007 letter recommended that FERC consider the following comprehensive plans as relevant to the RITE Project. These were also considered by Verdant and we do not believe the project is in conflict with any of them:

- Long Island Sound Study Comprehensive Conservation and Management Plan. http://www.lomrislandsoundstudv.net
- Long Island Sound Coastal Management Program. http://www.nvswaterITonts.com/initiatives_1oncisland.asp
- NY/NJ Harbor Estuary Program Comprehensive Conservation and Management Plan. http://www.harborestuarv.org
- NYC Local Waterfront Revitalization Program. http://www.nvswaterfronts.com/aboutus_LWRP.asp
- New York State's Comprehensive Wildlife Conservation Strategy (CWCS). http://www.dec.state.nv.us/website/dfwmr/swg/cwcsmainpg.html
- 2001 Hudson River Estuary Action Plan. http://www.dec.state.nv.us/website/hudson/actionplan2001.pdf

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PILOT LICENSE APPLICATION
ROOSEVELT ISLAND TIDAL ENERGY PROJECT
FERC NO. 12611

EXHIBIT F

DESIGN DRAWINGS
AND SUPPORTING DESIGN REPORT

December 2010

Submitted by:

VERDANT POWER

PILOT LICENSE APPLICATION
ROOSEVELT ISLAND TIDAL ENERGY PROJECT
FERC NO. 12611

EXHIBIT F

DESIGN DRAWINGS AND SUPPORTING DESIGN REPORT

Exhibit F contains drawings of Project works that meet the definition of Critical Energy Infrastructure Information (CEII) pursuant to FERC's June 23, 2003 Order No. 630-A. As a result of security regulations enacted after September 11, 2001, project documents related to the design and safety of dams and appurtenant facilities, and that are necessary to protect national security and public safety ("Critical Energy Infrastructure Information" or "CEII"), are restricted from public distribution or viewing.

As part of the Exhibit F submittal, the FERC requires the Applicant to submit a separate report at the time the application is filed that contains, as a minimum, supporting information to demonstrate that existing and proposed structures are safe and adequate to fulfill their intended function.

PILOT LICENSE APPLICATION

ROOSEVELT ISLAND TIDAL ENERGY PROJECT

FERC NO. 12611

EXHIBIT F

DESIGN DRAWINGS
AND SUPPORTING DESIGN REPORT

December 2010

Submitted by:

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EXHIBIT F

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Exhibit F contains drawings of Project works that meet the definition of Critical Energy Infrastructure Information (CEII) pursuant to FERC's June 23, 2003 Order No. 630-A. As a result of security regulations enacted after September 11, 2001, project documents containing information that may compromise national security and/or public safety ("Critical Energy Infrastructure Information" or "CEII") are restricted from public distribution or viewing. Anyone seeking to view CEII must file a CEII request with FERC. FERC's website, at http://www.ferc.gov/legal/ceii-foia/ceii.asp, contains additional details related to CEII.

PILOT LICENSE APPLICATION
ROOSEVELT ISLAND TIDAL ENERGY PROJECT
FERC NO. 12611

EXHIBIT G

PROJECT BOUNDARY MAP

December 2010

Submitted by:

VERDANT POWER

Transmission Line
Streets, Roads, and Highways
County Line
Rivers
Security Zone
Navigation Channel
Reference Points
Approximate Project Boundary
Project Structures
Proposed Tri-Frame Location
Test Project Area

Reference Point 1
1001050.9938 E
219144.3288 N

Queens
Queens County
New York County

New Jersey
New York
Project Location
New York
LOCUS MAP

Project Boundary
Navigation Channel
(Minimum 21 ft depth from east bank and 140 ft wide)
FLOOD FLOW
EBB FLOW
East River (East Channel)
140 ft (42.6 m)
197 ft (60.0 m)
131 ft (39.9 m)
Tri Frame Cable Run
550' Security Zone (See Note 1)
140 ft (42.6 m)
200 ft (60.9m)
Roosevelt Island Bridge
East Rd

VAULT E
VAULT D 8' (2.4m) x6' (1.8m)
VAULT C 8' (2.4m) x6' (1.8m)
VAULT B
VAULT A 8' (2.4m) x6' (1.8m)
Verdant Bus Line Between Vaults
Existing Storage Container
Buried Transmission Interconnection 2' Project Width
Main St
Verdant Control Room (Existing)
Existing Con Ed Station
River Rd
West Rd
City Park

Roosevelt Island

Proposed Super Vault
Tri Frame Cable Run
8ft (2.4 m)
12ft (3.7 m)
10ft (3.1 m)
10ft (3.1 m)
Verdant Bus Line
Main St.

Proposed Super Vault
Tri Frame Cable Run
8ft (2.4 m)
12ft (3.7 m)
10ft (3.1 m)
10ft (3.1 m)

East River (West Channel)

Reference Point 2
999637.6088 E
220926.6619 N

Reference Point 3
998822.7293 E
217600.2742 N

Manhattan

Magnetic Declination of 13° 9' West
December 2, 2010

Course	Direction	Distance (ft)
1	N32° 54' 30"E	51.6
2	N57° 1' 20"W	19.3
3	N33° 13' 26"E	182.3
4	S56° 23' 42"E	9.6
5	N37° 59' 23"E	46.0
6	N55° 38' 52"W	6.0
7	N34° 21' 8"E	8.0
8	S55° 38' 52"E	6.0
9	N34° 21' 8"E	434.7
10	N55° 38' 52"W	10.0
11	N34° 21' 8"E	4.4
12	N57° 58' 35"W	278.7
13	N29° 50' 3"E	124.7
14	N57° 58' 8"W	194.9
15	N32° 1' 52"E	2.0
16	S57° 58' 8"E	196.8
17	S29° 50' 3"W	124.7
18	S57° 58' 35"E	276.8
19	N34° 21' 8"E	3.6
20	S55° 38' 52"E	2.0
21	N34° 21' 8"E	12.0
22	S55° 38' 52"E	8.0
23	N31° 56' 44"E	198.1
24	N28° 31' 23"E	174.8
25	N60° 37' 43"W	6.0
26	N29° 22' 17"E	8.0
27	S60° 37' 43"E	6.0
28	N28° 42' 29"E	272.1
29	N34° 30' 35"E	160.6
30	N53° 58' 36"W	6.0
31	N36° 1' 24"E	8.0
32	S53° 58' 36"E	6.0
33	N34° 57' 49"E	343.5
34	N47° 24' 31"E	50.5
35	N43° 51' 57"W	10.0
36	N46° 8' 3"E	10.0
37	S43° 51' 57"E	2.0
38	N46° 8' 3"E	12.0
39	S43° 51' 57"E	8.0
40	N48° 55' 6"E	135.1
41	N45° 47' 12"E	164.3
42	N62° 3' 37"E	108.9
43	N56° 38' 23"E	112.5
44	N22° 42' 43"E	148.5
45	N25° 31' 39"E	89.8
46	N35° 19' 7"E	116.6
47	N27° 45' 58"E	140.0
48	N11° 53' 12"E	107.3
49	N5° 53' 55"E	98.4
50	N5° 23' 3"W	96.0
51	N2° 38' 56"W	204.3
52	N89° 3' 20"E	164.9
53	S2° 0' 28"E	280.9
54	S5° 37' 24"E	319.9
55	S27° 28' 11"W	159.4
56	S34° 23' 15"W	127.6
57	S20° 51' 3"W	157.6
58	S29° 12' 3"W	123.9
59	S47° 54' 28"W	144.6
60	S40° 24' 0"W	177.1

Note:

1. USCG Requested 550' of Security Clearance at Bridge. Final Clearance and Location of First Tri-Frame Under Consultation with Verdant.

2. Coordinate system: New York State Plane, Long Island Zone (US FEET), NAD 83.

3. Navigation channel based on NOAA navigation Chart "Tallman Island to Queensboro Bridge" updated June 2008. Depth soundings based on Mean Low Water Elevation.

4. Elevations shown are in feet, USGS Vertical Datum.

250 125 0 250
Feet

VERDANT POWER

EXHIBIT G
SHEET 1 OF 1

ROOSEVELT ISLAND TIDAL ENERGY PROJECT
FERC NO. 12611-NY

PROJECT BOUNDARY MAP

VERDANT POWER LLC
NEW YORK, NEW YORK

Kleinschmidt
Energy & Water Resource Consultants