4. ENVIRONMENTAL CONSEQUENCES OF THE MREC ALTERNATIVES

4.1 INTRODUCTION AND OVERVIEW

NEPA requires the disclosure of environmental impacts associated with the proposed Federal action, other alternatives, and the No Action Alternative. The environmental impact analyses provide the basis for comparing the effects of the alternatives. NEPA requires consideration of context, intensity and duration of impacts, indirect impacts, cumulative impacts, and measures to mitigate for impacts. NPS policy also requires that "impairment" of resources be evaluated in all environmental documents. Chapter 4 describes and analyzes potential environmental effects on the physical, natural and human environment associated with the Preferred Alternative (East Site), the South Site Alternative, the West Site Alternative, and the No Action Alternative. When potential impacts for the three sites (East, South, and West Sites) are similar, impacts are discussed together under the heading *Project Site Alternatives*. Cumulative impacts are discussed in Chapter 6.

4.1.1 Statutory Requirements

Primary laws and guidance documents that guided the development of this EA are:

- NPS Organic Act of 1916 (16U.S.C. 1-4, et seq.) – Created the NPS to promote and regulate the use of national parks, monuments, and reservations, by such means and measures as to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the land in such manner as would leave them unimpaired for the enjoyment of future generations.

- National Historic Preservation Act of 1966 as amended (16 U.S.C. 470) – To protect and preserve historic districts, sites and structures, and archeological, architectural and cultural resources. Section 106 and Section 110 (36 CFR 800), respectively, require consultation with the State Historic Preservation Office and that NPS nominate all eligible resources under its jurisdiction to the National Register of Historic Places.

- National Environmental Policy Act of 1969 – Public Law 91-190 established a broad national policy to improve the relationship between humans and their environment and sets out policies and goals to ensure that environmental considerations are given careful attention and appropriate weight in all decisions of the Federal government. This legislation requires and guides the preparation of this EA.

NPS Regulations and Policies – Actions proposed in this document are subject to the NPS Director's Order #28 (Cultural Resource Management), Director's Order #2 (Park Planning), Director's Order #12 (Conservation Planning, Environmental Impact Analysis, and Decision-making), and Director's Order #77 (Natural Resource Protection). Actions are also subject to the service-wide policy document, Management Policies (2006).

4.1.2 Methods for Evaluating Environmental Effects

The method of analysis of potential effects is based on *Director's Order* #12 Handbook [sec 5.4(f)]. Four categories of effects are considered: direct effects, indirect effects, cumulative effects and impairment. The context, duration, and intensity of the impacts must also be defined. Intensity of effects and thresholds of significance are defined for both beneficial and adverse effects. These are further defined in Section 4.1.2.2.

Where quantitative data were not available, best professional judgment was used to determine impacts. In general, the thresholds used come from existing literature, consultation with subject experts, and appropriate agencies.

To analyze impacts, methods were selected to predict the potential change in park resources that would occur with the implementation of the alternatives. Evaluation factors were established for each impact topic to assess the changes in resource conditions of the alternatives. The study area was defined to include resources within SARI and the region that might reasonably be affected. Because resources vary in function and relation to environmental factors, the study area was defined independently for each impact topic.

4.1.2.1 Impact Categories

The three impact categories used in this chapter are defined below. The fourth impact category is cumulative effects which are defined in Chapter 6.

Direct Effects - Those impacts occurring from the alternative at the same time and in the same place as the action.

Indirect Effects - Those actions caused by the alternative that cause impacts to a resource or condition that occur later in time or farther in distance.

Impairment - The NPS *Management Policies 2006* requires an analysis of potential effects to determine whether or not actions would impair park resources. The primary purpose of the NPS, as established by the Organic Act and reaffirmed by the General Authorities Act, as amended, is to conserve park resources and values. Impacts to park resources and values are allowed when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Impairment is an impact that would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values.

NPS conducted an analysis to determine whether the magnitude of impacts identified for specific impact topics reached the level of "impairment," as defined. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of SARI; key to the natural or cultural integrity of SARI or to opportunities for enjoyment of SARI; or identified as a goal in SARI's general management plan or other relevant NPS planning documents.

- An impact would be less likely to constitute impairment to the extent that it is an unavoidable result, which cannot reasonably be further mitigated, of an action necessary to preserve or restore the integrity of park resources or values.

- Impairment may occur from visitor activities, NPS activities in the course of managing a park, or activities undertaken by concessionaires, contractors, and others operating in SARI.

4.1.2.2 Impact Definitions

Each potential impact is described in terms of its context (site-specific, local, or regional), duration (short-term or long-term), and intensity (negligible, minor, moderate, or major). For the purposes of analysis, the following definitions, unless stated otherwise, are used for all impact topics:

Duration

Short-term impacts: Impacts that might occur in the short-term (1 to 6 months) during construction or after implementation of the MREC.

Long-term impacts: Those impacts occurring from of the implementation of the MREC through the next 10 years.

Intensity

Negligible: Impacts would have no measurable or perceptible changes to the resource.

Minor

Adverse: Impacts would be measurable or perceptible but would be localized within a relatively small area. The overall viability of the resource would not be affected and, if left alone, would recover.

Beneficial: Resource improvement would be perceptible, but barely, and localized within a small area of SARI.

Moderate

Adverse: Impacts would cause a change in the resource; however, the impact would remain localized.

Beneficial: Resource improvements would be measurable, enhancing the viability of the resource within SARI.

Major

Adverse: Impacts to the resource would be substantial, highly noticeable, and permanent.

Beneficial: Resource improvements would be substantial, enhancing the viability of the resource within SARI, the surrounding community, and beyond.

4.2 PHYSICAL FEATURES

This section discusses the impacts of the Preferred Alternative (East Site), the South Site Alternative, the West Site Alternative, and the No Action Alternative on the physical environment, including soils/sediments, bathymetry, air quality, noise, climate/seismicity, and water resources (water quality and hydrology).

4.2.1 Soils/Sediments

Preferred Alternative (East Site) – The construction phase of the MREC (includes the buildings and roads) would have short-term, minor, adverse effects to soils, but these impacts would be localized at the site. During the movement of soil through construction activities, the potential for erosion and sedimentation into nearby stormwater culverts and waterways exists. This potential would be minimized through the use of approved sediment and erosion control measures set in place before construction.

The project would require a seawater supply pipeline to bring reliable, clean, water from the sea to the wet lab and the Education Center for marine research and education activities. The exact location of the pipeline would be dependent on future hydrodynamic and water quality studies. These studies would

determine the best location for the open-ocean intake as well as the location of suitable clean water for the research activities. A potential location for access to clean water for the East Site would be from inside the reef on the extreme northeast side of the site directly out to deep water beyond the coral rubble surf zone. The pipeline then could run parallel to the coastal beach road and over to either the wet lab/boat dock area or up to the main research facility. The 1960 development project installed a pipeline, which exists currently, to provide flushing between the Salt Pond and the Mangrove Lagoon. Re-use of this pipeline may be feasible. General construction methods for the installation of the pipeline would include burying the pipeline below grade on land and tethering the pipeline to the bottom substrate (i.e., sediment, sand, rock) for installation in the lagoon, bay, and sea. Short-term, minor, adverse impacts to the soils and sediments would occur at SARI from the installation of the seawater supply pipeline.

Sediments in Salt River Bay and the Mangrove Lagoon would be disturbed if future bathymetry studies reveal the need for maintenance dredging at the Preferred Alternative (East Site). Maintenance dredging would be required if the bathymetry studies revealed that the water depths were too shallow for research boats to reach the MREC boat docks. The types of vessels needed for the MREC would include one main diving boat (45 ft), two medium-sized vessels (25-45 ft), and four small boats (outboards). These vessels would need to have access to and from the facility boat docks for marine research activities. The areas directly south of the East Site and within the Mangrove Lagoon are the most likely locations for maintenance dredging. Placement of the dredge material would need to be addressed in future studies. Maintenance dredging would result in short-term, minor, adverse effects to the sediments at the East Site due to this activity.

Finally, soils and sediments would be disturbed during construction of a boat ramp and installation of a boat dock and moorings for the Preferred Alternative. A floating boat dock system would be constructed since it minimizes impacts to the sediments. A minor amount of bottom (i.e., lagoon, bay) disturbance would occur during installation of pilings to be used for keeping the floating dock in place. The floating dock would need to accommodate one main diving boat (45 ft), two medium-sized vessels (25-45 ft), and four small boats (outboards). Mooring space would be needed for four to six small boats. Short-term, minor, adverse effects to the soils and sediments would occur from construction of the boat ramp and installation of the boat dock and moorings.

Appropriate agencies (i.e., U.S. Army Corps of Engineers, V.I. Department of Planning and Natural Resources) have been notified on the proposed project to ensure compliance with Federal laws (Sections 401 and 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Appropriation Act). The next step in the compliance process would be agency review of this EA. Finally, applicable permits (10/404 permit) associated with construction in waters of the U.S. would be obtained from the U.S. Army Corps of Engineers following completion of the EA and signing of the FONSI but prior to the start of the installation of the seawater supply pipeline, boat dock, and moorings, construction of the boat ramp, and maintenance dredging.

South Site Alternative – Impacts to soils and sediments as a result of the South Site Alternative are similar to impacts discussed above for the Preferred Alternative (East Site). The construction phase of the MREC (i.e., buildings, boat dock) and the installation of the seawater supply pipeline would have short-term, minor, adverse effects to soils and sediments. Sediments in Salt River Bay have the potential to be disturbed if future bathymetry studies reveal the need for maintenance dredging at the South Site Alternative. Areas directly east and northeast of the South Site Alternative are the most likely locations for maintenance dredging. Maintenance dredging would result in short-term, minor, adverse effects to the sediments. As stated above, appropriate agencies would be consulted and applicable permits would be obtained prior to the initiation of construction activities.

West Site Alternative – Impacts to soils and sediments as a result of the West Site Alternative are similar to impacts discussed above for the Preferred Alternative (East Site) and South Site Alternative. The construction phase of the MREC (i.e., buildings, roads) and the installation of the seawater supply pipeline would have short-term, minor, adverse effects to soils and sediments. Currently boat access is adequate for research boats at the existing marina, however it is anticipated that this would change in the future since the entire bay is progressively filling in with silt. Therefore, maintenance dredging would be required in the future resulting in disturbed sediments in Salt River Bay due to this activity. Maintenance dredging would result in short-term, minor, adverse effects to the sediments. As stated above, appropriate agencies would be consulted and applicable permits would be obtained prior to the initiation of construction activities. Due to the limited number of marinas and boat slips on the island (Salt River Marina is 1 of only 3 functioning marinas), the current Salt River Marina would be allowed to continue to function as a commercial marina. However, the MREC would need to acquire the use of as much as ½ of the existing boat slips that are currently available to the boating community. Some of the current private boats would lose their preferred slips in the marina.

No Action Alternative – SARI would remain in its current use and no action would be taken. There would be no new construction at SARI. The No Action Alternative does not result in environmental impacts to the soils and sediments at SARI. However, if dredging in the Mangrove Lagoon at the East Site does not occur, there is the potential that the mouth of this lagoon would eventually become closed off to the bay due to siltation. This is being currently observed in the Mangrove Canal, located immediately south of the Mangrove Lagoon. The mangrove trees that exist along the shoreline of the Mangrove Canal are being lost, potentially from to the lack of flushing due to siltation that is occurring at the mouth of the canal. There is the possibility that the existing mangrove trees located along the shoreline of the Mangrove Lagoon could be lost as well if dredging does not occur to maintain flushing between the bay and the lagoon.

Conclusion – Construction of the MREC facilities, maintenance dredging, and installation of the seawater supply pipeline, boat dock and/or moorings is expected to create minor adverse impacts to soils and sediments at SARI regardless of the alternative. These construction, installation, and dredging impacts would be short-term in nature, lasting for the duration of the activity. The No Action Alternative would not impact the soil or sediments at SARI. None of the alternatives would cause impairment to park resources.

4.2.2 Bathymetry

Project Site Alternatives – The bathymetry in the bay would be altered if future bathymetry studies reveal the need for maintenance dredging. Impacts to bathymetry would be localized. For the East Site, the areas most likely considered for maintenance dredging include the area directly south of the East Site and along the south side of peninsula and narrow entrance into the Mangrove Lagoon. For the South Site, maintenance dredging would include the area directly east and northeast of the South Site. For the West Site, maintenance dredging would include the existing dredged channel in the bay and areas within the marina. Water depths are expected to increase in Salt River Bay resulting in long term minor impacts to the bathymetry of SARI from maintenance dredging activities.

No Action Alternative – The No Action Alternative does not result in any alteration to the bathymetry at SARI. There would be no change in water depths at SARI.

Conclusion – The bathymetry in Salt River Bay has the potential to be altered if future bathymetry studies reveal the need for maintenance dredging regardless of the alternative. Long term minor impacts to the bathymetry of SARI would occur due to maintenance dredging. The No Action Alternative would not alter the bathymetry at SARI. None of the alternatives would cause impairment to park resources.

4.2.3 Air Quality

Project Site Alternatives – Negligible, long-term, adverse impacts to air quality may occur from stationary sources regardless of the alternative. Potential stationary sources include emergency generators. Water is proposed to be heated by solar power. Mobile sources (ground support equipment, vehicles, and boats) would have a minor, long-term, adverse impact. The Virgin Islands has insignificant regional air quality impacts and is in conformity with the NAAQS. It is also in attainment with USEPA for all six air quality criteria pollutants.

During the short-term construction phase of implementing the MREC, the operation of construction equipment would generate some criteria pollutant emissions, including carbon monoxide, nitrogen oxides, and particulate matter (PM). However, these emissions would be minimal since the proposed construction activities are temporary. Short-term fugitive dust emissions would be generated primarily due to land-disturbing activities to remove the vegetation and install new parking areas and roads. The amount of PM_{10} should not be expected to be high due to the short duration and can be mitigated by using control techniques such as wet suppression and truck bed covers for construction vehicles hauling soil. Overall, the construction phase of the MREC facility is expected to create minor adverse impacts. These impacts would be short-term in nature, lasting only for the duration of construction activities.

No Action Alternative – Under the No Action Alternative, the site would remain in its current use, which does not emit substantial quantities of air pollutants.

Conclusion – Negligible, long-term, adverse impacts to air quality may occur from stationary sources (i.e., emergency generators) and minor, long-term, adverse impacts to air quality would occur from mobile sources (ground support equipment, vehicles, and boats). Minor, short-term, adverse impacts to air quality from the additional emissions created during the construction phase of the project would also occur. Under the No Action Alternative, the site would remain in its current use, which does not emit substantial quantities of air pollutants. None of the alternatives would cause impairment to park resources.

4.2.4 Noise/Light

4.2.4.1 Noise

Project Site Alternatives – The construction phase of the project is expected to create short-term, adverse, minor impacts to noise at the site regardless of the alternative. These impacts would be short-term in nature, lasting for the duration of construction activities and would temporarily impact visitor experience at SARI. Noise is expected, but noise impacts would be temporary and localized at the vicinity of the construction site and would not disrupt the surrounding area. Day-time construction only would occur; no nighttime construction is currently anticipated. Short-term sources of noise associated with all three project alternatives includes the clearing of vegetation from the site, construction of the MREC buildings, construction of the boat dock, and maintenance dredging activities. Construction on and closest to the water has the most potential to create short-term disturbances, due to noise, since sound can be heard over water at greater distances than sound can be heard over land. Short-term, temporary impacts from noise and construction activities may cause existing avian and other wildlife species to avoid areas in close proximity to the construction, including both terrestrial and aquatic habitats, but these effects would diminish after construction is completed. In addition, time-of-year (TOY) restrictions required for wildlife species (specifically, the least tern nesting season) would be adhered to throughout the duration of the project. TOY restrictions would be developed in coordination with appropriate Federal and Territorial agencies, including NMFS, USFWS, and USVI DPNR.

The potentially increased effects of noise would be associated with recreational boaters for all three sites. Long-term sources of noise would be associated with the ongoing human activities from the daily activities at the MREC facility. Noise associated with the use of the facility may increase relative to current levels from standard building features (i.e., generators), additional vehicle traffic, and the operation of boats. The park is planning to control current un-authorized recreation activities, such as the use of off-road vehicles (ORVs) and all-terrain vehicles (ATVs) at the Preferred Alternative (East Site) with limited use. Although temporary noise impacts are anticipated during construction activities, construction noise typically occurs along the shoreline of the north-central portion of St. Croix when new parcels of land are developed. Therefore, recreational boaters in the vicinity should be somewhat accustomed to noise on the water.

Maintenance dredging would result in temporary minor noise impacts to the local community surrounding the site during the dredging activity. Additionally, noise impacts may occur from hauling dredged material off-site or placement of dredged material on-site.

No Action Alternative – Current noise sources in SARI would not change since the site would remain in its current use under the No Action Alternative. The current noise sources are predominantly the result of ongoing human activities (i.e., vehicles, boat operation at the marina, activities at the NPS Visitor Center).

Conclusion – Implementation of the MREC would produce short-term, minor, adverse noise effects during the construction phase of the project regardless of the alternative. Maintenance dredging activities would also result in short-term, minor, adverse noise effects to the surrounding local community. Current noise sources in SARI would not change since the site would remain in its current use under the No Action Alternative. None of the alternatives would cause impairment to park resources.

4.2.4.2 Light

Project Site Alternatives – The construction phase of the project is not expected to create light impacts at the park since no nighttime construction is currently anticipated. Long-term sources of light would be associated with the nighttime human activities at the MREC facility. Light associated with the use of the MREC facility may increase relative to current levels; however, nighttime lighting would be at low levels and would not include any bright intrusive lights.

No Action Alternative – Current light sources in SARI would not change since the site would remain in its current use under the No Action Alternative. The current light sources are predominantly the result of ongoing human activities (i.e., vehicles on local roadways, nearby residences).

Conclusion – Implementation of the MREC would produce negligible long-term, adverse light effects to the surrounding local community. Current light sources in SARI would not change under the No Action Alternative. None of the alternatives would cause impairment to park resources.

4.2.5 Climate/Seismicity

4.2.5.1 Climate

Project Site Alternatives – Impacts from coastal storms to the proposed MREC facility are anticipated at SARI. The U.S. Virgin Islands faces a serious threat from hurricanes and other coastal storms, and the resulting shoreline flooding and water surges (IRF 1993). Although Salt River Bay is considered to be a "hurricane hole" for boats seeking refuge from a tropical storm, Hurricane Hugo demonstrated that the

area is not safe during a storm of that magnitude (IRF 1993). The siting of a facility along the coast increases a cumulative threat potential with respect to three types of coastal storm impacts: (1) threats to public health, safety, and welfare; (2) costs for disaster relief and protection; and (3) losses of irreplaceable natural resources. Implementing strict building standards to achieve increased wind and/or flooding resistance during the design phase of the project would minimize damage from coastal storms.

No Action Alternative – Under the No Action Alternative, the MREC would not be built at SARI. Mitigation for coastal storm hazards for the MREC would not be necessary.

Conclusion – Impacts from coastal storms to the proposed MREC facility are anticipated at SARI. Implementing strict building standards to achieve increased wind and/or flooding resistance would minimize damage from coastal storms. Under the No Action Alternative, mitigation for coastal storm hazards for the MREC would not be necessary.

4.2.5.2 Seismicity

Project Site Alternatives – The Virgin Islands are located near the northeastern corner of the Caribbean Plate and as such are highly susceptible to earthquakes and seismic hazards (IRF (1993). Earthquake potential at St. Croix is relatively high. Site-specific vulnerability to earthquake damages would depend upon localized construction practices, and soil and geologic conditions. Although earthquakes are not frequent they have resulted in major damage and loss of life in the region, and they tend to be severe when they do occur. Waterfront areas that have undergone construction on filled (reclaimed land) land would be avoided for construction of the MREC facilities since this land is vulnerable to impacts from earthquakes. Reclaimed land includes the peninsula between the East Cove and the Mangrove Lagoon located in the East Site.

Mitigation for earthquakes at the MREC would include minimizing injury and damage from seismic activity by constructing earthquake-resistant structures by enforcing strict building standards (i.e., insulated steel-enforced concrete walls, stronger windows and doors).

No Action Alternative – Under the No Action Alternative, the MREC would not be built at SARI. However, SARI should avoid future construction of buildings on reclaimed land.

Conclusion – Waterfront areas that have undergone construction on filled (reclaimed land) land would be avoided for construction of the MREC facilities since this land is vulnerable to impacts from earthquakes. Reclaimed land includes the peninsula between the East Cove and the Mangrove Lagoon located in the East Site.

4.2.6 Water Resources

4.2.6.1 Water Quality

Preferred Alternative (East Site) – The construction phase of the MREC (includes the buildings and roads) would have short-term, minor, adverse effects to water quality. These impacts would result from potential sediment runoff into nearby waterways during the clearing of vegetation and construction and grading activities. These activities may result in increases in sediment input and turbidity in the bay. Because disturbed soils are susceptible to erosion until revegetation takes place, standard sediment and erosion control measures, best management practices (BMPs) would be used to minimize potential soil erosion and minimize impacts to Salt River Bay. A Stormwater Pollution Prevention Plan (SWPPP) would be required and implemented prior to, during, and following ground-disturbing activities. Contractors would also be required to prepare an Erosion Control Plan that requires a description of

specific erosion and sediment control measures that would be implemented. With these restrictions and controls in place, no long-term adverse effects to water quality would be expected as a result of the project. TMDLs for DO exist for Salt River, due to low oxygen levels. This project is not expected to exacerbate the existing DO levels in the Bay.

The operational phase of the MREC would result in new impervious surface area (i.e., buildings, roads) which has the potential to increase runoff from the site into the bay. The use of semi-pervious surfaces (i.e., gravel and grass parking areas) would be used wherever possible to minimize the creation of impervious surfaces areas. The gravel and grass parking areas would be landscaped with native plants to control stormwater runoff toward the bay. Implementing these stormwater management techniques in the design phase of the project would minimize additional impacts to current surface water quality in the area by controlling stormwater runoff from the newly developed areas. Impermeable paved roads at the MREC would be minimized. Permeable paved surfaces allow limited percolation of precipitation and would be used wherever possible. However, some impermeable paved surfaces may be needed for the roads associated with the MREC due to higher load and traffic requirements. Sanitary waste from the MREC as well as seawater discharge from research activities would be contained on-site in appropriate holding tanks that would routinely be pumped and hauled to St. Croix's Waste Water Treatment Plant. If feasible, another waste treatment alternative for the MREC would include composting toilets located in low-lying buildings such as the marine facilities and wet labs as well as a waste treatment greenhouse. This state-of-the-art sewage treatment system would assure minimum contamination of the bay and its surrounding area. A roofed-over concrete containment bunker would be built around storage tanks for fuel and other potentially polluting liquids to reduce contamination from these substances into the bay. The operation of motorized watercraft associated with the MREC would also affect water quality through the introduction of chemicals and oils into the water via engine exhaust or during maintenance and fueling though drips and spills. Overall, the impacts to water quality from the operational phase of the MREC would be expected to be minor, adverse, and long-term.

Minor impacts to the water quality at SARI would occur as a result of the seawater supply pipeline installation. The impacts would be primarily an increase in the turbidity of the bay/sea from the activities associated with the installation of the pipeline (i.e., tethering, placement of pipe) in the bay. This effect would be minor, adverse, and temporary and would dissipate quickly after the installation ceases and suspended sediments resettle.

Maintenance dredging activities would create short-term, adverse minor impacts to the water quality of Salt River Bay and the Mangrove Lagoon. The impacts would be primarily an increase in the turbidity of the bay and lagoon from the dredging activities. This effect would be temporary and would dissipate quickly after the dredging ceases and suspended sediments resettle. Increases in turbidity of Salt River Bay have the potential to impact the existing seagrasses that currently inhabit the shallow-water areas of the bay, the fisheries resources in the bay, the surrounding mangrove wetlands, and other aquatic wildlife (such as sea turtles). To mitigate for impacts due to turbidity, a silt curtain placed during dredging activities would be required. In addition, TOY restrictions required by Federal and Territorial agencies would be strictly adhered to, thus reducing water quality impacts on the aquatic species that utilize areas in close proximity to project activities. In the long term, water quality in the Mangrove Lagoon has the potential to improve from being dredged. Maintenance dredging would provide improved flushing of the lagoon which would improve water quality in the lagoon as well as providing a benefit to the mangroves.

Finally, construction of a boat ramp, boat dock, and moorings would be required at this site. Minor, adverse effects on water quality would occur during the installation of moorings and for the pilings to be used for keeping the floating dock in place; however, a minor amount of lagoon bottom disturbance would occur, and measures would be taken to minimize turbidity and sedimentation. The impact would be both short-term and temporary and would dissipate quickly after the construction has ended and

suspended sediments resettle. To minimize effects on water quality, erosion and sediment control measures, in accordance with state regulations, would be implemented during construction. Constructing the dock on site and floating it into its designated location would minimize effects on water quality.

South Site Alternative – Impacts to water quality as a result of the South Site Alternative would be similar to impacts discussed above for the Preferred Alternative (East Site). Temporary and minor adverse impacts to the water quality at SARI would occur during the construction phase of the MREC, the installation of the seawater supply pipeline, maintenance dredging, and the construction of a boat ramp/boat dock/moorings. Long-term, minor, adverse impacts to the water quality would occur during the operational phase of the MREC.

West Site Alternative – The West Site Alternative would have impacts similar to the Preferred Alternative as discussed above, although no boat ramp or boat slip would be required at this site. Existing roads at the West Site would be utilized since they are currently composed of a permeable paved road surface (sand and gravel). Temporary and minor adverse impacts to the water quality at SARI would occur during the construction phase of the MREC, the installation of the seawater supply pipeline, and maintenance dredging. Long-term, minor, adverse impacts to the water quality would occur during the operational phase of the MREC.

No Action Alternative – The MREC would not be implemented under the No Action Alternative. This alternative would not create any disturbance to the water and, therefore, would result in no impact or impairment to water quality.

Conclusion – The operational phase of the MREC would potentially cause minor, long term, adverse effects to the water quality in the bay. Construction of the MREC facilities, installation of the seawater supply pipeline, construction of the boat dock and/or ramp/moorings, and maintenance dredging are expected to create minor short term adverse impacts to the water quality at SARI regardless of the alternative. However, dredging of the Mangrove Lagoon at the East Site would flush the lagoon which could potentially improve the water quality long term in the lagoon as well as providing a long term benefit to the mangroves located in the lagoon. The No Action Alternative would not impact the water quality at SARI. None of the alternatives would cause impairment to park resources.

4.2.6.2 Hydrology

Project Site Alternatives – The construction phase of the MREC would have similar impacts to hydrology at SARI regardless of the alternative. Long-term, minor adverse effects to the Salt River Bay watershed drainage would occur due to wetland impacts at the East and South Site locations (as discussed in detail in Section 4.3.4) and increasing the impervious surface areas associated with the MREC facilities at all alternative locations. Construction of the MREC facilities would require clearing of forest (semi-deciduous), shrubs, and vegetated field habitats. The clearing of vegetation and increasing impervious areas would have a long-term, minor impact on hydrology. However, where possible and practical, new road surfaces would be semi -permeable. Revegetating and stabilizing the area at the end of the construction period and implementing stormwater control techniques would minimize the impacts to hydrology. If applicable, water collected on impervious surfaces would be collected through drainage channels that would flow into gray water catchments basins for use on landscape. This would reduce impacts to the mangrove area from storm drainage and provide additional water for use at the MREC.

The Salt River Bay is characterized as tidal waters, so flow coming from land would be flushed out daily. The MREC would need to withdraw clean seawater from the sea to maintain a flow-through ambient seawater system for research activities, regardless of the site alternative. The seawater supply system (pipeline, storage tanks and pipeline connecting the tanks to the Wet Lab and the MREC) would take in

an amount of water, most likely at high tide, to fill the tanks when the system is set up. From that point forward, through the operation of the MREC and the tests undertaken with the seawater both within the MREC and the Wet Lab, any additional ocean water taken in would be dependent upon the amount used in testing. On many days, this amount would be negligible. On days with more active use of the testing facilities, the amount would vary but is not likely to be significant. Therefore, impacts to hydrology in the sea from seawater withdrawal would be negligible.

No Action Alternative – Under the No Action Alternative, the site would remain in its current use, which would not change or impact the hydrology and drainage at SARI.

Conclusion – Construction of the boat dock and boat ramp would impact wetlands at the East and South Sites and the clearing of vegetation for the MREC facilities would increase impervious areas at each alternative, which is expected to create minor, adverse long-term effects to the hydrology at SARI. Wetland and vegetation resources are discussed in detail in Section 4.3.4 and 4.4.1, respectively. The No Action Alternative would not impact the hydrology at SARI. None of the alternatives would cause impairment to park resources.

4.3 FLOODPLAINS, COASTAL ZONE, COASTAL BARRIER RESOURCES SYSTEM AREAS, AND WETLANDS

4.3.1 Floodplains

Preferred Alternative (East Site) – The 100-year floodplain, as mapped by FEMA in 2007, is located within the site boundary (Figure 4-1). NPS has adopted guidelines pursuant to Executive Order 11998 stating that it is NPS policy to restore and preserve natural floodplain values and avoid environmental impacts associated with the occupation and modification of floodplains. Water-dependent structures including the boat dock and wet lab would be located in the 100-year floodplain resulting in minor, adverse, long-term alterations to the floodplain. These water-dependent structures would impact approximately 1 acre of the floodplain. A floating boat dock system would be constructed since it minimizes impacts to the floodplain. Additionally, the Wet Lab would be constructed on pilings above the flood zone so as to not impede the function of the floodplain. Non-water dependent buildings associated with the MREC were purposely placed outside of the floodplain to avoid impacts to the floodplain. Only those facilities that are water-dependent were placed in the floodplain because no other practical alternative was available.

The seawater supply pipeline, which is water-dependent, would also be located within the 100-year floodplain. Impacts to the floodplain would not be expected since the pipeline would be located below grade. The pipeline would not interfere with the function of the floodplain.

South Site Alternative – Impacts to the floodplain as a result of the South Site Alternative are similar to impacts discussed above for the Preferred Alternative (East Site) (Figure 4-1).

West Site Alternative – Impacts to the floodplain as a result of the West Site Alternative are similar to impacts discussed above for the Preferred Alternative (East Site) (Figure 4-1).

No Action Alternative – No development or alteration of the floodplains within SARI would occur with the No Action Alternative. The site would remain in its current use; therefore, there would be no impact to floodplains at the site.

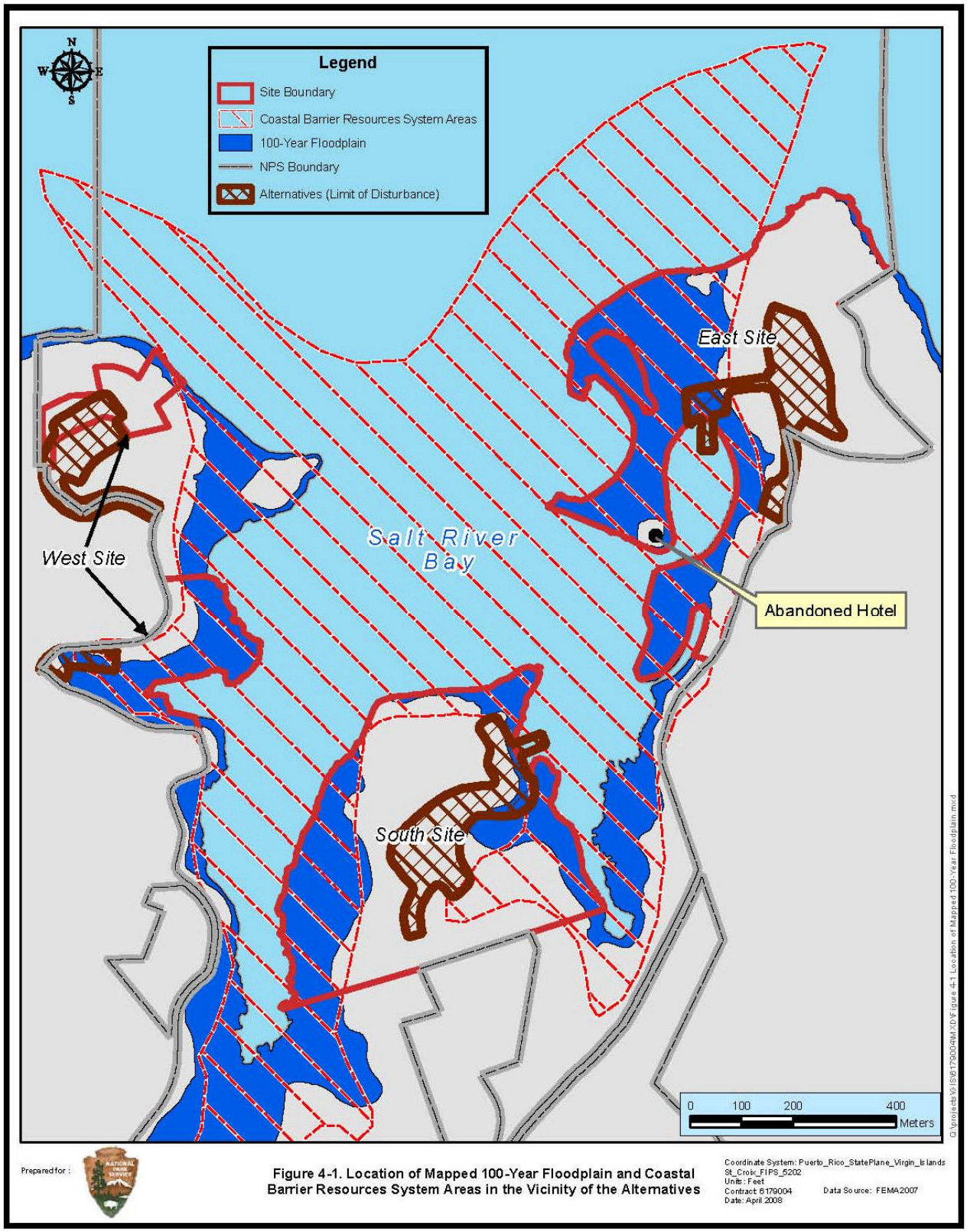

Figure 4-1. Location of Mapped 100-Year Floodplain and Coastal Barrier Resources System Areas in the Vicinity of the Alternatives

Conclusion – Minor, adverse, long-term impacts to floodplains would occur due to proposed activities associated with the Preferred Alternative (East Site), the South Site Alternative, and the West Site Alternative relating to the construction of water-dependent structures (i.e., boat dock, wet lab, seawater supply pipeline), which would be located in the 100-yr floodplain. No development or alteration of the floodplains within SARI would occur with the No Action Alternative. Due to floodplain impacts, a Statement of Findings for floodplains is required and is included as Appendix D. None of the alternatives would cause impairment to park resources.

4.3.2 Coastal Zone

Project Site Alternatives – All three sites are located within Tier 1 of the coastal zone, as defined by the VICZMP. Short-term, minor impacts to the coastal zone are anticipated. Activities proposed within the coastal zone by a Federal agency, such as the NPS, require a certification of consistency. A certification of consistency is supported by necessary data and information that a proposed activity or development complies with the VICZMP and that such activity shall be conducted in a manner consistent with the program. A Federal consistency is the review of Federal projects for consistency with State coastal policies. The term "Federal consistency" refers to the review process mandated by Section 307 of the CZMA, and NOAA regulations (15 CFR Part 930). The CZMA requires that Federal actions, which are reasonably likely to affect land or water use, or natural resource of a Territory's coastal zone, be conducted in a manner that is consistent with the federally approved Coastal Zone Management Program. The Federal consistency review is based on the enforceable policies of the VICZMP. The USVI DPNR is the principal agency requiring permit applications for construction activities in the coastal zone and comments on Federal permit applications to ensure consistency with the CZMP.

The NPS would be consistent to the extent practicable for the proposed project to be in compliance with the VICZMP. The NPS has determined that the project is in compliance with the VICZMP and will request concurrence from the VICZMP to ensure compliance between the Federal and Territorial coastal zone management programs. To comply with the VICZMP, the NPS initiated preliminary consultation with the Division in the form of a scoping meeting to discuss the proposed project. The preliminary meeting occurred on August 21, 2006 and a list of attendees is presented in Appendix C. The NPS would prepare a consistency determination in the form of a letter stating that the project is consistent, to the maximum extent practicable with the VICZMP. This letter would be prepared after completion of this EA and the signing of the FONSI but prior to construction. The VICZMP would review the consistency determination and determine if the project is in compliance with the VICZMP. If the project is in compliance, a notice of agreement would be provided by the VICZMP, thus completing all relevant CZM requirements.

No Action Alternative – Under the No Action Alternative, no impacts to the coastal zone would occur.

Conclusion – Short-term, minor adverse impacts to the coastal zone are anticipated. However, the project is expected to be consistent, to the maximum extent practicable with the VICZMP. The NPS would prepare a consistency determination in the form of a letter stating that the project is consistent, to the maximum extent practicable with the VICZMP. None of the alternatives would cause impairment to park resources.

4.3.3 Coastal Barrier Resources System Areas

Coastal barriers are unique landforms that serve as a protective barrier against the forces of wind and tidal actions caused by coastal storms. They are protected by the Coastal Barrier Resources Act (CBRA) and the Coastal Barrier Improvement Act (CBIA) which defined and established a system of protected coastal areas known as the Coastal Barrier Resources System (CBRS) Areas. CBRS areas, as mapped by FEMA

in 2007, are shown on Figure 4-1. Exceptions for certain activities, such as fish and wildlife research, are provided, and National Wildlife Refuges and other, otherwise protected areas are excluded from the CBRS areas.

Preferred Alternative (East Site) – Water-dependent structures including the boat ramp and Wet Lab would be located in the CBRS area resulting in minor, adverse, long-term alterations to this resource (Figure 4-1). The Wet Lab would be constructed on pilings so as to not impede the function of the CBRS area. Non water dependent buildings associated with the MREC were purposely placed outside of the CBRS area to avoid impacts to this resource. Only those facilities that are water-dependent were placed in the CBRS area because no other practical alternative was available.

It is possible that the seawater supply pipeline would be located within a CBRS area. Impacts would not be expected since the pipeline would be located below grade. The pipeline would not interfere with the function of the CBRS area.

South Site Alternative – Impacts to the CBRS area as a result of the South Site Alternative are similar to impacts discussed above for the Preferred Alternative (East Site) (Figure 4-1).

West Site Alternative – Impacts to the CBRS area as a result of the West Site Alternative are similar to impacts discussed above for the Preferred Alternative (East Site) (Figure 4-1).

No Action Alternative – Under the No Action Alternative, the shoreline at SARI would remain the same. The No Action Alternative would not impact the CBRS area.

Conclusion – Placement of the Wet Lab is expected to create negligible to minor, adverse long-term impacts to CBRS areas at the East, South, and West Sites. However, exceptions for certain activities, such as fish and wildlife research, are provided in the CBRS area. The No Action Alternative would not impact the CBRS areas. None of the alternatives would cause impairment to park resources.

4.3.4 Wetlands/Mangroves

The wetland areas within SARI are composed of mangrove swamps, salt ponds, estuarine wetlands, and shoreline/coastal wetlands. Based upon both the NPS and Federal definition of wetlands, construction at all three sites would impact wetland areas, including areas designated as mangrove wetlands. The NPS defines wetlands as areas with at least one of the three wetland indicators (wetland hydrology, hydric soil, or hydrophytic vegetation) as described in USACE 1987; the USACE defines wetlands as areas with all three wetlands indicators as described in USACE 1987. This section discusses impacts to all wetland types, including impacts to mangrove wetlands.

Both Federal and Territorial laws protect wetlands in St. Croix. Section 404 of the Clean Water Act establishes a Federal program to regulate the discharge of dredge and fill material in waters on the United States, including wetlands. The Virgin Islands wetlands are covered by the *Endangered and Indigenous Species Act of 1990* (Title 12, Chapter 2) and paragraph 906, *Coastal Zone Management*. The USVI DPNR/DEP works closely with the USEPA, the USFWS and USVI DPNR/DFW, the University of Virgin Islands and other agencies to protect wetlands. Federal Executive Order 11990 – Protection of Wetlands, directs all Federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. In the absence of such alternatives, parks must modify actions to preserve and enhance wetland values and minimize degradation. The NPS *Director's Order* #77-1 (Wetland Protection) states that for new actions where impacts to wetlands cannot be avoided, proposals must include plans for compensatory mitigation that

restore wetlands on NPS lands where possible at a minimum acreage ratio of 1:1. A Statement of Findings (SOF) for wetlands was completed, which includes appropriate mitigation measures for wetlands (see Appendix D). The SOF documenting compliance with *Director's Order* #77-1 and *Procedural Manual 77-1* would be attached to the FONSI for this EA. The paragraphs below discuss the wetland impacts for each Alternative. A figure depicting the impacts to mangrove wetlands for all three sites is included as Figure 4-2.

Applicable permits associated with wetlands would be acquired, potentially including a Section 404 Permit, prior to construction activities to ensure compliance with both Federal and Territory laws (i.e., CWA Sections 401 and 404). In addition, the appropriate agencies, including the USACE and USVI DPNR, would be notified and consulted with prior to permit submittal or construction activities to ensure compliance with the CWA. This discussion does not include impacts to submerged lands based upon impacts from proposed maintenance dredging activities. It is currently unknown if maintenance dredging would be required, exactly where dredging would occur, and how large of an area would be dredged/impacted. If future studies reveal that current water depths are too shallow for appropriately-sized MREC boats to access the sites, then the areas directly south of the East Site and within the Mangrove Lagoon, directly east and northeast of the South Site, and in and around the marina at the West Site are the most likely locations for maintenance dredging. The placement of dredged material would be addressed in future studies. The impacts associated with dredging and installation of the seawater supply pipeline and associated impacts would be analyzed in detail if a Section 10/404 Permit application and other permits or assessments are required. Appropriate coordination and consultation concerning the future dredging would occur following the completion of the EA and signing of the FONSI. Depending on the final design location of the seawater supply pipeline to bring salt water from the sea to the MREC facility, mangrove wetlands may be impacted by this pipeline as well for all three alternatives. Mangroves would be avoided to the maximum extent possible, when designing the location of this pipeline. However, there is the potential, depending on the exact pipeline route chosen for each alternative, for minor impacts to wetlands to occur at SARI regardless of the alternative from the installation of the pipeline.

Preferred Alternative (East Site) **–** Approximately 0.03 acres of Federally-defined (and NPS-defined) mangrove wetlands (Wetland W-1) would be impacted as a result of constructing the boat dock and launch, and approximately 0.66 acres of an NPS-defined estuarine wetland (Wetland W-5) would be impacted by the wet lab and associated roads/facilities, located on the northern shoreline of the Mangrove Lagoon. A maximum of approximately 0.38 acres of open water would be impacted in the Mangrove Lagoon from the construction of the boat dock; this is a conservative estimate based upon the footprint from conceptual drawings, even though piers (which would decrease the footprint) would be used in the final design document for the boat dock. Therefore, approximately 1.07 total acres of NPS-defined wetlands would be impacted by the MREC and associated structures, including the boat dock. Due to these impacts, a SOF for wetlands was completed, which includes appropriate mitigation measures for wetlands (see Appendix D). Figure 7 included in the SOF shows the location of wetlands impacted as a result of the Preferred Alternative and is included in Appendix D. The SOF also includes a wetland mitigation plan for the Preferred Alternative that is two-fold: 1.) a mangrove wetland mitigation plan and 2.) an estuarine wetland mitigation plan proposed to compensate for the impacts associated with both the construction of the MREC. The paragraphs below summarize the proposed mitigation.

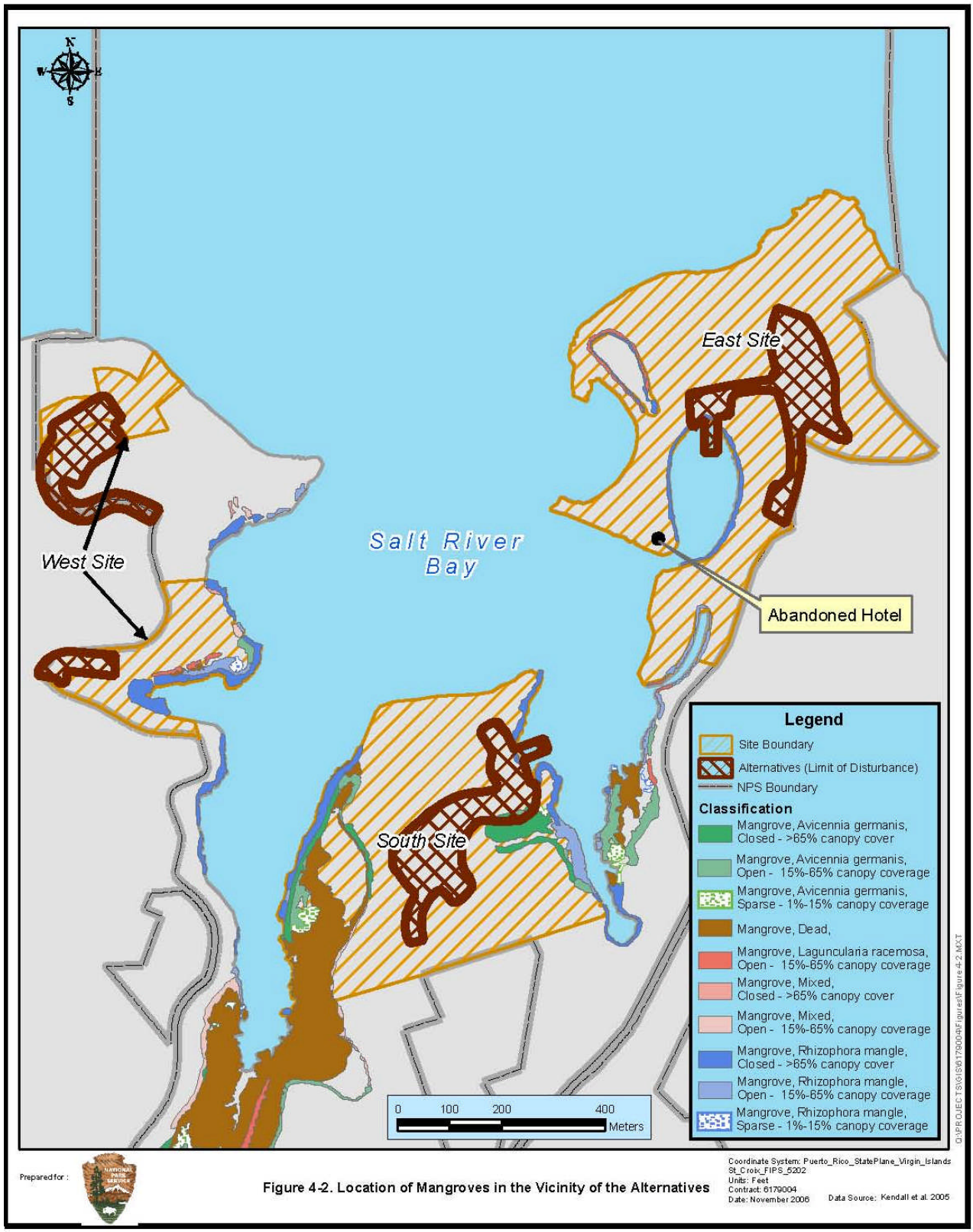

Figure 4-2. Location of Mangroves in the Vicinity of the Alternatives

Based upon positive results from past mangrove restoration efforts in Salt River Bay, mangrove revegetation/enhancement along the shoreline of the Mangrove Lagoon is the mitigation strategy to partially offset the 0.03 acres of mangrove impacts at Wetland W-1 associated with the Preferred Action (East Site). The specific ratio of mangrove revegetation was discussed with the USACE and was determined to be a 3:1 ratio (see Appendix C of the Environmental Assessment for phone conversation with the USACE). For each mature mangrove plant removed as a result of the boat dock, three mangrove seedlings would be planted as mitigation. The compensation proposal for the additional 1.04 acres of estuarine emergent / scrub shrub wetlands (excluding mangrove wetlands) and open water as a result of the MREC construction is wetland mitigation through wetland vegetation plantings and site rehabilitation on the peninsula at the East Site at a 1:1 ratio. However, because the entire peninsula would be rehabilitated and is approximately 7 acres, a ratio above 1:1 may be achieved at this site. This mitigation site is envisioned as a rehabilitated peninsula with groupings of mature wetland shrubs (and some trees) that were flagged and avoided during construction activities, a shoreline stabilized with herbaceous wetland forbs and ground covers, and more interior (inland) areas of sparse wetland vegetation that would attract and support least tern nesting.

Wetland impacts were minimized by placing the wet lab and boat dock on piers to raise the structure above the wetland areas. Wetland W-5 currently is not vegetated due to unrestricted visitor access and is functioning poorly as a wetland. The restriction of visitor vehicular access in the vicinity of Wetland W-5 (mudflats fringing the Mangrove Lagoon behind the existing mangrove vegetation) may be authorized to promote the natural re-growth of wetland vegetation in this area. It is expected that if left fallow, wetland vegetation would recolonize in this location; the area would then constitute additional wetland acreage enhanced at the site, potentially achieving above the minimum 1:1 ratio of mitigation. Based upon the mitigation strategy, short-term, adverse impacts to the mangrove wetlands and estuarine wetlands are expected to be minor. A long-term, minor, beneficial impact of revegetating the historically decimated shoreline of the Mangrove Lagoon with mangroves and the rehabilitation of the peninsula at the East Site is anticipated.

South Site Alternative – Minor, adverse impacts to mangrove wetlands are anticipated as a result of the South Site Alternative. On the eastern side of the South Site, a mangrove wetland is located along the shoreline. Approximately 0.04 acres of mangrove wetlands would be impacted as a result of constructing the boat dock and launch. Because a wetland assessment has not occurred at this site due to access restrictions, it is unknown if additional wetlands would be impacted as a result of the South Site Alternative. As stated previously for the Preferred Alternative (East Site), the appropriate Federal and Territorial agencies would be consulted with and required permits would be obtained prior to the initiation of construction activities.

West Site Alternative – No impacts to mangrove wetlands are anticipated with the West Site Alternative. The current boat ramp and slips at the marina would be utilized and the Wet Lab and Maintenance Building would be located to the west of the existing mangrove wetlands (Figure 4-2). Even though a wetland assessment has not occurred at the marina due to access restrictions, it is anticipated that no impacts to mangrove wetlands would result from the construction of these structures. There is no documentation of wetlands occurring at the Visitor Contact Station; therefore, no impacts to wetlands are anticipated at the Visitor Contact Station.

No Action Alternative – Under the No Action Alternative, SARI would remain in its current use and no action would be taken. There would be no new construction or maintenance dredging at SARI. The benefits of mangrove restoration at Wetland W-1 and the rehabilitation of the peninsula associated with the estuarine wetland impacts described for the Preferred Alternative (East Site) would not occur under the No Action Alternative. No impacts to wetlands are anticipated as a result of the No Action Alternative. However, if dredging in the Mangrove Lagoon at the East Site does not occur, there is the

potential that the mouth of this lagoon would eventually become closed off to the bay due to siltation. This is being currently observed in the Mangrove Canal, located immediately south of the Mangrove Lagoon. The mangrove trees that exist along the shoreline of the Mangrove Canal are being lost, potentially from to the lack of flushing due to siltation that is occurring at the mouth of the canal. There is the possibility that the existing mangrove trees located along the shoreline of the Mangrove Lagoon could be lost as well if dredging does not occur to maintain flushing between the bay and the lagoon.

Conclusion – Short-term, minor, adverse impacts to mangroves are anticipated with both the Preferred Alternative (East Site) and the South Site Alternative. Additional short-term minor adverse impacts to NPS-defined wetlands are also anticipated from the Preferred Alternative (East Site). The Preferred Alternative (East Site) impacts approximately 0.03 acres of mangrove wetlands and approximately 1.04 acres of estuarine wetlands (totaling 1.07 acres, including Federally- and NPS-defined wetlands) and the South Site Alternative impacts approximately 0.04 acres (includes Federally-defined wetlands only) of mangrove wetlands. As a result of the NPS-defined wetlands impacted by the proposed MREC and associated structures including a new boat dock, a SOF for wetlands was prepared and is included in Appendix D. The wetland mitigation plan included in the SOF would offset the majority of proposed wetland impacts. As a result of the Federal (USACE) mangrove wetlands impacted by the proposed MREC and associated structures including a new boat dock, and maintenance dredging activities, a Section 10/404 Permit would be required, and therefore, a *Joint Application for Environmental Resource Permit/Authorization to use State Owned Submerged Lands/Federal Dredge and Fill Permit* would be completed and submitted to both USACE and the USVI DPNR. The permits would be received prior to the initiation of construction or dredging activities. The exact acreage of wetlands impacted and a detailed mitigation plan (the same mangrove mitigation that is proposed in the SOF, Appendix D) for the loss of Federal mangrove wetlands would be included in the joint application as a requirement of the Section 10/404 Permit. No impacts to wetlands are anticipated as a result of the No Action Alternative. None of the alternatives would cause impairment to park resources.

4.4 TERRESTRIAL RESOURCES

4.4.1 Plants

Impacts to terrestrial vegetation are expected from implementation of the MREC facility for all three sites. During the construction phase, the loss of forest (semi-deciduous), shrubs, and vegetated field habitat would occur. The loss of vegetated habitat by the MREC would be partially mitigated by revegetating and stabilizing the MREC area at the end of the construction period with appropriate vegetative species. This would be addressed in a landscaping plan for the MREC facility that would be developed following the completion of the EA and signing of the FONSI. Replanting native trees, shrubs, and maintained grasses at the site would occur regardless of which alternative is selected. Additionally, the removal of non-native invasive species would be attempted. Existing, non-native invasive plant species such as African guinea grass and tan tan would be removed and replaced with native vegetation species. The replacement of non-native invasive species with native plant species would have a long-term, moderate, beneficial impact on the terrestrial wildlife species and other vegetation species that inhabit the area as well as the greater island of St. Croix. Non-native invasive species threaten the biodiversity of fragile island ecosystems such as St. Croix.

For all three project alternatives, a seawater supply pipeline would be required, although the exact location would be dependent on future studies. Construction methods for the installation of the pipeline would include burying the pipeline below grade on land, which would cause short-term, minor, adverse impacts to terrestrial vegetation. The route of the pipeline would follow existing roads to the extent possible to minimize additional disturbance to vegetation. On terrestrial locations, the pipeline would be buried underground and the disturbed areas would be returned to pre-construction conditions. Therefore,

no long-term impacts are anticipated as a result of the pipeline. Table 4-1 depicts the approximate land cover that would be impacted for each alternative considered.

Table 4-1. Land Cover Affected (in acres) within the Limit of Disturbance (LOD) for each MREC Alternative

Land Cover	Alternatives			
	Preferred Alternative (East Site)	South Site Alternative	West Site Alternative	
			NPS Visitor Contact Station	Salt River Marina
Forest (semi-deciduous)	0.23	7.0	0.88	0.21
Mangroves	0.03	0.04	---	---
Other Wetlands/Open Water	1.04	---	---	---
Shrubs	3.0	0.04	0.71	---
Vegetated Field	4.0	0.17	2.0	0.24
Bare Areas (rock/soil/unpaved roads)	0.75	0.69	0.34	0.15
Developed (paved roads, buildings)	0.04	0.76	1.0	0.58

Preferred Alternative (East Site) – Approximately 0.23 acres of forest (semi-deciduous) habitat, 4 acres of vegetated fields, and 3 acres of shrubs would be impacted due the MREC facilities, roads, and associated parking facilities. Adverse impacts to plants from the MREC are expected; however, most of the vegetation at this site includes non-native invasive species, including African guinea grass and tan-tan, due to the previously altered soils that exist at the site in the vicinity of the Mangrove Lagoon. The vegetation proposed for clearing to develop the MREC is not exceptional habitat; similar habitat is located on and adjacent to NPS property. Mitigation of this non-native vegetation is an option for this alternative and could include the removal of non-native invasive species with the replacement of appropriate native vegetation. The landscaping plan for the East Site would include revegetating disturbed areas (i.e., mud flats, bare areas, areas dominated by African guinea grass) beyond the MREC footprint. This plan would be developed following the completion of the EA and signing of the FONSI. A long-term, moderate, beneficial impact would result from the replacement of non-native invasive plant species with appropriate native vegetation.

South Site Alternative – Approximately 7 acres of forest (semi-deciduous), 0.04 acres of shrubs, and 0.17 acres of vegetated fields would be impacted by the MREC. Impacts to plants are expected to be moderate. Because detailed information is not currently available for the South Site, a vegetative species survey would be completed prior to the initiation of construction activities to ensure that no T&E vegetation species occupy the site.

West Site Alternative – Approximately 0.88 acres of forest (semi-deciduous), 0.71 acres of shrubs, and 2 acres of vegetated fields would be impacted within the northwest section by the MREC. Approximately 0.21 acres of forest (semi-deciduous) and 0.21 acres of vegetated fields would be impacted within the southwest section by the MREC. Impacts to plants are expected to be minor, since the vegetation proposed for clearing to develop the MREC is not exceptional habitat. However, because detailed information is not currently available, a vegetative species survey would occur prior to the initiation of construction activities to ensure that no T&E vegetation species occupy the site.

No Action Alternative – The site would remain in its current state and terrestrial habitat and vegetation that exists would remain unchanged. Therefore, there would be no impact to plants as a result of the No Action Alternative. No long-term, moderate, beneficial impacts would result from the replacement of non-native invasive plant species with appropriate native vegetation with the No Action Alternative. Non-native invasive species would remain an issue at the East Site.

Conclusion – Long-term, minor to moderate, adverse impacts to terrestrial vegetation are anticipated as a result of the South and West Site Alternatives. Forested (semi-deciduous) habitat, vegetated fields, and shrub habitat would be impacted due the MREC facilities, roads, and associated parking facilities for all alternatives. However, a long-term, moderate, beneficial impact would result from the replacement of non-native invasive plant species with appropriate native vegetation for the Preferred Alternative (East Site) as well as revegetating disturbed areas (i.e., mud flats, bare areas, areas dominated by African guinea grass) beyond the MREC footprint. The No Action Alternative would not impact terrestrial vegetation. None of the alternatives would cause impairment to park resources.

4.4.2 Birds

The proposed project would have minor adverse impacts to the birds at SARI, regardless of the alternative. Impacts to avian species are a direct result of impacts to and loss of their habitat. Habitats at SARI provide nesting, roosting and foraging for a wide variety of birds including year round residents, overwintering residents, and species that stop briefly at St. Croix during annual migrations. Loss of habitat due to vegetation removal, including mangroves, is the primary impact to birds. Mangrove habitat at SARI is important to birds as nesting habitat for resident species and foraging habitat for over wintering and migrant species. The results of the vegetation impact analysis were used to assess impacts to avian species. The removal of vegetation for construction of the MREC has the potential to disrupt or displace birds in the area. Vegetation would be removed from various areas including mangrove wetlands, forest (semi-deciduous), shrub, and vegetated field habitats. The mangroves of Salt River Bay provide nesting habitat for endangered white-crowned pigeons, cattle egrets, common egrets, and little blue herons. There would be a net loss of habitat for birds in the MREC footprint, the majority occurring at the South Site. The MREC footprints at both the East Site and the West Site are located in areas of exotic plant species. Therefore, the removal of these exotic species and the replacement with native plant species would have a long-term, positive impact on the avian species at these sites. The increase in human activity at the project site may also affect use of the available habitat by birds.

Preferred Alternative (East Site) – The Preferred Alternative (East Site) would have short-term, minor, adverse impacts to the birds at SARI through the loss of habitat. Nearby avian species (landbirds and shorebirds) that nest and forage in the vicinity of the proposed MREC area may be temporarily disrupted during the construction operations due to the unavoidable noise and human activity. The permanent loss of approximately 8.1 acres of avian habitat is a long-term, minor, adverse impact to avian species. Construction of the boat dock and wet lab would have a minor, permanent impact on mangrove wetlands (0.03 acres) and other wetlands/open water (1.04 acres) and would disturb avian species currently utilizing or nesting in mangroves. The species most likely to be impacted during construction are those species that may utilize mangrove habitat at the site and include cattle egrets, little blue herons, least bittern (Territorially endangered species), great blue heron, great egret, snowy egret, and black-crowned night heron. However, adjacent mangrove, shoreline, and wetland habitats for nesting and foraging are available adjacent to the East Site. The NPS *Director's Order* #77-1 (Wetland Protection) states that for new actions where impacts to wetlands cannot be avoided, proposals must include plans for compensatory mitigation that restore wetlands on NPS lands. An SOF for wetlands was completed, which includes appropriate mitigation measures for wetlands, including a mitigation plan for estuarine wetlands and mangroves (see Appendix D). In addition, approximately 62 acres of avian habitat at the East Site that is not proposed for MREC construction would still be available during the construction activities.

Implementation of the MREC may cause these species to temporarily relocate during the construction process. It is anticipated that these species would re-establish at the site after completion of the MREC. Following construction activities, approximately 60 (potentially more) acres of avian habitat would be available at the East Site. Since documented non-native invasive plant species occur at this site, replacement of these species with appropriate native vegetation is proposed. This would result in a minor, long-term, beneficial impact to avian species at the East Site.

South Site Alternative – The South Site Alternative would have long-term, minor adverse impacts to the birds at SARI through the loss of approximately 7 acres of avian habitat (forest, vegetated fields, and shrubs) as a result of the MREC. The South Site Alternative would have the greatest impact to forest habitat since the majority of proposed site of the MREC is located in an existing dry forest. Similar to the Preferred Alternative, the South Site Alternative would temporarily disrupt nearby avian species (landbirds and shorebirds) that nest and forage in the vicinity of the proposed MREC area during the construction operations. Construction of the boat dock would have a minor, permanent adverse impact on mangrove wetlands and would disturb avian species currently utilizing or nesting in mangroves.

West Site Alternative – The West Site Alternative would have long-term, minor adverse impacts to the birds at SARI through the loss of approximately 4 acres of avian habitat (forest, vegetated fields, and shrubs) as a result of the MREC. Cattle egrets and little blue herons currently nest in a rookery within a large patch of mangroves near the Salt River Marina. However, these avian species are already accustomed to the daily noise sources from the operating marina. The MREC construction noise sources should have a negligible affect on the avian community. Similar to the East Site Alternative, there are documented non-native invasive plant species at this site. The replacement of these species with appropriate native vegetation is proposed and would result in a minor, long-term, beneficial impact to avian species at the West Site.

No Action Alternative – The site would remain in its current state and wildlife habitat that exists would remain unchanged. Therefore, there would be no impact to birds found in the region, and they would continue to utilize the site as habitat.

Conclusion – The South and West Site Alternatives would have a long-term, minor, adverse impact on the avian species that utilize the area as a result of habitat loss from construction of the MREC. The South Site Alternative would have the greatest impact to forest since the majority of proposed site of the MREC is located in an existing dry forest. The East Site would have a short-term, minor, adverse impact on the avian species that utilize the area as a result of habitat loss from construction of the MREC. Both the East Site and the West Site would also have a long-term, minor, beneficial impact to avian species due to the replacement of non-native invasive plant species with appropriate native vegetation as well as the wetland mitigation plan for estuarine areas and mangroves for the East Site. The No Action Alternative would not impact birds, but the positive effects or replacing exotic plant species with native vegetation at both the East Site and the West Site would not occur. None of the alternatives would cause impairment to park resources.

4.4.3 Mammals

Project Site Alternatives – As with birds, impacts to mammals are a direct result of impacts to vegetation. Long-term, minor, adverse impacts to mammals through the loss of habitat due to vegetation removal and construction of the MREC is the primary impact to mammals. The removal of vegetation for the construction of the MREC has the potential to disrupt or displace mammals in the area. Vegetation would be removed from various areas including mangroves, forest (semi-deciduous), shrub, and vegetated field habitats. There would be a net loss of habitat for mammals in the MREC footprint. The increase in human activity at the site may also affect use of the available habitat by mammals. Nearby mammals

(i.e., Indian mongoose, white-tailed deer) that utilize the surrounding habitats within the vicinity of the MREC area may be temporarily disrupted during the construction operations due to the unavoidable noise and human activity. This may cause species to relocate during the construction process. It is anticipated that these species would re-establish at nearby available habitat after the completion of the MREC. The area of disturbance which might cause the relocation of the Indian mongoose may actually benefit the bird populations, as the mongoose has decimated local bird populations. As discussed in the previous section, the East Site would provide in the long term a beneficial impact to mammals due to the replacement of non-native invasive plant species with appropriate native vegetation which would attract mammals to the site.

No Action Alternative – The site would remain in its current state and wildlife habitat that exists would remain unchanged. Therefore, there would be no impact to mammals found in the region, and they would continue to utilize the site as habitat.

Conclusion – The South and West Site Alternatives would have a long-term, minor, adverse impact on the mammals in the area; however, the East Site would have a short-term, minor, adverse impact initially. In the long-term the East Site would provide a beneficial impact to mammals due to the proposed replacement of non-native invasive plant species with appropriate native vegetation. The No Action Alternative would not impact mammals. None of the alternatives would cause impairment to park resources.

4.5 AQUATIC RESOURCES

This section discusses the impacts of the Preferred Alternative (East Site), the South Site Alternative, the West Site Alternative, and the No Action Alternative on aquatic resources including coral reefs, seagrasses, and fish.

4.5.1 Reefs/Hardbottom

Project Site Alternatives – No impacts to reefs and hardbottom habitat due to the construction of the MREC or the boat dock and the wet lab are anticipated as a result of the three alternatives. The construction of these facilities has the potential to temporarily and locally increase turbidity in Salt River Bay, but these effects would not negatively impact the reefs or hardbottom habitats, which are located sufficiently far enough away from the construction activities. Erosion and sediment control BMPs would be employed during construction activities to minimize impacts to the bay.

No impacts to reefs and hardbottom habitat would occur as a result of maintenance dredging. Dredging has the potential to temporarily and locally increase turbidity in Salt River Bay, but these effects would not negatively impact the reefs or hardbottom habitats, which are located sufficiently far enough away from the dredging activities. All documents (including a CWA Section 404(B)(1) Evaluation, an EFH Evaluation and a CWA Section 401 Water Quality Certification) required to support a permit for dredging along with a dredging permit would be obtained prior to the initiation of dredging activities. All anticipated impacts associated with dredging would be evaluated in detail in these documents.

Minor, adverse, short-term impacts to the coral reefs and hardbottom substrate would occur from installation of the seawater supply pipeline. The final location of the seawater supply pipeline is unknown at this time and would be dependent on future hydrodynamic and water quality studies. The pipeline would probably be located in the open ocean away from the bay tidal plume and beyond the coastal high-energy region, which means that the pipeline would encounter reefs and hardbottom substrate. To avoid impacts to the coral reef the pipeline would be installed (i.e., horizontal directional drilling, trenching) below the reef habitat. The impacts would be primarily an increase in the turbidity in

the area of the pipeline installation. This effect would be temporary and would dissipate quickly after the installation ceases and suspended sediments resettle. Therefore, the installation of the seawater supply pipeline would have short-term minor impacts on the coral reef. Impacts to the hardbottom substrate would occur from the installation of the pipeline under the coral reef and from the tethering of the pipeline to this substrate. Alignment of the pipeline would be selected based on avoiding coral altogether, avoiding areas of high quality coral reefs, or routing the pipeline in areas with the least amount of coral to the maximum extent possible. There are many areas along the northern shore of the East Site where coral density is low due to past hurricane debris piling, several feet of coral cobble, and high surf conditions; this area also provides a relatively short distance to deeper water for the seawater supply line.

The intake for the seawater supply pipeline could potentially entrain coral gametes in the water column during the spawning season. This may result in some loss of gametes but no impact to the coral reef is expected.

No Action Alternative – SARI would remain in its current use and no action would be taken. There would be no need to install a seawater supply pipeline at SARI. The No Action Alternative does not result in environmental impacts to the coral reefs at SARI.

Conclusion – The installation of the seawater supply pipeline would have short-term, minor, adverse impacts on the reef/hardbottom habitat at SARI. Minor impacts to the hardbottom substrate would occur from the installation of the pipeline under the coral reef and from the tethering of the pipeline to this substrate. The No Action Alternative would not impact the coral reefs. None of the alternatives would cause impairment to park resources.

4.5.2 Seagrasses

Project Site Alternatives – No aquatic impacts to seagrasses due to the construction of the MREC and associated buildings are anticipated as a result of the three alternatives. Based upon interpolation from aerial photographs in 2000, the pilings to support the boat dock for the East and the South Sites are not currently located in areas that would impact seagrasses. However, a more detailed site-specific seagrass survey would be required to support necessary permit obligations for the proposed boat dock at both the East and the South Sites to ensure that seagrasses are not impacted by the project.

Seagrasses would be impacted (i.e., disturbed, removed) by the proposed seawater supply pipeline that would draw seawater from the ocean into the MREC facility for the South and West Site Alternatives. However, it is likely that the pipeline route for the East Site would be located on the inside of the coral reef on the extreme northeast side of the site since this is where coral density is low. This location would not impact the sea grass and algae matt area in the bay. Seawater would have to be piped in from outside the coral reef and across extensive sea grass and algal matt areas for both the South and West Sites. Underwater, the pipeline would be tethered to the bottom substrate (i.e., sediment, sand, rock) for installation in the lagoon, bay, and sea. Minor, adverse impacts to seagrasses are expected from the anchors of the tethered pipeline. All attempts to avoid areas of quality seagrasses that are preferred as forage material for turtles would be made during siting of the pipeline. Seagrasses would be retained and replanted after completion of the pipeline installation if applicable. Where this is not possible, it is likely that the seagrasses would on their own become re-established in the location of the proposed pipeline. To minimize unforeseeable impacts to turtles, sand may used to cover the pipeline. Therefore, the installation of the seawater supply pipeline would have short-term, minor, adverse impacts to seagrasses.

Seagrasses could also be potentially impacted by maintenance dredging activities associated with all three alternatives. The areas directly south of the East Site and within the Mangrove Lagoon, directly east and northeast of the South Site, the existing channel within the bay and within the marina are the most likely

locations for maintenance dredging. Seagrasses are currently located to the south of the East Site and north of the South Site (see Figure 3-6). It is unlikely that seagrasses currently occur within the Mangrove Lagoon, existing channel, or the marina. If dredging is determined as necessary for this project, then a site-specific seagrass survey within the footprints of the areas proposed for dredging would occur. Additionally, if needed, appropriate seagrass mitigation would occur following the site-specific survey. The impacts to seagrasses would be from an increase in the turbidity in the area of dredging and the removal of seagrasses during the dredging activity. If seagrasses are found within the footprints of the areas proposed for dredging, then maintenance dredging would have long-term, minor, adverse impacts to the seagrasses.

No Action Alternative – The site would remain in its current state and the seagrasses would remain unchanged. Therefore, there would be no impact to the seagrasses found in the region.

Conclusion – Impacts to seagrasses include long-term, minor, adverse effects from maintenance dredging regardless of the alternative. Seagrasses would also be impacted (i.e., disturbed, removed) by the proposed seawater supply pipeline for the South and West Site Alternatives which would result in short-term, minor, adverse effects The No Action Alternative would not impact seagrasses. None of the alternatives would cause impairment to park resources.

4.5.3 Fish

Project Site Alternatives – Short-term, minor, adverse effects to fish would occur during construction of boat docks and mooring facilities at SARI for the Preferred Alternative (East Site) and the South Site Alternative. Fish in the area would be disturbed by the construction equipment and activities needed for the installation of dock pilings and moorings. The fish would be expected to avoid, or leave these areas. These construction activities would have temporary, localized effects to fish.

No impacts to pelagic fish species are anticipated as a result of the seawater supply pipeline; minor, adverse, short-term impacts to demersal fish species could occur, but these species are expected to move from the area when the pipeline is being tethered to the substrate.

Fish would also be impacted from maintenance dredging activities. The fish would be expected to avoid, or leave these areas. Maintenance dredging would have minor, adverse, temporary, localized effects to fish.

No Action Alternative – The site would remain in its current state and fish habitat would remain unchanged. Therefore, there would be no impact to the fish found in the region, and they would continue to potentially utilize Salt River Bay as habitat.

Conclusion – Impacts to wildlife species include short-term, minor, adverse effects to fish within SARI. The species potentially impacted are expected to avoid or leave the areas being disturbed and the return at the conclusion of the construction/installation and maintenance dredging activities. The No Action Alternative would not impact wildlife. None of the alternatives would cause impairment to park resources.

4.5.4 Benthic Organisms

Project Site Alternatives – Long-term, minor, adverse effects to the benthic community would occur during construction of boat dock/mooring facilities at SARI for the Preferred Alternative (East Site) and the South Site Alternative. The benthic community in the area would be affected (i.e., crushed, damaged)

by the installation of dock pilings and moorings. These construction activities would have permanent, localized effects to the benthic community.

Impacts to the benthic community would result from the seawater supply pipeline for all three alternatives. The pipeline would be tethered to the bottom substrate; during this installation benthic organisms may be crushed or damaged. Minor, adverse, long-term impacts to the benthic community would occur as a result of the seawater supply pipeline installation.

The benthic community would also be impacted (i.e., crushed, removed, damaged) from maintenance dredging activities. Maintenance dredging would have minor, permanent, localized effects to the benthic community.

No Action Alternative – The site would remain in its current state and the aquatic habitat would remain unchanged. Therefore, there would be no impact to the benthic communities.

Conclusion – Impacts to aquatic species include long-term, minor, adverse effects to the benthic community within SARI. The No Action Alternative would not impact the benthic community. None of the alternatives would cause impairment to park resources.

4.6 THREATENED AND ENDANGERED SPECIES

The Endangered Species Act defines the terminology used to assess impacts to listed species as follows:

> ***No effect:*** When a proposed action would not affect a listed species or designated critical habitat.
>
> ***May affect/not likely to adversely affect:*** Adverse effects on special status species are discountable (i.e., extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated) or are completely beneficial.
>
> ***May affect/likely to adversely affect:*** When an adverse effect to a listed species may occur as a direct or indirect result of proposed actions and the effect either is not discountable or is completely beneficial.
>
> ***Is likely to jeopardize proposed species/adversely modify proposed critical habitat (impairment):*** The appropriate conclusion when NPS or USFWS identifies situations in which the proposal could jeopardize the continued existence of a proposed species or adversely modify critical habitat to a species within or outside park boundaries.

In accordance with the Federal and Territorial requirements for threatened and endangered (T&E) species, ESA Section 7 Consultation was conducted with the USFWS Southeast Region, the NMFS Southeast Region Office, and the USVI DPNR. Information requested from these agencies included Federal and Territorial listed threatened and endangered species, designated or proposed critical habitat, and candidate taxa occurring in the project area. More details and correspondence between NPS and agencies consulted are supplied in Chapter 10 and Appendix B. NMFS has stated that four listed sea turtle species (green sea turtle, hawksbill sea turtle, leatherback sea turtle, and loggerhead sea turtle) have the potential to occur in the vicinity of SARI. Two Federally-listed species of coral (staghorn coral and elkhorn coral) also occur within the boundary of SARI and have been observed in Salt River Canyon (Kendall et al 2005). The spawning season for these species could range from July to September. In compliance with ESA Section 7 Consultation, information was requested on T&E species at SARI but, to date, no response has been received from the USFWS, the Commissioner of the USVI DPNR, or from contacts at the USVI DPNR/DEP or the USVI DPNR/DFW.

Also in accordance with the Federal and Territorial requirements for T&E species, ESA Section 7 Consultation would be required with USFWS, NMFS Southeast Region Office, and the USVI DPNR/DFW prior to construction and dredging activities. NMFS has already stated in the September 8, 2006 letter that a biological evaluation (BE) would be required as part of the planning and design stages for this project. The impacts analyzed in this section include impacts associated with the construction of the MREC and associated buildings, the construction of the boat dock and the wet lab, the impacts associated with dredging activities, and the impacts associated with a submerged seawater supply pipeline. This chapter does not analyze in detail secondary aquatic impacts associated with the additional marine research activities that may be conducted as a result of the MREC. These impacts would be analyzed in detail at an appropriate time in conjunction with the required BE and other required permits that may be obtained for this project at a later date in time. For the Preferred Alternative and the South Site Alternative, the proposed dredging activities would require further coordination with NMFS prior to construction to ensure compliance with Section 7 of the ESA. In addition, for all three alternatives, the seawater supply pipeline may require further coordination with NMFS prior to construction to ensure compliance with Section 7 of the ESA.

Preferred Alternative (East Site) – No impacts to the two Federally-listed coral species are anticipated as a result of the construction of the Preferred Alternative, since these species are located sufficiently far away from the project site. The east wall of Salt River Canyon, where the two coral species have been observed, is located approximately 0.12 nautical miles from the East Site. However, depending on the final location, operation of the seawater supply pipeline could cause a short-term, minor, adverse impact to coral species if intake occurs during coral spawning season. During the coral spawning season, it is a possibility that coral gametes may become entrained at the pipeline intake. Coral spawning occurs in the water column with the release of gametes and could range from July to September. If coral spawning was observed at SARI the MREC would temporary shut off the pipeline intake; however, only if the shutdown does not impact the internal Wet Lab system. In addition, TOY restrictions for construction may be in place to avoid short-term, minor, adverse impacts to coral gametes. Both the proposed dredging activities and the seawater supply pipeline would require further coordination with the USFWS and USACE prior to construction to ensure compliance with Section 7 of the ESA.

The construction of the MREC facilities would not adversely affect the federally listed sea turtles that have the potential to occur at SARI (leatherback sea turtle and loggerhead sea turtle) and the federally listed sea turtles that reside both inside and outside of the bay (green sea turtle and hawksbill sea turtle), as the majority of these construction activities would occur on land. However, short-term, minor, adverse impacts to listed species could potentially occur from in-water work, including construction of the boat dock and maintenance dredging for the East Site. Watercraft would be required for these construction activities, resulting in the potential to affect the listed sea turtles if contact with watercraft occurs. These activities would require coordination with the NMFS prior to construction for compliance with Section 7 of the ESA. Watercraft would be required for maintenance dredging activities and for the proposed seawater supply pipeline, resulting in the potential for short-term, minor, adverse impacts to the listed sea turtles if contact with watercraft occurs. Sea turtles are not expected to feed in the vicinity of the Preferred Alternative since it is unlikely that seagrasses currently occur within the Mangrove Lagoon, but sea turtles may feed in the vicinity of the seawater supply pipeline, depending on the exact location and depth of the pipeline. To minimize possible impacts to listed sea turtles, TOY restrictions for construction would be in place during turtle nesting seasons to avoid possible unanticipated adverse impacts to this species. If aquatic construction is avoided during the nesting time period from March until mid November, and personnel operating watercraft are vigilant during construction for foraging sea turtles, the four listed sea turtles should not be adversely affected by this project.

The Territorially listed endangered least tern has been observed nesting on the northwest side of the East Site. Least tern habitat is discussed in more detail in Section 4.7.1.

South Site Alternative – Impacts to listed species as a result of the South Site Alternative are similar to impacts discussed above for the Preferred Alternative (East Site). The east wall of Salt River Canyon, where the two coral species have been observed, is located approximately 0.37 nautical miles from the South Site. No known Least Tern nesting sites are located within the South Site Alternative. As stated above, short-term, minor, adverse impacts to aquatic species could occur from in-water work, including construction of the boat dock, maintenance dredging, and the seawater supply pipeline (depending on the exact location) for the South Site Alternative. But, as stated previously, TOY restrictions for construction would be in place during nesting seasons of sea turtles and coral gamete season to avoid possible unanticipated adverse impacts to listed species.

West Site Alternative – Portions of West Site Alternative in the vicinity of the Salt River Marina are currently developed. However, the surrounding habitats of the marina have the potential to support Federal and Territorial listed species. The habitats in the vicinity of the Visitor Contact Station also have the potential to support Federal and Territorial listed species. The waters adjacent to Sandy Point National Wildlife Refuge, located on the southwestern tip of St. Croix, over 15 miles southwest of the Columbus Landing Site, on the other side of the island, are designated critical habitat for the Federally-listed leatherback sea turtle. However, NMFS has stated that due to the distance of this area from the project site, it is unlikely that this habitat would be affected by the proposed construction (see Appendix B). *A. palmata* and *A. cervicornis* have been observed on both walls of Salt River canyon and along the coast line north and east of the East Site. The west wall of Salt River Canyon, where the two coral species have been observed, is located approximately 0.22 nautical miles from the West Site. Critical habitat is discussed in more detail in Section 4.7.1.

As stated above for the other alternatives, short-term, minor, adverse impacts to aquatic species could occur from in-water work, including maintenance dredging and the seawater supply pipeline (depending on the exact location). Watercraft would be required for the proposed maintenance dredging and seawater supply pipeline, resulting in the potential to affect the listed sea turtles if contact with watercraft occurs. But, as stated previously, TOY restrictions for construction would be in place during nesting seasons to avoid possible unanticipated adverse impacts to listed species.

No Action Alternative – Under the No Action Alternative, listed species would not be impacted. All uses of SARI would remain the same as in the current state.

Conclusion – No impacts to T&E species are anticipated as a result of the construction of the MREC, as the majority of these construction activities would occur on land. However, short-term, minor, adverse impacts to listed species could occur from in-water work, including construction of the boat dock and maintenance dredging regardless of the alternative. Watercraft would be required for these construction activities, resulting in the potential to affect the listed sea turtles if contact with watercraft occurs. These activities, along the proposed seawater supply pipeline, which may also have short-term, minor, adverse impacts to listed species for all three alternatives (depending on the exact location) would also require coordination with the NMFS prior to construction for compliance with Section 7 of the ESA. During the coral spawning season, it is a possibility that coral gametes may become entrained at the pipeline intake. However, TOY restrictions would be in place to avoid short-term, minor, adverse impacts to both listed coral species and sea turtle species. The leatherback turtle nesting beach at Sandy Point NWR, located on the southwestern tip of St. Croix would not be impacted as a result of any of the project alternatives. The No Action Alternative would not impact listed species. None of the alternatives would cause impairment to park resources.

4.7 UNIQUE NATURAL RESOURCES

As stated previously, the MREC facility would have minor, adverse impacts to some of the unique natural systems and designated natural areas. Minor, adverse impacts to mangrove wetlands from the boat dock and wet lab at the Preferred Alternative and the South Site Alternative are anticipated, although wetland mitigation would offset the majority of these impacts. For all three alternatives, minor, adverse, short-term impacts to the coral reefs would occur from installation of the seawater supply pipeline. Also, the intake for the seawater supply pipeline could potentially entrain coral gametes in the water column during the spawning season, which may result in some loss of gametes, but no impact to the coral reef is expected.

For all three site, the MREC facility would provide long-term, moderate, beneficial impacts to the unique natural systems at SARI, especially the coral reefs and mangrove habitat by fostering public awareness of the importance of coral reefs and other marine ecosystems from economic, aesthetic and global health standpoints though educational programs for students and the general public (JICMS 2005). The MREC would also foster the understanding and proper management of coral reef and other tropical and sub-tropical marine ecosystems by initiating a comprehensive long-term research and education program in the U. S. Virgin Islands (JICMS 2005). Lastly, the MREC would share information and research and form partnerships with other nations within the Caribbean and adjacent regions with common interests in and concerns for the marine environment (JICMS 2005). Overall, this project would not significantly alter the unique natural systems or designated natural areas that occur in the vicinity of Salt River Bay, which includes critical habitat, mangrove habitat, coral reef habitat, the submarine canyon, APCs, and ecological preserves. These resources are discussed in more detail in the following paragraphs.

4.7.1 Ecologically Critical Areas

Preferred Alternative (East Site) – The construction of the Preferred Alternative (East Site) is unlikely to adversely impact the designated critical habitat for the Federally-listed leatherback sea turtle (located in the waters adjacent to Sandy Point NWR, located on the southwestern tip of St. Croix) as stated by NMFS, due to the distance of this area from the project site (see Appendix B). The Territorially listed endangered least tern has been observed nesting on the northwest side of the East Site. However, the majority of the proposed MREC is located on the eastern side of the East Site, at a sufficient distance from the nesting site such that noises from construction activities are unlikely to impact the Least Tern, with the exception of the construction of the water-dependent structures, such as the boat dock and wet lab. Similar to current conditions, posted signs would indicate the Least Tern nesting locations during the appropriate seasons to deter visitors from utilizing these areas. In addition, TOY restrictions during construction of the water-dependent structures would be in place during both the Least Tern nesting seasons (which occurs, conservatively at a maximum from the middle of April until the middle of July) to avoid possible unanticipated adverse impacts to these species. With TOY restrictions in place, no adverse impacts to Least Tern nesting habitat are expected with the Preferred Alternative.

Minor, adverse, short-term impacts to the coral reefs may occur from installation of the seawater supply pipeline. To minimize these impacts, however, the location of the seawater supply line would be routed to avoid areas of high quality coral reefs. There are existing areas along the northern shore of the East Site where coral reef density is low due to impacts from hurricanes, areas of existing coral cobble, and high surf conditions; this area also provides a relatively short distance to deeper water for the seawater supply line. Also, the intake for the seawater supply pipeline could potentially entrain coral gametes in the water column during the spawning season, which may result in some loss of gametes, but no impact to the coral reef is expected. As stated previously in Section 4.3.4, minor, adverse impacts to mangrove wetlands from the boat dock and launch at the Preferred Alternative (East Site) are anticipated. Approximately 0.03 acres of mangrove wetlands would be permanently lost as a result of constructing the

boat dock and launch and the wet lab, located on the northern shoreline of the Mangrove Lagoon. As discussed in detail in Section 4.3.4 and in the SOF (Appendix D), mangrove mitigation measures are proposed to partially offset the loss of mangrove habitat. Dredging has the potential to temporarily and locally increase turbidity in Salt River Bay, potentially causing a short-term, minor, adverse impact to EFH and HAPC. An EFH Evaluation required to support a permit for dredging would be obtained prior to the initiation of dredging activities. All anticipated impacts associated with dredging would be evaluated in detail in this document.

As stated previously, the construction of the MREC facilities would not adversely affect the federally listed sea turtles that have the potential to occur at SARI (leatherback sea turtle and loggerhead sea turtle) and the federally listed sea turtles that reside both inside and outside of the bay (green sea turtle and hawksbill sea turtle), as the majority of these construction activities would occur on land. However, short-term, minor, adverse impacts to listed sea turtle species could potentially occur from in-water work and are discussed in more detail in Section 4.6.

Long-term, moderate, beneficial impacts are anticipated as a result of the MREC facility. The knowledge gained from research conducted at the MREC facility would benefit the unique natural systems at SARI, especially the coral reefs and mangrove habitat. The MREC would also share information and research and form partnerships with other nations within the Caribbean and adjacent regions with common interests in and concerns for the marine environment (JICMS 2005).

South Site Alternative – Impacts to critical habitat, including coral reefs, as a result of the South Site Alternative are similar to impacts discussed above for the Preferred Alternative, with the exception of the Least Tern. No known Least Tern nesting sites are located within the South Site Alternative. Approximately 0.04 acres of mangrove wetlands would be permanently lost as a result of constructing the boat dock and launch, located along the shoreline of Triton Bay. As discussed in detail above and in Section 4.3.4, mangrove mitigation measures would be required to partially offset the loss of mangrove habitat. Similar long-term, beneficial impacts associated with the MREC, as discussed above for the Preferred Alternative, are also expected with the South Site Alternative.

West Site Alternative – Impacts to critical habitat, including coral reefs, as a result of the West Site Alternative are similar to impacts discussed above for the South Site Alternative. However, mangroves would not be impacted by the West Site Alternative because a boat dock and launch would not be required. The West Site Alternative would make use of the existing, working marina (i.e., boat ramp) located along the shoreline of Sugar Bay. Because the designated critical habitat for the Federally-listed leatherback sea turtle (located in the waters adjacent to Sandy Point NWR), is located over 15 miles southwest of the Columbus Landing site, NMFS has determined that no impacts to this habitat would be anticipated (see Appendix B). Although leatherback sea turtles have been observed foraging in the bay and nesting (rarely) at the Columbus Landing Site, short-term, minor, adverse impacts to the leatherback sea turtle (and three other listed sea turtles) could potentially occur from in-water work and are discussed in more detail in Section 4.6. Similar long-term, beneficial impacts associated with the MREC, as discussed above for the Preferred Alternative, are also expected with the South Site Alternative.

No Action Alternative – Under the No Action Alternative, ecologically critical areas would not be impacted. All uses of SARI would remain the same as in the current state. No long-term beneficial impacts associated with the MREC facility would occur.

Conclusion – No impacts to designated critical habitat for the Federally-listed leatherback sea turtle are anticipated with the project alternatives. However, short-term, minor, adverse impacts to listed sea turtle species could potentially occur from in-water work and are discussed in more detail in Section 4.6. The least tern nesting habitat on the East Site would not be negatively impacted as a result of the Preferred

Alternative. Minor, adverse impacts to mangroves, identified as critical habitat, are anticipated as a result of the Preferred Alternative (East Site) and the South Site Alternative. However, mangrove mitigation measures through plantings at a specified ratio of 3:1 would be required to partially offset the loss of mangrove habitat associated with the construction of the MREC. Details concerning the location of the mitigation and the planting plan were determined through consultation with the NPS, the USACE, and the USDA NRCS and are described in detail in the SOF included as Appendix D. For all three alternatives, minor, adverse, short-term impacts to the coral reefs would occur from installation of the seawater supply pipeline and could potentially entrain coral gametes in the water column during the spawning season, although no impact to the coral reef is expected. The impacts to coral reefs would be minimized routing the seawater supply pipeline to avoid areas of high quality coral reefs.

As stated previously, the MREC facility would provide long-term, moderate, beneficial impacts to the unique natural systems at SARI, especially the coral reefs and mangrove habitat by fostering public awareness of the importance of coral reefs and other marine ecosystems from economic, aesthetic and global health standpoints though educational programs for students and the general public (JICMS 2005). Under the No Action Alternative, ecologically critical areas would not be impacted and no long-term beneficial impacts associated with the MREC facility would occur. None of the alternatives would cause impairment to park resources.

4.7.2 Designated Natural Areas

Due to the general nature of designated natural areas, the majority of Salt River Bay is included in a number of different designations for natural areas, including Salt River Bay Marine Reserve and Wildlife Sanctuary, Salt River Bay and Watershed Areas of Particular Concern, Salt River Bay National Historical Park and Ecological Preserve, and the St. Croix Coral Reef System Areas of Particular Concern. As stated above, the MREC facility would have a positive impact on the unique natural systems at SARI and would therefore allow these designated natural areas to continue to be preserved.

Preferred Alternative (East Site) – As stated above in Section 4.7.1 *Critical Habitat*, long-term, beneficial impacts are anticipated as a result of the MREC facility.

South Site Alternative – Potential impacts to avian species as a result of the South Site Alternative were discussed previously in Section 4.4.2 and determined to be minor. Long-term, beneficial impacts are anticipated as a result of the MREC facility.

West Site Alternative - Impacts associated with the West Site Alternative have long-term beneficial impacts and are similar to the discussion above for the Preferred Alternative.

No Action Alternative – Under the No Action Alternative, designated natural areas would not be impacted. All uses of SARI would remain the same as in the current state. No long-term beneficial impacts associated with the MREC facility would occur.

Conclusion – Long-term, beneficial impacts are anticipated as a result of the MREC facility and the Project Site Alternatives. No long-term, beneficial impacts are anticipated as a result of the No Action Alternative. None of the alternatives would cause impairment to park resources.

4.8 CULTURAL RESOURCES

4.8.1 Archaeological Sites

Of the three alternatives under consideration for the implementation of the MREC, only one of these locations, the Preferred Alternative (East Site), has received a comprehensive archaeological survey and is the location of known archaeological sites. There is also the potential for submerged resources (shipwrecks, etc.) in the bay itself for all three alternatives, which are discussed in the *Underwater Archaeology* subheading that follows the discussion of Project Site Alternatives.

Preferred Alternative (East Site) – Construction of the MREC on the East Site would have an affect on sites SARI-2.03 and SARI-2.06. The sites are located in the area of the MREC Administration and Education Center and the Maintenance Building and would be affected by the construction of these facilities. Further archaeological testing in accordance with Section 106 of the NHPA would be needed to determine if these sites represent two separate locations or should be considered as a single site, and if these sites are eligible for listing on the NRHP. The sites have already been disturbed by the construction of the Mangrove Lagoon, as well as by existing dirt roads, and hence there is limited potential for an adverse affect.

The potential effects on underwater archaeological resources would need to be considered for the construction of MREC in-water support facilities (i.e., boat dock, moorings) on the East Site, as outlined in the Section Underwater Archaeology, below.

Meredith Hardy (2005) also recommends either monitoring of any construction or earth disturbance in the immediate area (within 50 feet) of SARI-2.01 to make certain that this site is not impacted by MREC construction activities on the East Site or the installation of construction fencing to assure that the SARI-2.01 site boundary is protected.

South Site Alternative – No archaeological survey has been completed for the South Site. This property is located on a knoll and small projections in the upper reaches of the bay and should also be considered to have moderate to high site potential, with impacts where the existing structures are located. Construction of the MREC on the South Site would require a Phase I survey in accordance with Section 106 of the NHPA to identify archaeological resources on the property as well as a Phase II archaeological investigation to determine the NRHP eligibility of such sites if discovered. The results of this Phase I survey would need to be reviewed by the USVI SHPO. If eligible sites are identified, efforts to mitigate adverse effects would be required. Additionally, the potential effects on underwater archaeological resources would need to be considered for the construction of the MREC in-water support facilities on the South Site, as outlined in the Section Underwater Archaeology, below.

West Site Alternative - Construction of the MREC on the West Site would require a Phase I survey in accordance with Section 106 of the NHPA to identify archaeological resources on the Salt River Marina property as well as a Phase II archaeological investigation to determine the NRHP eligibility of such sites if discovered. If eligible sites are identified, efforts to mitigate adverse effects would be required. Additionally, the potential effects on underwater archaeological resources would need to be considered for the construction of the MREC in-water support facilities on the West Site, as outlined in the Section Underwater Archaeology, below.

Underwater Archaeology

Common to all Alternatives – The location chosen for the MREC would require a seawater intake pipeline extending from the site through the bay and into the Caribbean Sea that would bring salt water

for use in the MREC labs. Construction of this line has the potential to affect submerged cultural resources in Salt River Bay and the Caribbean Sea. These waters are under the jurisdiction and management of the Government of the U.S. Virgin Islands.

The results of the underwater archaeological reconnaissance of Salt River Bay was conducted in 1989 by the IASD of the NPS indicated that there are near-shore, bay and off-shore archaeological resources in the project area (See Section 3.8.2). Construction of the MREC at any of the locations would require an underwater archaeological survey to determine the location of submerged cultural resources along the course of the seawater supply pipeline into the Caribbean Sea required for the MREC.

It is recommended that a remote-sensing survey using a magnetometer or side-scan sonar be conducted along the alignment of the seawater supply pipeline to determine if any submerged anomalies are present in this area. With the locations of anomalies mapped, efforts should be made to route the pipeline to avoid such submerged resources. If a pipeline route can be designed that avoids submerged resources, no further treatment for underwater archaeology would be needed. If it is not feasible to site the pipeline without crossing submerged anomalies, underwater archaeological survey should be completed to investigate and evaluate the resources identified by the remote-sensing survey. If NRHP-eligible shipwrecks or other submerged resources are identified, the project's affects on such resources would need to be determined and mitigation would be required for adverse effects.

No Action Alternative – Under the No Action Alternative, archeological sites would not be impacted. All uses of SARI would remain the same as in the current state.

Conclusion – Of the three alternatives under consideration for the implementation of the MREC, only a portion of East Site, has received comprehensive archaeological surveys and is the location of known archaeological sites. Regardless of the alternative, detailed archeological survey and investigation would likely be required. The Preferred Alternative (East Site) would potentially affect known archeological sites SARI-2.03 and SARI-2.06. Further archaeological testing in accordance with Section 106 of the NHPA would be required to determine if these sites are eligible for listing on the NRHP. Additionally, there is also the potential for submerged resources (shipwrecks, etc.) in the bay itself for all three Project Site Alternatives. Under the No Action Alternative, archeological sites would not be impacted. No impairment of SARI resources would result from any of the alternatives. None of the alternatives would cause impairment to park resources.

4.8.2 Historic Resources

Project Site Alternatives – None of the three Project Site Alternatives has the potential to affect SARI's historic resources.

No Action Alternative – Under the No Action Alternative, historic resources would not be impacted. All uses of SARI would remain the same as in the current state.

Conclusion – None of the three Project Site Alternatives or the No Action Alternative has the potential to affect historic resources.

4.8.3 Cultural Landscapes

Cultural landscape elements and issues associated with each of the sites are discussed below.

Preferred Alternative (East Site) – The East Site landscape has been significantly modified by construction activities associated with the 1960s development for the Virgin Grand Hotel. Landscape modifications that have occurred on this site include alterations to the shoreline, the dredging of a mangrove lagoon for the construction of a marina, the creation of a peninsula with dredge spoil on which the 26,000 square foot superstructure of the unfinished hotel sits, the excavation of roadways including roads cut into the adjacent hillside, and the clearing of native vegetation. Erosion and off-road vehicle traffic has also impacted the landscape. This site is adjacent to the Judith's Fancy residential development, which overlooks the site from the surrounding hillsides.

The proposed construction on this location would consist of wet labs and water tanks along the shore of the Mangrove Lagoon, and the Education Center, cafeteria, and dormitories on the southern and eastern edges of the hill found in this corner of SARI. The latter are planned as single story buildings constructed into the hillside to minimize their profiles as well as for energy efficiencies and hurricane resistance. These would further be masked by plantings of native vegetation. The view of these structures would be shielded from ocean approaches from the east, but would be visible from the west and from the Columbus Landing Site as well as from directly off shore from Salt River Bay. The MREC's design for this alternative intentionally hugs the hillside in this area, which partially, but not completely, mitigates its visual effect on the landscape. Furthermore, the regeneration of native vegetation on this site could help shield the view of these structures as well as return the East Site to the appearance of its historic landscape. Construction on this alternative could have an adverse effect on the SARI cultural landscape. The degree of effect is difficult to calculate without construction and landscape plans, but is estimated at minor.

South Site Alternative – The South Site is located on a knoll at the back of the bay. The proposed construction on this location consists of wet lab facilities and an education center on Triton Bay and placement of the MREC building, cafeteria, and dormitories behind the hill which dominates this point. Use of this alternative would have an adverse effect on SARI's cultural landscape, as it would clear a wooded hillside and construct a facility that would be visible from the mouth of Salt River Bay as well as from the Columbus Landing Site. While the distance of this alternative from the mouth of the bay in part moderates the visual effect, changing this hillside from wooded to developed would be a notable visual intrusion and the degree of adverse effect is judged to be moderate.

West Site Alternative – The West Site is located at the Salt River Marina and on a hill above Salt River Bay. Construction on the hill would introduce additional buildings overlooking the Columbus Landing Site and would have an adverse visual effect on SARI's cultural landscape. Given the proximity of this new construction to the mouth of the bay, it would represent a moderate adverse effect on the cultural landscape of SARI.

The Salt River Marina is tucked back into the southwest corner of the bay and is not visible from the ocean. Use of this site would not have an adverse affect on SARI's cultural landscape, as long as the new facilities' mass and scale were appropriate.

No Action Alternative – Under the No Action Alternative, cultural landscapes would not be impacted. All uses of SARI would remain the same as in the current state.

Conclusion – All three alternatives could potentially have an adverse visual effect on the cultural landscape of SARI. The effect would range from minor to moderate and would be long-term. Section 106 and Section 110 compliance are required and would be completed for this project. The proposed project was analyzed in detail and has minimized or avoided, when possible, adverse impacts to SARI's cultural landscape. Applicable concurrence and/or approvals associated with construction of the MREC would be obtained from the VI SHPO following completion of the EA and signing of the FONSI but

prior to the start of the construction of the MREC. The No Action Alternative would not impact the cultural landscape of SARI.

4.9 HUMAN ENVIRONMENT

4.9.1 Recreation

Preferred Action (East Site) – Construction of the MREC would cause minor, short-term, adverse impacts to land-based recreational activities (i.e., hiking). Navigation in the vicinity of the project would be impacted from maintenance dredging and construction activities needed for the installation of the boat dock and moorings preventing the use of portions of the Mangrove Lagoon and bay. An increase in turbidity and activity in the water may decrease the quality of kayaking, swimming, and snorkeling in the immediate area during dredging and construction. These impacts to recreation would be minor, temporary, and adverse. However, long-term moderate benefits to recreation would occur during the operational phase of the MREC. The MREC would attract more visitors to SARI and would become an integral component of the overall tourism experience for St. Croix and the Virgin Islands.

South Site Alternative – No land-based recreational activities (i.e., hiking) are currently available at the South Site since it is not public land. Navigation in the vicinity of the project would be impacted from maintenance dredging and construction activities needed for the installation of the boat dock and moorings preventing the use of portions of the bay. An increase in turbidity and activity in the water may decrease the quality of kayaking and swimming in the immediate area during dredging and construction. These impacts to recreation would be minor, adverse, and temporary. As stated above, long-term, moderate, benefits to recreation would occur during the operational phase of the MREC.

West Site Alternative – Construction of the MREC would cause minor, short-term impacts to the area surrounding the NPS Visitor Center since this is where most of the construction for the MREC buildings would occur. The Visitor Center is planning to continue to operate during construction of the MREC. Construction of the MREC would not affect scuba diving, snorkeling, swimming, and kayaking. There would be minor short-term impacts to recreation from the construction of the wet lab and maintenance buildings proposed to be located at the marina. The temporary impacts to recreation include SCUBA, kayaking, and boating during the MREC construction activities. These impacts to recreation would be minor, adverse, and temporary. As stated above, long-term, moderate benefits to recreation would occur during the operational phase of the MREC.

No Action Alternative – Under the No Action Alternative, recreational opportunities would remain the same at SARI. Current levels of visitor services would remain unchanged. No long-term benefits to recreation would occur since the MREC would not be built as part of the No Action Alternative.

Conclusion – There would be minor, short-term, adverse impacts to recreational resources in the vicinity of SARI regardless of the alternative during construction. The No Action Alternative would not result in impacts to SARI's recreational resources. For all Project Site Alternatives, long-term, moderate, benefits to recreation would occur from the MREC by attracting more visitors to SARI and by becoming an integral component of the overall tourism experience for the USVI. None of the alternatives would cause impairment to park resources.

4.9.2 Socioeconomic Conditions

Project Site Alternatives – Implementation of the MREC would improve the quality of life in the Salt River Bay region by providing additional opportunities for educational programs for students and the general public regardless of the alternative. Through the participating institutions of the MREC,

scholarships and stipends to local students may occur. The MREC would also provide comprehensive long-term research programs. Additional opportunities for incentives for partnering with local governments, community groups, and individual citizens would be provided by the MREC; all of which would create a potential economic benefit to the community. As an individual entity, it is estimated that the MREC would contribute to the local economy by attracting more visitors to SARI. It also has the potential in the future to become an integral component of the overall tourism experience for the Virgin Islands.

In addition, the MREC would contribute directly to the local economy by hiring permanent and part-time employees and purchasing goods and services from local suppliers. The local economy would benefit from a short-term increase in employment during construction by the creation of new jobs. Regardless of the alternative, the local economy would benefit.

West Site Alternative – There is a potential that the project would have a negative impact on the current businesses at the marina, which would be from the reuse of some of the existing buildings at the site for the Wet Lab and Maintenance Building. Some of the current businesses at the marina may also be impacted during construction of these buildings. Additionally, there would be an impact on the use of the public boat slips at the marina, since the MREC would need to acquire the use of as much as ½ of the existing slips that are currently available to the boating community for regular use and in the event of a hurricane. The current private boats would lose their preferred slips in the marina, which would result in a long-term, moderate, adverse impact to some of the current boat slip users and a long-term, major, adverse long term impacts to the current business owners.

No Action Alternative – The No Action Alternative would not result in any impacts to the community. The benefit to the local economy from the hiring of permanent and part-time employees and the purchasing goods and services from local suppliers would not happen. The local economy would not benefit from a short-term increase in employment during construction by the creation of new jobs.

Conclusion – Implementation of the MREC would result in beneficial impacts to the local communities. The No Action Alternative would not result in impacts to the surrounding community. None of the alternatives would cause impairment to park resources.

4.9.3 Environmental Justice

Project Site Alternatives – The minority population and persons living below the level of poverty is similar for the communities adjacent to the East Site (45% minority, 37% below poverty level) and West Site (32 % minority, 40% below poverty level). However, for the communities adjacent to the South Site, the minority populations are 65 % and persons living below the level of poverty are 92 %. Even though there are disproportionate minority and low-income communities at the South Site as compared to the East and West Sites, the MREC would actually benefit all the local communities by providing jobs and additional educational opportunities.

No Action Alternative – The No Action Alternative would not result in any impacts to low-income or minority communities.

Conclusion – The project would result in beneficial impacts to the region's low-income and minority communities by providing additional jobs and educational opportunities. The No Action Alternative would not result in impacts to surrounding low-income or minority communities. None of the alternatives would cause impairment to park resources.

4.9.4 Aesthetics

Preferred Action (East Site) **–** Aesthetics would be altered from current conditions at the East Site; however, the MREC buildings would be constructed to blend in as much as possible with the natural surroundings. This would be accomplished by restricting building heights and using natural paint colors for the exterior of the buildings and roofs. Additionally, the view of the MREC structures would be shielded from ocean approaches from the east as the structures intentionally hug the hillside in this area and placement of the buildings was chosen to minimize impacts to adjacent residents as well as revegetation would partially screen the site from adjacent residents. A balance between maintaining important views and re-establishing native plants would be a priority. The Preferred Alternative would cause short-term, minor adverse disturbances during construction and long-term, moderate, adverse effects to the aesthetics at this site.

South Site Alternative **–** As with the Preferred Alternative aesthetics would be altered from current conditions; however, the MREC buildings would be constructed to blend in as much as possible with the natural surroundings by restricting building heights and using natural paint colors. The buildings would also be screened by topography and vegetation. This site would reuse some of the current structures on-site; the Education Center would be located in an existing building. This site would have the least visual impact on the Salt River Bay especially true for views looking from outside the bay by placement of the cafeteria and dormitories behind the hill which dominates the point. The South Site Alternative would cause short-term, minor, adverse disturbances during construction and long-term, minor, adverse effects to the aesthetics at this site.

West Site Alternative **–** As with the Preferred Alternative and the South Site aesthetics would be altered from current conditions. Most of the building program would be located on the Visitor Contact Station site which would include the main MREC building, a cafeteria building, and dormitories converted from the existing residential buildings. Developing on the ridge top at the Visitor Contact Station could create a visual impact, as both the Visitor Contact Center and MREC buildings would be visible from the bay and the ocean. However, most facilities would be located on the inland side of the ridge to reduce the visual impact from the ocean. Revegetating would also screen views of the development to the west and help frame other views. The proposed use of this site would increase the density of buildings on the ridge, but the entire Salt River Bay watershed is already dotted with homes. As with the other sites, building heights would be restricted and natural paint colors would be used for the exterior of the buildings and roofs.

At the marina would be located the maintenance building and wet labs, either constructed as new or located in an existing building. The Salt River Marina is tucked back into the southwest corner of the bay and is not visible from the ocean. Use of this site would not have an adverse affect on the aesthetics at the site and on SARI's cultural landscape.

The West Site Alternative would cause short-term, minor, adverse disturbances during construction and long-term, moderate, adverse effects to the aesthetics at this site.

No Action Alternative **–** The No Action Alternative would not result in changes to the aesthetic appearance of SARI. The surrounding viewshed would also remain relatively unchanged compared to the Preferred Alternative, and South Site and West Site alternatives.

Conclusion **–** All sites would have short-term, minor, adverse disturbances during construction and long-term, minor, adverse effects to the aesthetics at the South Site and long-term, moderate, adverse effects to the aesthetics at the East and West Sites. However, the MREC buildings and structures would be constructed to blend in as much as possible with the current surroundings and the surrounding viewshed

would be protected as much as possible. The No Action Alternative would not result in changes to the aesthetic appearance of SARI. None of the alternatives would cause impairment to park resources.

4.9.5 Public Health and Safety

Project Site Alternatives – The proposed project would include building and structure designs that would comply with fire safety, mechanical and electrical codes and regulations. Accessibility for visitors with disabilities would be implemented during the design process for the MREC. All structures, parking facilities, visitor circulation paths and vehicles used to transport visitors would meet the requirements of the Americans with Disabilities Act (ADA). Even though not mandatory, strict building standards to achieve increased wind and/or flooding resistance would be adhered to for coastal storm hazards. Mandatory safety requirements as well as non-mandatory precautions would benefit overall visitor experience, and would not result in an impairment to park resources.

No Action Alternative – Under the No Action Alternative, the site would remain unchanged and the MREC would not be implemented.

Conclusion – The proposed project would comply with fire safety, mechanical and electrical codes and regulations. All structures, parking facilities, visitor circulation paths and vehicles used to transport visitors would meet the requirements of the ADA. Under the No Action Alternative, the site would remain unchanged and the MREC would not be implemented. None of the alternatives would cause impairment to park resources.

4.9.6 Energy Requirements and Conservation

Project Site Alternatives – Energy is required for heating and cooling of constructed buildings and for vehicles operating on the site. NPS management policies require that all facilities be managed, operated, and maintained to minimize energy consumption. The policies also require that new energy-efficient technologies be used where appropriate and cost-effective. Energy consumption and natural resource requirements would minimally increase during all phases of construction and operation of the MREC regardless of the alternative. During the construction phase, energy requirements would be temporary. However, minor increases in energy consumption would occur to operate the many components of the MREC. These would primarily occur through electricity supplied from USVI WAPA and from fuel needed to operate generators, vehicles, and boats. Actions to promote sustainable development in the design, retrofit, and construction of facilities have associated energy conservation and air quality benefits.

The use of green development for the proposed MREC would include solar, wind, and recycled materials to be used whenever possible and that wastewater/sewage would be treated with the latest technologies resulting in the least amount of impact on the environment. The following energy conservation and sustainable resources would be included in the final design for MREC where practical and cost efficient: alternative power such as solar panels and windmills, solar hot water systems high-volume rainwater collecting cisterns, reverse-osmosis freshwater production system (produces about 3,000 gallons a day), composting toilets, and pervious pavers/substrate for parking lots and roads. Minor, long-term increases in energy and natural resource requirements would occur for the MREC regardless of the alternative. However, wherever possible, energy conservation would be applied and sustainable resources would be used.

No Action – The site would remain in its current use, and no action would be taken; therefore, there would be no changes to the energy requirements and conservation at the site.

Conclusion – Minor, long-term increases in energy and natural resource requirements would occur for the MREC regardless of the alternative. However, wherever possible, energy conservation would be applied and sustainable resources would be used. The No Action Alternative would result in the site remaining in its current use, and no action would be taken; therefore, there would be no changes to the energy requirements and conservation at the site. None of the alternatives would cause impairment to park resources.

4.9.7 Infrastructure

Utilities

Impacts resulting from proposed water use, energy use, and waste disposal would not differ among the three alternatives. Electricity is currently provided to the South and West Site Alternatives, but would need to be installed at the Preferred Alternative (East Site). However, utility development at the East Site may be a benefit for this alternative due to the lack of existing infrastructure. The lack of utility infrastructure at the East Site would provide the NPS with the opportunity to design the MREC infrastructure independent of existing territorial utilities. Benefits would include: not burdening the existing system, underground utilities providing eliminating overhead poles which would reduce the amount of utility service, reduce hurricane impacts, and provide for the lowest profile on the landscape.

Roads and Site Access

Preferred Alternative (East Site) - The circuitous and narrow character of the current access to the site through the private gated community of Estate Judith's Fancy, necessitates that a more direct road access be developed for the MREC. The Haul Road, proposed to be constructed for the abandoned hotel demolition, would be improved and converted into a low traffic public road for access to the east side of the park following demolition activities. Access to the MREC would be to the north along the proposed public access road from Route 79 (Bennie Benjamin Road).

South Site Alternative – Since this site is privately owned, the NPS would need to acquire this site to change the access to the site from a private road to a NPS road. Access to the South Site would be to the north from Route 75 (North Side Road) to Route 79 (see Figure 2-3).

West Site Alternative – Public road access to the Salt River Marina and the Visitor Contact Station would be from the south by way of public roads Route 80 (North Shore Road) and Route 801 (see Figure 2-3).

Traffic

Vehicle trips to SARI would increase slightly with the addition of the MREC; however, the operational phase of the MREC is not expected to generate a significant increase of traffic in the SARI area.

Preferred Alternative (East Site) – Minor, long-term, beneficial impacts to the Estate Judith's Fancy community would occur from vehicle traffic during the operational phase of the MREC. The proposed public access road (if built) planned for the east side of the park would allow public access to the MREC and would reduce the impact on the private Judith's Fancy community (see Figure 2-6). This would benefit the community by diverting all park traffic and beach access traffic from the private gated community to the proposed public access road.

South Site Alternative – Minor, short- and long-term, adverse impacts to the Estate Montpellier community would occur from increased vehicle traffic during the construction and operational phase of

the MREC. Vehicles would mainly access the MREC from the south by way of a public road Route 79 (Bennie Benjamin Road) (Figure 2-3).

West Site Alternative – Minor, short- and long-term, adverse impacts to the Estate Salt River and Estate Morningstar communities would occur from increased vehicle traffic during the construction and operational phase of the MREC. Vehicles would mainly access the MREC from the south by way of public roads (Routes 80 and 801) (see Figure 2-3).

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No Action – The site would remain in its current use, and no action would be taken; therefore, there would be no changes to the traffic conditions in the vicinity of SARI.

Conclusion – Minor, short- and long-term, adverse impacts to local communities would occur from increased vehicle traffic during the operational phase of the MREC for the South and West Site Alternatives. However, minor, long-term, beneficial impacts would occur for the Estate Judith's Fancy community since park vehicle traffic would be diverted to a new route via the proposed public access road. The No action alternative would result in no changes to the traffic conditions in the vicinity of SARI. None of the alternatives would cause impairment to park resources.

4.10 VISITOR USE

Project Site Alternatives – Currently, SARI is utilized by the local residents and tourists, mainly for recreation. The visitor experience at SARI would be greatly enhanced from current conditions for all Project Site Alternatives through the addition of the MREC. The MREC would provide an Education Center which would promote the sustainable utilization and conservation of marine resources through educational programs. The MREC would include an interactive interpretation center with aquaria for public viewing of local species and ecosystems. Overall, moderate, long-term benefits would occur from the MREC by attracting more visitors to SARI and by becoming an integral component of the overall tourism experience for the USVI. Short-term, adverse, minor disturbances would occur during the construction period; however, in the long-term, visitor experience at SARI would benefit from the proposed center. Visitors would be aware of the additional sound and visual effects associated with the construction of the MREC, but adverse effects would be slight.

No Action Alternative – Under the No Action Alternative, the existing uses at SARI would continue to limit the experience of visitors to sustainable utilization and conservation of marine resources.

Conclusion – In summary, the MREC would have beneficial impacts on visitor experience regardless of the alternative. The No Action Alternative would limit the experience of visitors. None of the alternatives would cause impairment to park resources.

4.11 PARK OPERATIONS

Project Site Alternatives – Park maintenance and operations would be increased over current levels regardless of the alternative. Park operations would experience minor, short-term, impacts during construction and moderate, long-term, beneficial impacts during operation. Current activities at SARI (i.e., hiking, boating, snorkeling, and scuba diving) would be allowed to continue uninterrupted during the construction period. Following completion of construction, park operations and park staff would increase over the current levels for the operation phase of the MREC. Beneficial impacts would result from a full-time presence of park staff at SARI which would result in improved security.

No Action Alternative – Under the No Action Alternative, park operations would remain unchanged and there would be no impacts to SARI.

Conclusion – The proposed project would have minor, long-term, beneficial impacts during operation of the MREC due to a full-time presence of park staff at SARI which would result in improved security. The No Action Alternative would not result in impacts to park operations. None of the alternatives would cause impairment to park resources.

4.12 SUMMARY OF IMPACTS

Table 4-2 presents a summary of the potential environmental and socioeconomic impacts for each alternative for this project. Following comparisons of the Preferred Alternative (East Site Alternative), the South Site Alternative, and the West Site Alternative all three alternatives result in similar resource impacts.

Short-Term Impacts

The construction phase of the MREC, installation of the seawater supply pipeline, and maintenance dredging would have short-term, minor, adverse effects to the soils and sediments, air quality, noise, water quality, coral reef/hardbottom substrate, fish, recreation, aesthetics, and visitor use at the park regardless of the alternative. The project may result in potential sediment runoff into nearby waterways during the clearing of vegetation and construction and grading activities. Best management practices (BMPs) would be used to minimize potential soil erosion and minimize impacts to Salt River Bay. The use of semi-pervious surfaces (i.e., gravel and grass parking areas) would be used wherever possible to minimize the creation of new impervious surfaces areas. Construction of a boat dock and ramp at the Preferred Alternative (East Site Alternative) and the South Site Alternative would also result in short-term, minor adverse impacts to the soils and sediments, water quality, fish, and mangroves/wetlands at these alternative locations. As a result of the wetlands impacted by the proposed MREC, an SOF for wetlands was prepared which included a wetland mitigation plan which offsets the majority of proposed wetland impacts. As a result of the Federal (USACE) mangrove wetlands impacted by the proposed MREC and the proposed maintenance dredging, a Section 10/404 Permit would be required. The permit would be acquired prior to the initiation of construction and dredging activities.

All three alternatives are located within Tier 1 of the coastal zone resulting in short-term, minor adverse impacts from the MREC; however, the project is expected to be consistent, to the maximum extent practicable with the VICZMP.

Long-Term Impacts

In the long-term, implementation of the MREC would have minor, adverse effects to the hydrology, air quality, noise, water quality, and energy requirements at the park regardless of the alternative. Maintenance dredging proposed for all three alternatives would have long-term, minor, adverse impacts to the bathymetry, seagrasses, and the benthic community at the park. However, in the long term, water quality in the Mangrove Lagoon (Preferred Alternative - East Site) has the potential to improve from being dredged since it would provide for improved flushing of the lagoon which would ultimately improve the water quality in the lagoon as well as providing a benefit to the mangroves. Long-term, minor, adverse effects to the 100-year floodplain and CRBS areas would occur from the construction of structures (i.e., Wet Lab, boat dock) at all the action alternatives. However, these structures would be constructed on pilings so as to not impede the function of the floodplain and the CRBS areas. Non water dependent buildings associated with the MREC were purposely placed outside of the 100-year floodplain and CRBS areas to minimize impacts to these resources. Implementation of the MREC would have long-term, minor to moderate, adverse effects to the birds, mammals, and vegetation at the South and West Site Alternatives. Forested (semi-deciduous) habitat, vegetated fields, and shrub habitat would be impacted

due the MREC facilities, roads, and associated parking facilities. However, long-term, minor to moderate, beneficial impacts would result from the replacement of non-native invasive plant species with appropriate native vegetation and revegetating disturbed areas (i.e., mud flats, bare areas, areas dominated by African guinea grass) beyond the MREC footprint at the Preferred Alternative (East Site).

T & E Species, Designated Critical Habitat, and Unique Natural Systems

No impacts to threatened and endangered species (T&E) species are anticipated as a result of the construction of the MREC, as the majority of these construction activities would occur on land. However, short-term, minor, adverse impacts to listed species could occur from in-water work, including construction of the boat dock and maintenance dredging regardless of the alternative. These activities, along the proposed seawater supply pipeline, which may also have short-term, minor, adverse impacts to listed species for all three alternatives (depending on the exact location) would also require coordination with the NMFS prior to construction for compliance with Section 7 of the ESA. However, TOY restrictions would be in place to avoid short-term, minor, adverse impacts to both listed coral species and sea turtle species.

No impacts to designated critical habitat for the Federally-listed leatherback sea turtle are anticipated with the project alternatives. However, short-term, minor, adverse impacts to listed sea turtle species could potentially occur from in-water work. Minor, adverse impacts to mangroves, identified as critical habitat, are anticipated as a result of the Preferred Alternative (East Site) and the South Site Alternative. However, mangrove mitigation measures through plantings at a specified ratio of 3:1 would be required to partially offset the loss of mangrove habitat associated with the construction of the MREC. For all three alternatives, minor, adverse, short-term impacts to the coral reefs would occur from installation of the seawater supply pipeline, although no impact to the coral reef is expected. The impacts to coral reefs would be minimized by routing the seawater supply pipeline to avoid areas of high quality coral reefs.

For all three project site alternatives, the MREC facility would provide long-term, moderate, beneficial impacts to the unique natural systems at SARI, especially the coral reefs and mangrove habitat by fostering public awareness of the importance of coral reefs and other marine ecosystems from economic, aesthetic and global health standpoints though educational programs for students and the general public. The MREC would also foster the understanding and proper management of coral reef and other tropical and sub-tropical marine ecosystems by initiating a comprehensive long-term research and education program in the U. S. Virgin Islands.

Cultural Resources

Of the three alternatives under consideration for the implementation of the MREC, only a portion of East Site, has received comprehensive archaeological surveys and is the location of known archaeological sites. Regardless of the alternative, detailed archeological surveys would likely be required. The Preferred Alternative (East Site) would affect known archeological sites and further archaeological testing in accordance with Section 106 of the NHPA would be required to determine if these sites are eligible for listing on the NRHP. Additionally, there is also the potential for submerged resources (shipwrecks, etc.) in the bay itself for all three project site alternatives. None of the alternative has the potential to affect historic resources at the park. All three alternatives could potentially have a long-term, minor to moderate, adverse visual effect on the cultural landscape of SARI. Section 106 and Section 110 compliance are required and would be completed for this project. Applicable concurrence and/or approvals associated with construction of the MREC would be obtained from the VI SHPO following completion of the EA and signing of the FONSI but prior to the start of the construction of the MREC.

Recreation and Aesthetics

There would be minor, short-term, adverse impacts to recreational resources at the park regardless of the alternative during construction. However, for all alternatives, long-term, moderate, benefits to recreation would occur from the implementation of the MREC by attracting more visitors to SARI and by becoming an integral component of the overall tourism experience for the USVI. Impacts to the aesthetics at the park during construction would be short-term, minor, and adverse regardless of the alternative and in the long-term the impacts would range from minor to moderate. However, the MREC buildings and structures would be constructed to blend in as much as possible with the current surroundings and the surrounding viewshed would be protected as much as possible. Minor, long-term, adverse impacts to local communities would occur from increased vehicle traffic during the operational phase of the MREC for the South and West Site Alternatives. However, minor, long-term, beneficial impacts would occur for the Estate Judith's Fancy community since park vehicle traffic would be diverted to the new route through the Historic Service Road.

Socioeconomic Conditions

Implementation of the MREC would improve the quality of life in the Salt River Bay region by providing additional opportunities for educational programs for students and the general public regardless of the alternative. Additional opportunities for incentives for partnering with local governments, community groups, and individual citizens would also be provided by the MREC; all of which would create a potential economic benefit to the community. As an individual entity, it is estimated that the MREC would contribute to the local economy by attracting more visitors to SARI. In addition, the MREC would contribute directly to the local economy by hiring permanent and part-time employees and purchasing goods and services from local suppliers. The region's low-income and minority communities would also benefit from the additional jobs and educational opportunities provided by the MREC. However, for the West Site Alternative, there is a potential that the project would have a negative impact on the current businesses at the marina and on the use of the public boat slips, since the MREC would need to acquire the use of as much as ½ of the existing slips that are currently available to the boating community. This would result in a long-term, moderate, adverse impact to some of the current boat slip users and a long-term, major, adverse impact to the current business owners.

Visitor Experience and Park Operations

Implementation of the MREC would have long-term beneficial impacts on visitor experience regardless of the alternative. Park maintenance and operations would be increased over current levels for all alternatives. The proposed project would result in moderate, long-term, beneficial impacts during park operation due to the full-time presence of park staff at SARI which would result in improved park security.

No Action Alternative

Under the No Action Alternative, there would be no adverse impacts to the resources discussed previously. Many benefits to the park would never be realized under the No Action Alternative. The benefit to the local economy from the hiring of permanent and part-time employees and the purchasing goods and services from local suppliers would not happen. The local economy would also not benefit from a short-term increase in employment during construction by the creation of new jobs. No long-term benefits to recreation would occur. No long-term beneficial impacts associated with the MREC facility would occur including the experience of visitors to learn about sustainable utilization and conservation of

marine resources. The long-term beneficial impacts to the unique natural systems at SARI, especially the coral reefs and mangrove habitat would not occur.

Overall, none of the alternatives including the No Action would cause impairment to park resources.

TABLE 4-2. MATRIX OF POTENTIAL ENVIRONMENTAL AND SOCIOECONOMICS IMPACTS BY ALTERNATIVES FOR THE PROPOSED MREC

Resource	No Action Alternative	Preferred Alternative (East Site) South Site Alternative West Site Alternative
Soils/ Sediments	• No additional beneficial or adverse impacts.	• Localized short-term, minor, adverse effects from construction activities, including installation of seawater supply pipeline. • Localized short-term, minor, adverse effects from maintenance dredging. Previous dredging has occurred at all locations. • Preferred Alternative and South Site Alternative – Short-term, minor, adverse effects from construction of boat ramp/dock.
Bathymetry	• No additional beneficial or adverse impacts.	• Localized, long-term, minor, impacts to water depths from maintenance dredging. Water depths are expected to increase.
Air Quality	• No additional beneficial or adverse impacts.	• Minor, long-term, adverse impacts from mobile sources associated with the MREC facilities. • Negligible, long-term, adverse impacts from stationary sources associated with the MREC. • Short-term, minor, adverse impacts from construction activities.
Noise	• No additional beneficial or adverse impacts.	• Localized, short-term, minor, adverse impacts from construction activities. • Localized, long-term, minor, adverse effects from noise associated with the use of the MREC facilities (i.e., generators, additional vehicle traffic, and operation of boats). • Short-term, minor, adverse effect from maintenance dredging activities.
Light	• No additional beneficial or adverse impacts.	• Negligible long-term, adverse light effects to the surrounding local community. • Nighttime lighting would be at low levels and would not include any bright intrusive lights.
Climate	• No additional beneficial or adverse impacts.	• Implementing strict building standards to achieve increased wind and/or flooding resistance would minimize damage from coastal storms.
Seismicity	• No additional beneficial or adverse impacts.	• MREC facilities would not be placed on reclaimed land. Current building codes to construct earthquake-resistant structures would be implemented.
Water Quality	• No additional beneficial or adverse impacts.	• Short-term, minor, adverse effect would occur due to the potential for erosion runoff from construction and grading activities. This may result in increases of sediment input and turbidity. Erosion and sediment BMPs would be employed during construction activities. • Long-term, minor, adverse effect from increased impervious surfaces. Stormwater management techniques are expected to improve current surface water quality and control additional Stormwater runoff. • Short-term, minor, adverse impacts during implementation of the seawater supply pipeline. • Preferred Alternative and South Site Alternative - Short-term, minor, adverse impacts during construction of boat ramp/boat dock/moorings. • Short-term, minor, adverse impacts from increased turbidity associated with dredging activities. Temporary localized minor impacts to seagrasses, fisheries, mangrove wetlands, and other aquatic life from increased turbidity. • Preferred Alternative - Maintenance dredging in the Mangrove Lagoon would improve water quality in the lagoon thereby providing a long term benefit.
Hydrology	• No additional beneficial or adverse impacts.	• Long-term, minor, adverse effects to the Salt River Bay watershed drainage would occur due to wetland and vegetation impacts from construction of the MREC by increasing impervious surfaces.

TABLE 4-2. MATRIX OF POTENTIAL ENVIRONMENTAL AND SOCIOECONOMICS IMPACTS BY ALTERNATIVES FOR THE PROPOSED MREC

Resource	No Action Alternative	Preferred Alternative (East Site) South Site Alternative West Site Alternative
Floodplains	• No additional beneficial or adverse impacts.	• Long-term, minor, adverse impacts are anticipated to the 100-year floodplain.
Coastal Zone	• No additional beneficial or adverse impacts.	• All three sites are located within the Coastal Zone. Short-term, minor, adverse impacts are anticipated; however, the project is expected to be consistent, to the maximum extent practicable with the VICZMP.
Coastal Barrier Resources System Areas	• No additional beneficial or adverse impacts.	• Long-term, minor, adverse effects from the construction of structures in CBRS Areas.
Wetlands/ Mangroves	• No additional beneficial or adverse impacts.	• Preferred Alternative – Short-term, minor, adverse impacts to approximately 0.03 acres of mangroves and 1.04 acres of other wetlands/open water would be impacted (1.07 total acres). • South Site Alternative – Short-term, minor, adverse impacts to approximately 0.04 total acres (includes Federally-defined wetlands) of mangrove wetlands would be impacted. • West Site Alternative – No impact to mangroves or wetlands is anticipated. • Preferred Alternative - Maintenance dredging in the Mangrove Lagoon would improve water quality in the lagoon thereby providing a long term benefit to mangroves.
Vegetation	• No additional beneficial or adverse impacts.	• Preferred Alternative – Approximately 0.23 acres of forest (semi-deciduous) habitat, 4 acres of vegetated fields, and 3 acres of shrubs would be impacted due to the MREC facilities; short-term, minor, adverse impacts are anticipated. • Preferred Alternative – Long-term, minor, beneficial impacts would result from the replacement of non-native invasive plant species with native vegetation. • South Site Alternative – Approximately 7 acres of forest (semi-deciduous), 0.04 acres of shrubs, and 0.17 acres of vegetated fields would be impacted due to the MREC; impacts would be long-term, moderate, and adverse. • West Site Alternative – Approximately 0.88 acres of forest, 0.71 acres of shrubs, and 2 acres of vegetated fields would be impacted due to MREC facilities, roads, and associated parking facilities. Impacts would be long-term, minor, and adverse.
Birds	• No additional beneficial or adverse impacts.	• South and West Site Alternatives - Long-term, minor, adverse impact to birds as a result of loss of habitat due to vegetation removal. Birds may be temporarily disrupted during the construction operations due to the unavoidable noise and human activity. • Preferred Alternative - Short-term, minor, adverse impact to birds as a result of loss of habitat due to vegetation removal; long-term, minor, beneficial impact to avian species would result from the replacement of non-native vegetation with native vegetation.
Mammals	• No additional beneficial or adverse impacts.	• South and West Site Alternatives - Long-term, minor, adverse impact to mammals in the area due to the loss of habitat. • Preferred Alternative – Long-term, minor, beneficial impact to mammals would result from the replacement of non-native vegetation with native vegetation.
Coral Reef/ Hardbottom Substrate	• No additional beneficial or adverse impacts	• Minor, adverse, short-term impacts to the coral reefs would occur from the installation of the seawater supply pipeline due to an increase in the turbidity in the water. • Minor, adverse, short-term impacts to the hardbottom substrate would occur from the installation of the seawater supply pipeline.

TABLE 4-2. MATRIX OF POTENTIAL ENVIRONMENTAL AND SOCIOECONOMICS IMPACTS BY ALTERNATIVES FOR THE PROPOSED MREC

Resource	No Action Alternative	Preferred Alternative (East Site) South Site Alternative West Site Alternative
Seagrasses	• No additional beneficial or adverse impacts.	• No impacts to seagrasses due to the construction of the MREC facilities. • South and West Site Alternatives -Short-term, minor, adverse impacts to seagrasses from the seawater supply pipeline installation. • Long-term, minor, adverse impacts due to maintenance dredging.
Fish	• No additional beneficial or adverse impacts.	• Short-term, minor, adverse effects to fish would occur during installation of seawater supply pipeline. Construction activities would have temporary, localized effects to fish. • Preferred Alternative and South Site Alternative - Short-term, minor, adverse effects to fish would occur during construction of boat docks, boat ramps, and mooring facilities. Construction activities would have temporary, localized effects to fish. • Short-term, minor, adverse impacts to fish due maintenance dredging activities.
Benthic Organisms	• No additional beneficial or adverse impacts.	• Preferred Alternative and South Site Alternative -Long-term, minor adverse effects would occur during construction of boat dock/boat ramp and mooring facilities. Construction activities would have permanent, localized effects to the benthic community. • Minor, adverse, long-term impacts to the benthic community would occur as a result of the seawater supply pipeline installation and maintenance dredging activities.
Threatened and Endangered Species	• No additional beneficial or adverse impacts.	• No impacts to T&E species are anticipated as a result of the construction of the MREC. • Short-term, minor, adverse impacts to the four federally listed sea turtles if contact with watercraft occurs during construction of the boat dock and seawater supply pipeline. TOY restrictions for in-stream work would be required. • Short-term, minor, adverse impacts to the four federally listed sea turtles if contact with watercraft occurs during maintenance dredging. TOY restrictions for in-stream work would be required.
Unique Natural Resources	• No adverse impacts. • No beneficial impacts of educational programs.	• Long-term, moderate, beneficial impact by fostering public awareness of marine ecosystems through educational programs. • No impacts to designated critical habitat for the Federally listed leatherback sea turtle. • Preferred Alternative and South Site Alternative – Minor, adverse impacts to mangroves identified as critical habitat would occur during the installation of boat dock and launch. • Minor, adverse, short-term impacts to the coral reef would occur from installation of the seawater supply pipeline.
Cultural Resources	• No additional beneficial or adverse impacts.	• Detailed archeological surveys would likely be required for all alternatives. • No impact to historic resources. • South and West Site Alternatives would have a long-term moderate adverse impact on the cultural landscape. • East Site Alternative would have a long-term minor adverse impact on the cultural landscape. • Preferred Alternative has the potential to provide the public with a beneficial educational opportunity.
Recreation	• No adverse impacts. • Level of recreational activities would remain the same.	• Short-term, minor, adverse impacts to recreational resources in the vicinity of SARI • Long-term, moderate, beneficial impact would occur during operational phase. MREC would attract visitors to SARI. • Preferred Alternative – Minor, short-term impacts to land-based recreational activities. • Maintenance dredging and construction of boat docks and moorings, boat ramps, and seawater supply pipeline may cause short-term, minor impacts to in-stream recreation due to increased turbidity and navigation.

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Resource	No Action Alternative	Preferred Alternative (East Site) South Site Alternative West Site Alternative
		• West Site Alternative – Short-term, minor impacts to area surrounding the NPS visitor center due to construction activities.
Socio-economic Conditions	• No additional beneficial from employment at the MREC.	• Long-term, beneficial impact to the local community by providing additional educational programs, employment, and attracting more visitors. • Short-term beneficial impact to local economy by increasing employment during construction. • West Site - Long-term, major adverse impact to businesses at the marina if relocated. • West Site – Long-term, moderate, adverse impacts to public use of boat slips, MREC would use some of the public boat slips that are available to the public.
Environmental Justice	• No additional beneficial or adverse impacts.	• Long-term, beneficial impacts to the region's low-income and minority communities by providing jobs and additional educational opportunities.
Aesthetics	• No additional beneficial or adverse impacts.	• Short-term, adverse, minor disturbances during construction. • Preferred Alternative and West Site Alternative - Long-term, moderate, adverse effects to the aesthetics from the MREC facilities. • South Site Alternative – Long-term, minor, adverse effects to the aesthetics from the MREC facilities.
Public Health and Safety	• No additional beneficial or adverse impacts.	• The MREC facilities would comply with fire safety, mechanical and electrical codes and regulations. All structures, parking facilities, visitor circulation paths, and vehicles used to transport visitors would meet ADA requirements.
Energy Requirements and Conservation	• No additional beneficial or adverse impacts.	• Minor, long-term increases in energy and natural resource requirements would occur. Energy conservation would be applied and sustainable resources would be used.
Infrastructure	• No additional beneficial or adverse impacts.	• South Site Alternative and West Site Alternative –Minor, long-term, adverse impacts to local communities would occur from increased vehicle traffic during the operational phase of the MREC. • Preferred Alternative – Minor, long-term, beneficial impacts to Estate Judith's Fancy community would occur from increased traffic during the operational phase due to the diverted park access through the community.
Visitor Use	• Loss of additional visitors to SARI.	• Long-term, beneficial impacts on visitor experience. • Short-term, minor, adverse impacts would occur during construction period.
Park Operations	• No additional beneficial or adverse impacts.	• Long-term, minor, beneficial impacts during operation of the MREC due to a full-time presence of park staff at SARI which would result in improved security.