National Park Service
U.S. Department of the Interior

Gateway National Recreation Area
New York / New Jersey

GATEWAY NATIONAL RECREATION AREA

Personal Watercraft Use Environmental Assessment

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April 2003

SUMMARY

The purpose of and the need for taking action is to evaluate a range of alternatives and strategies for the management of personal watercraft (PWC) use at Gateway National Recreation Area in order to ensure the protection of park resources and values while offering recreational opportunities as provided for in the recreation area's enabling legislation, purpose, mission, and goals. Upon completion of this process in accordance with the National Environmental Policy Act (NEPA), the National Park Service (NPS) may either take action to adopt special regulations to manage PWC use, or it may discontinue PWC use at this park.

BACKGROUND

More than one million personal watercraft are estimated to be in operation today in the United States. Sometimes referred to as "Jet Skis" or "Wet Bikes," these vessels use an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. They are used for enjoyment, particularly for touring and maneuvers such as wave jumping, and they are capable of speeds in the 60 mph range. While PWC use remains a relatively new recreational activity, it has occurred in 32 of the 87 national park system units that allow motorized boating.

After studies in Everglades National Park showed that PWC use resulted in damage to vegetation, adverse impacts to shorebirds, and disturbed the life cycles of other wildlife, the National Park Service prohibited PWC use by a special regulation at the park in 1994. In recognition of its duties under its Organic Act and NPS *Management Policies,* as well as increased awareness and public controversy about PWC use, the National Park Service subsequently reevaluated its methods of PWC regulation. Historically, the National Park Service had grouped personal watercraft with all vessels; thus, PWC use was allowed when the unit's superintendent's compendium allowed the use of other vessels. Later the Park Service closed seven units to PWC use through the implementation of horsepower restrictions, general management plan revisions, and park-specific regulations such as those promulgated by Everglades National Park.

In May 1998 the Bluewater Network filed a petition urging the National Park Service to initiate a rulemaking process to prohibit PWC use throughout the national park system. In response to the petition, the Park Service issued an interim management policy requiring superintendents of parks where PWC use can occur but had not yet occurred to close the unit to such use until the rule was finalized. The Park Service envisioned the servicewide regulation as an opportunity to evaluate impacts from PWC use before authorizing the use. On March 21, 2000, the National Park Service issued a regulation prohibiting PWC use in most units and required 21 units to determine the appropriateness of continued PWC use.

In response to the PWC final regulation, Bluewater Network sued the National Park Service, challenging the National Park Service's decision to allow continued PWC use in 21 units while prohibiting PWC use in other units. In response to the suit, the National Park Service and the Bluewater Network negotiated a settlement. While 21 units could continue PWC use in the short term, each of those parks desiring to continue long-term PWC use must promulgate a park-specific special regulation in 2002. In addition, the settlement stipulated that the National Park Service must base its decision to issue a park-specific special regulation to continue PWC use through an environmental analysis conducted in accordance with the National Environmental Policy Act. The NEPA analysis at a minimum, according to the settlement, must evaluate PWC impacts on water quality, air quality, soundscapes, wildlife, wildlife habitat, shoreline vegetation, visitor conflicts, and visitor safety.

With the settlement deadlines approaching and the units preparing to no longer allow PWC use, the National Park Service, Congress, and PWC user groups sought legal methods of keeping parks open for PWC use. However, no method was successful. Thus, on April 22, 2002, Gateway National Recreation Area closed to PWC use. Units that identify a preferred alternative that continues PWC use must draft a special regulation to authorize PWC use.

ALTERNATIVES CONSIDERED

This environmental assessment evaluates four alternatives addressing the use of personal watercraft at the three park units of Gateway National Recreation Area — Jamaica Bay, Staten Island, and Sandy Hook. Each unit is assessed separately, but variations of the following four alternatives are considered for each unit:

Alternative A — Continue PWC use under a special regulation.

Alternative B — Continue PWC use under a special regulation with geographic restrictions.

Alternative C — Continue PWC use under a special regulation with geographic restrictions and/or additional management restrictions in each unit.

No-Action Alternative — Ban PWC use throughout the unit.

The preferred alternative at each unit is as follows:

Jamaica Bay Unit: Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions. A special regulation would be promulgated to continue PWC use within the Jamaica Bay Unit but only in the following navigational channels: North Channel (Island Channel), Beach Channel (South Channel), Grass Hassock Channel, Rockaway Inlet, and Broad Channel to the trestle bridge (the Raunt). PWC users would be prohibited from landing or launching within the unit. PWC owners living on the adjacent creeks, basins, and waterways would be allowed access through the unit; however, they must stay within the buoyed route (if one is present) or take the most direct route to access the designated navigational channels from Gerritsen Creek, Mill Basin, Paerdegat Basin, Shellbank Basin, Hawtree Creek, Breezy Point, and Roxbury. PWC use would be restricted from all waters along Breezy Point, and a 150-foot buffer would be implemented around all protected areas within Jamaica Bay (even if they occur within a channel).

Staten Island Unit: Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions. A special regulation would be promulgated to continue PWC use, but no landing or launching of any vessels within the unit would be allowed except at the Great Kills Park boat launch. PWC operation would be prohibited in salt marshes within the unit. Personal watercraft would be prohibited from the unit boundaries around Hoffman and Swinburne Islands and from all waters along the oceanside of the unit, including those waters at Crookes Point (Great Kills Park), Miller Field, and Fort Wadsworth. Operational restrictions at the unit include those regulations mandated by New York State boating regulations.

Sandy Hook Unit: Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions. A special regulation would be promulgated to continue PWC use, but only in the Shrewsbury River Channel, connecting Shrewsbury River (at the southernmost boundary of the unit) with the waters of Sandy Hook Bay west of the park boundary. PWC use would not be allowed in the Sandy Hook Channel, the False Hook Channel (which parallels the Atlantic coast beaches), or in any of the oceanside waters. All operational restrictions, including the New Jersey State boating regulations, would continue to be enforced within the Shrewsbury River Channel.

The alternatives, as proposed for each unit, are discussed in detail in the "Alternatives" section for each unit.

Based on the analysis prepared for PWC use at Gateway National Recreation Area, the alternatives chosen by the individual recreation area units are the environmentally preferred alternatives at each respective unit, best fulfilling park responsibilities as trustee of this sensitive habitat; ensuring safe, healthful, productive, and aesthetically and culturally pleasing surroundings; and attaining a wider range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.

ENVIRONMENTAL CONSEQUENCES

Impacts of the three PWC management alternatives were assessed in accordance with *Director's Order #12: Conservation Planning, Environmental Impact Analysis and Decision-making.* The *Director's Order #12 Handbook* requires that impacts to park resources be analyzed in terms of their context, duration, and intensity. It is crucial for the public and decision-makers to understand the implications of those impacts in the short and long term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists.

To determine impacts, methodologies were identified to measure the change in park resources that would occur with the implementation of the PWC management alternatives. Thresholds were established for each impact topic to help understand the severity and magnitude of changes in resource conditions, both adverse and beneficial.

Each PWC management alternative was compared to a baseline to determine the context, duration, and intensity of resource impacts. For purposes of impact analysis, the baseline (alternative A) is the continuation of PWC use and current management projected over the next 10 years, in accordance with the "Superintendents' Compendiums" (see appendix A).

Because park units vary based on their enabling legislation, natural resources, cultural resources, and missions, the recreational activities appropriate for each unit and for areas within each unit vary as well. An action appropriate in one unit may impair resources in another unit. If PWC use was banned at any unit (the no-action alternative), it is assumed that PWC users accustomed to recreating in that unit would not travel to another Gateway unit to use personal watercraft because of the distance involved (i.e., PWC users at Staten Island would not travel to Sandy Hook if Staten Island was closed to PWC use). Therefore, no cumulative impacts were assumed under the no-action alternative.

Tables A, B, and C summarize the results of the impact analysis for the impact topics that were assessed at each unit. The analysis considered a 10-year period (2002–2012). No park resources or values would be impaired under any alternative.

TABLE A: SUMMARY OF THE IMPACT ANALYSIS — JAMAICA BAY UNIT

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions	No-Action Alternative — No PWC Use
Water Quality	PWC use impacts: Negligible impacts for all pollutants in all areas in 2002 and 2012. Cumulative impacts: Negligible impacts based on ecotoxicological benchmarks in 2002 and 2012. Minor impacts based on human health benchmarks in 2002, decreasing to negligible by 2012.	PWC use impacts: Similar to alternative A, with beneficial impacts from closing Breezy Point to PWC use and restricting PWC use to the main navigational channels (except Winhole Channel). Cumulative impacts: Similar to alternative A.	PWC use impacts: Similar to alternative A, with beneficial impacts from closing Breezy Point to PWC use and restricting PWC use to the main navigational channels (including Winhole Channel). Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts from banning PWC use. Cumulative impacts: Similar to alternative A.
Air Quality				
• Impacts on Human Health (Jamaica Bay is in a maintenance area for CO, and in a severe nonattainment area for ozone.)	PWC use impacts: Major adverse impacts from CO; negligible adverse impacts from PM. For ozone precursors, major adverse impacts from VOC emissions in 2002, decreasing to moderate by 2012; minor adverse impacts from NO_x. Cumulative impacts: Major adverse impacts from CO emissions (as defined by the federal conformity rule for a nonattainment area) in 2002 and 2012; negligible adverse impacts from PM. Major adverse impacts from VOC; moderate adverse impacts from NO_x in 2002, increasing to major by 2012.	PWC use impacts: Similar to alternative A. Cumulative impacts: Similar to alternative A.	PWC use impacts: Similar to alternative A. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts as a result of banning PWC use. Cumulative impacts: Similar to alternative A except no contribution from PWC use.
• Impacts on Air Quality Related Values	PWC use impacts: Moderate adverse impacts for ozone, but no perceptible visibility impacts or observed ozone injury to plants. Cumulative impacts: Moderate adverse ozone impacts; negligible visibility impacts.	PWC use impacts: Similar to alternative A. Cumulative impacts: Similar to alternative A.	PWC use impacts: Similar to alternative A. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts from banning PWC use. Cumulative impacts: Similar to alternative A, except no contribution from PWC use.
Soundscapes	PWC use impacts: Negligible to minor adverse impacts over the short and long term. Cumulative impacts: Negligible to moderate adverse impacts over the short and long term. Minor impacts to other visitors; minor to moderate impacts compared to the natural soundscape.	PWC use impacts: Similar to alternative A in and near navigational channels open to PWC use; beneficial impacts in closed areas. Cumulative impacts: Similar to alternative A.	PWC use impacts: Similar to alternative A in and near navigational channels open to PWC use (including Winhole Channel); beneficial impacts in closed areas. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts from eliminating PWC use within the unit boundary. Cumulative impacts: Similar to alternative A.
Wildlife and Wildlife Habitat	PWC use impacts: Minor to moderate, short- and long-term, direct and indirect, adverse impacts. Cumulative impacts: Minor to moderate adverse im-	PWC use impacts: Minor, short- and long-term, adverse impacts in areas remaining open to PWC use. Beneficial impacts from restricting PWC use to	PWC use impacts: Minor, short- and long-term, adverse impacts in areas remaining open to PWC use. Beneficial impacts from restricting PWC use to	PWC use impacts: Beneficial impacts from eliminating PWC access to shallow water habitats. Cumulative impacts: Similar to alternative A, but with no

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions	No-Action Alternative — No PWC Use
	pacts over the short and long term. Shorebird nesting areas closed to landing or launching of any vessels, including personal watercraft.	navigational channels and requiring a 150-foot buffer around all protected areas. Cumulative impacts: Similar to alternative A, except beneficial impacts in areas closed to PWC use.	navigational channels and requiring a 150-foot buffer around all protected areas. Cumulative impacts: Similar to alternative A, except beneficial impacts in areas closed to PWC use. Compared to alternative B, possibly more impacts in the Winhole Channel area.	contribution from PWC use.
Aquatic Fauna	PWC use impacts: Minor to moderate, short- and long-term, indirect, adverse impacts. Cumulative impacts: Moderate adverse impacts over the short and long term.	PWC use impacts: Similar to alternative A in areas open to PWC use. Beneficial impacts in areas closed to PWC use. Cumulative impacts: Similar to alternative A.	PWC use impacts: Similar to alternative A in areas open to PWC use, including Winhole Channel. Beneficial impacts in closed areas. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts from banning PWC use. Cumulative impacts: Similar to alternative A, with no contribution to impacts from PWC use in NPS waters.
Threatened, Endangered, or Special Concern Species	PWC use impacts: May affect but not likely to adversely affect listed species. Cumulative impacts: May affect but not likely to adversely affect listed species.	PWC use impacts: Similar to alternative A except no impacts in areas closed to PWC use. Cumulative impacts: Similar to alternative A except slightly less potential for impacts in areas closed to PWC use.	PWC use impacts: Similar to alternative A except no impacts in areas closed to PWC use. Cumulative impacts: Similar to alternative A except slightly less potential for impacts in areas closed to PWC use.	PWC use impacts: No adverse effect. Cumulative impacts: Similar to alternative A, but no contribution from PWC use.
Shoreline Vegetation and Wetland Habitats	PWC use impacts: Minor, direct and indirect, adverse impacts to shoreline vegetation from PWC-related foot traffic over the short and long term. Minor to moderate, short-term impacts to wetland habitats. Cumulative impacts: Minor to moderate, direct and indirect, adverse impacts.	PWC use impacts: Negligible impacts over the short and long term as a result of restricting use to navigational channels, prohibiting shoreline access, and establishing buffers around protected areas. Cumulative impacts: Similar to alternative A.	PWC use impacts: Negligible impacts over the short and long term as a result of restricting PWC use. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts from closing the Jamaica Bay Unit to PWC use. Cumulative impacts: Similar to alternative A, with no contribution to impacts from PWC use.
Visitor Use and Experience	PWC use impacts: Negligible to moderate adverse impacts on visitor experiences, depending on the location and seasonal variations in activities. Cumulative impacts: Negligible impacts.	PWC use impacts: Negligible to moderate adverse impacts on PWC users as a result of restricting use to navigational channels. Minor to moderate impacts to other boaters from increased congestion in the channels. Beneficial impacts on other visitors from PWC use restrictions Cumulative impacts: Similar to alternative A.	PWC use impacts: Negligible to moderate adverse impacts on PWC users; potentially enhanced experiences with Winhole Channel open. Minor to moderate impacts on other boaters from increased congestion in the navigational channels. Beneficial impacts on other visitors. Cumulative impacts: Similar to alternative A.	PWC use impacts: Moderate to major adverse impacts on PWC users. Beneficial impacts on other visitors. Cumulative impacts: Except for PWC users, beneficial impacts from banning PWC use. Possible minor adverse impacts in other areas used by displaced PWC recreationists.
Visitor Safety	PWC use impacts: Minor, adverse impacts on swimmers. Moderate adverse impacts for other boaters. Cumulative impacts: Minor to potentially moderate impacts as a result of increased use by all types of watercraft.	PWC use impacts: Beneficial impacts in areas closed to use. Minor to moderate adverse impacts at PWC turnaround at the trestle bridge. Cumulative impacts: Negligible to minor impacts. Minor adverse impacts at other areas if PWC use increased. More safety concerns for other boaters at the turnaround.	PWC use impacts: Beneficial impacts in areas closed to use. Minor adverse impacts in navigational channels. Cumulative impacts: Impacts reduced compared to alternative A, with negligible to minor impacts depending on the type of activity and its location.	PWC use impacts: Beneficial impacts from an overall reduction in potential accidents related to PWC use. Cumulative impacts: Negligible to minor impacts from other motorized uses and increased PWC use in non-NPS waters.

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions	No-Action Alternative — No PWC Use
Socio-economic Environment	No measurable impacts are expected on the regional economy or the local communities.	Same as alternative A.	Same as alternative A.	Same as alternative A.
Unit Management and Operations				
• Conflict with State and Local Ordinances	No conflict with state regulations or local ordinances.	Same as alternative A.	Same as alternative A.	Same as alternative A.
• Enforcement Needs	Long-term, minor to moderate impacts due to additional law enforcement needs.	Same as alternative A.	Same as alternative A.	Short-term, minor to moderate impacts from enforcing the PWC ban; minor long-term impacts once the ban was understood.

TABLE B: SUMMARY OF THE IMPACT ANALYSIS — STATEN ISLAND UNIT

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period	No-Action Alternative — No PWC Use
Water Quality	PWC use impacts: Negligible to minor impacts for all pollutants in 2002 and 2012 except potential major impacts from benzene (human health) in 2002 and 2012. Water quality monitoring to determine if mitigation measures required. Cumulative impacts: Under ecotoxicological benchmarks in 2002 potentially major impacts at Great Kills Park / Crookes Point (benzo(a)pyrene, 1-methyl naphthalene, and benzene) and negligible impacts at Great Kills Harbor and Fort Wadsworth / Miller Field (all pollutants). In 2012 potentially major impacts only at Great Kills Park / Crookes Point (1-methyl naphthalene), and moderate impacts from benzo(a)-pyrene and benzene. For human health benchmarks negligible to minor impacts from benzo(a)pyrene in all areas in 2002 and 2012. Moderate impacts from benzene at Great Kills Harbor and Fort Wadsworth, and potentially major impacts at Great Kills Park / Crookes Point in 2002 and 2012. Monitoring to determine if mitigation measures required.	PWC use impacts: Negligible impacts because of limited PWC use, with beneficial impacts in areas currently open to PWC use. Cumulative impacts: Impacts somewhat reduced from alternative A. Under ecotoxicological benchmarks moderate impacts at Great Kills Park / Crookes Point, minor impacts at Great Kills Harbor, and negligible impacts at Fort Wadsworth / Miller Field in 2002 and 2012. Under human health benchmarks negligible to minor impacts from benzo-(a)pyrene in all areas in 2002 and 2012. Potentially major impacts from benzene at Great Kills Park / Crookes Point and moderate impacts at Great Kills Harbor and Fort Wadsworth / Miller Field in 2002 and 2012. Monitoring to determine if mitigation measures required.	PWC use impacts: Negligible impacts during the phaseout period. Beneficial impacts after three years. Cumulative impacts: Same as alternative B.	PWC use impacts: Beneficial impact with improved water quality in areas currently open to PWC use. Cumulative impacts: Same as alternative B.

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period	No-Action Alternative — No PWC Use
Air Quality				
• Impacts on Human Health (Staten Island is in a maintenance area for CO and in a severe non-attainment area for ozone.)	PWC use impacts: Major adverse impacts from CO in 2002, decreasing to moderate in 2012; negligible impacts from PM. For ozone precursors, major adverse impacts from VOC in 2002, decreasing to moderate by 2012, and minor impacts from NO_x in 2002 and 2012. Cumulative impacts: Major adverse impacts for CO and negligible adverse impacts from PM. For ozone precursors, major adverse impacts from NO_x and VOC in 2002 and 2012.	PWC use impacts: Negligible impacts, with emissions assumed to be close to zero. Cumulative impacts: Similar to, but slightly less than, alternative A.	PWC use impacts: Negligible impacts during the phaseout period; beneficial impacts after PWC use discontinued. Cumulative impacts: Similar to, but slightly less than, alternative A, with no contribution from PWC use after three years.	PWC use impacts: Beneficial impacts from banning PWC use. Cumulative impacts: Similar to, but slightly less than, alternative A, with no contribution from PWC use.
• Impacts on Air Quality Related Values	PWC use impacts: Moderate adverse impacts for ozone exposure and negligible impacts to visibility. No perceptible visibility impacts or observed ozone injury on plants. Cumulative impacts: Moderate adverse impacts from ozone and negligible visibility impacts.	PWC use impacts: Negligible impacts because of effectively removing use unit waters. Cumulative impacts: Similar to, but slight less than, alternative A.	PWC use impacts: Similar to alternative B, except after three years beneficial impacts as a result of no PWC use. Cumulative impacts: Similar to, but slight less than, alternative A.	PWC use impacts: Beneficial impacts. Cumulative impacts: Similar to, but slight less than, alternative A, with no contribution from PWC use.
Soundscapes	PWC use impacts: Minor adverse impacts over the short and long term. Cumulative impacts: Negligible to moderate impacts over the short and long term.	PWC use impacts: Minor, adverse impacts near the Great Kills Park launch ramp over the short and long term. Beneficial impacts from discontinuing PWC use in the rest of the unit. Cumulative impacts: Similar to alternative A.	PWC use impacts: Minor, adverse impacts during the PWC use phaseout period; beneficial impacts after PWC use stops. Cumulative impacts: Similar to alternative A, except no contribution from PWC use after the phaseout period.	PWC use impacts: Beneficial impacts from banning PWC use. Cumulative impacts: Similar to alternative A, except no contribution from PWC use.
Wildlife and Wildlife Habitat	PWC use impacts: Minor adverse impacts over the short and long term. Cumulative impacts: Minor, adverse, impacts over the short and long term.	PWC use impacts: Minor, adverse impacts over the short and long term. Beneficial impacts from effectively closing unit waters to PWC use. Cumulative impacts: Similar to alternative A.	PWC use impacts: Minor, short- and long-term, adverse impacts during the PWC phaseout period; beneficial impacts after PWC use is banned. Cumulative impacts: Similar to alternative A but no contribution from PWC use after three years.	PWC use impacts: Beneficial impacts from banning PWC use within NPS jurisdictional waters. Cumulative impacts: Similar to alternative A but no contribution from PWC use.
Aquatic Fauna	PWC use impacts: Minor to moderate adverse impacts in shallow water areas over the short and long term. Cumulative impacts: Moderate adverse impacts over the short and long term	PWC use impacts: Minor adverse impacts over the short and long term in areas remaining open to PWC use. Cumulative impacts: Similar to alternative A.	PWC use impacts: Minor, adverse impacts over the short and long term during the phaseout period; beneficial impacts after PWC use is banned. Cumulative impacts: Similar to alternative A but no contribution from PWC use after three years.	PWC use impacts: Beneficial impacts from banning PWC use. Cumulative impacts: Similar to alternative A but no contribution from PWC use.

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period	No-Action Alternative — No PWC Use
Threatened, Endangered, or Special Concern Species	PWC use impacts: Not likely to adversely affect any listed species. Cumulative impacts: Not likely to adversely affect any listed species because no species are known to occur in accessible areas.	PWC use impacts: Similar to alternative A. Cumulative impacts: Similar to alternative A.	PWC use impacts: Similar to alternative A. Cumulative impacts: Similar to alternative A.	PWC use impacts: Similar to alternative A. Cumulative impacts: Similar to alternative A.
Shoreline Vegetation and Wetland Habitats	PWC use impacts: Minor, short- and long-term, adverse impacts. Cumulative impacts: Minor adverse impacts over the short and long term.	PWC use impacts: No adverse impacts expected because of PWC use restrictions. Cumulative impacts: Similar to alternative A.	PWC use impacts: No adverse impacts because of PWC use restrictions and phasing out PWC use. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts from banning PWC use. Cumulative impacts: Similar to alternative A.
Visitor Use and Experience	PWC use impacts: Negligible adverse impacts on PWC users and other boaters. Negligible to moderate adverse impacts on swimmers, hikers, and other visitors, depending on locations and seasonal variations in activities. Cumulative impacts: Negligible impacts	PWC use impacts: Negligible to minor adverse impacts on PWC users with use restricted to the Great Kills Park boat ramp. Beneficial impacts to other boaters and visitors. Cumulative impacts: Similar to alternative A except restricting PWC use to the Great Kills Park boat launch could displace some PWC users, creating minor, adverse impacts in other areas.	PWC use impacts: Minor to moderate adverse impacts on PWC users, who would be prohibited from using park waters after the three-year phaseout period. Negligible impacts to other boaters and visitors during the phaseout period, then beneficial impacts. Cumulative impacts: Similar to alternative A except phasing out PWC use in the unit could displace PWC users, creating minor, adverse impacts in other areas.	PWC use impacts: Minor to moderate adverse impacts on PWC users over the short and long term. Beneficial impacts on other boaters and visitors. Cumulative impacts: Similar to alternative A except banning PWC use in the unit could displace PWC users to other regional areas, creating minor, adverse impacts in those areas.
Visitor Safety	PWC use impacts: Minor adverse impacts on swimmers; moderate adverse impacts on other boaters because of increasing congestion in unit waters. Cumulative impacts: Minor to moderate impacts from increasing uses and more congestion.	PWC use impacts: Beneficial impacts on swimmers, anglers, and boaters from eliminating PWC use in all areas except the Great Kills Park boat ramp. Cumulative impacts: Similar to alternative A plus minor to moderate impacts to boaters in adjacent non-NPS waters if PWC use increased in these areas.	PWC use impacts: Beneficial impacts (similar to alternative B) on swimmers, anglers, and boaters from phasing out PWC use. Cumulative impacts: Similar to alternative A plus minor to moderate impacts to boaters in adjacent non-NPS waters if PWC use increased in these areas.	PWC use impacts: Beneficial impacts on all other visitors. Cumulative impacts: Similar to alternative A plus minor to moderate impacts to boaters in adjacent non-NPS waters if PWC use increased in these areas.
Socio-economic Environment	No measurable impacts are expected on the regional economy or the local communities.	Similar to alternative A.	Similar to alternative A.	Similar to alternative A except possible decreased revenue for PWC dealerships.
Unit Management and Operations				
• Conflict with State and Local Ordinances	No conflict with state regulations or local ordinances.	Same as alternative A.	Same as alternative A.	Same as alternative A.
• Enforcement Needs	Negligible to minor impacts over the short and long term due to continuing law enforcement needs.	Similar to alternative A.	Similar to alternative A.	Similar to alternative A.

TABLE C: SUMMARY OF THE IMPACT ANALYSIS — SANDY HOOK UNIT

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions	Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	No-Action Alternative — No PWC Use
Water Quality	PWC use impacts: Negligible impacts in 2002 and 2012. Cumulative impacts: Negligible impacts in 2002 and 2012.	PWC use impacts: Same as alternative A with a beneficial effect from closing most of the unit's bayside waters and some nearshore ocean waters to PWC use. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impact from banning PWC use in the oceanside waters. Negligible impacts in 2002 and 2012 in bayside waters. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts from banning PWC use. Cumulative impacts: Similar to alternative A.
Air Quality				
• Impacts on Human Health (Sandy Hook is in a severe nonattainment area for ozone.)	PWC use impacts: In 2002 and 2012 negligible adverse impacts from CO and PM emissions; for ozone precursors moderate adverse impacts from VOC and minor adverse impacts from NO_x. Cumulative impacts: Major adverse impacts from CO and negligible adverse impacts for PM. For ozone precursors, moderate adverse impacts from NO_x and major adverse impacts from VOC.	PWC use impacts: Similar to alternative A. Cumulative impacts: Similar to alternative A.	PWC use impacts: Similar to alternative A except impacts from VOC would be moderate in 2002, decreasing to minor by 2012. Cumulative impacts: Similar to alternative A except moderate adverse impacts from CO.	PWC use impacts: Beneficial impacts from banning PWC use. Cumulative impacts: Similar to alternative A except moderate adverse impacts from CO; no contribution from PWC emissions.
• Impacts on Air Quality Related Values	PWC use impacts: Moderate adverse impacts for ozone exposure and negligible impacts for visibility. No perceptible visibility impacts or observed ozone injury on plants. Cumulative impacts: Moderate adverse impacts for ozone exposure; negligible impacts on visibility.	PWC use impacts: Similar to alternative A. Cumulative impacts: Similar to alternative A.	PWC use impacts: Similar to alternative A. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts as a result of banning PWC use. Cumulative impacts: Similar to alternative A, no contribution from PWC emissions.
Soundscapes	PWC use impacts: Negligible, adverse impacts over the short and long term on both the bayside and oceanside of Sandy Hook. Cumulative impacts: Negligible to minor adverse impacts over the short and long term, depending on location and time of year and compared to the natural soundscape.	PWC use impacts: Similar to alternative A except lower noise levels on the oceanside due to prohibiting PWC use within 500 feet of the shore. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts on both the oceanside and bayside from limiting PWC use. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts by eliminating PWC noise within the unit boundary. Cumulative impacts: Similar to alternative A, no contribution from PWC emissions.
Wildlife and Wildlife Habitat	PWC use impacts: Minor, adverse, direct and indirect impacts over the short and long term. Cumulative impacts: Minor, indirect adverse impacts over the short and long term.	PWC use impacts: Negligible, adverse, direct and indirect impacts over the short and long term from restricting PWC use in most of the park waters and all nearshore areas. Cumulative impacts: Similar to alternative A.	PWC use impacts: Negligible, adverse impacts over the short and long term (similar to alternative B). Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts from eliminating PWC use. Cumulative impacts: Similar to alternative A, no contribution from PWC emissions.

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions	Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	No-Action Alternative — No PWC Use
Aquatic Fauna	PWC use impacts: Minor to moderate, indirect, adverse impacts over the short and long term. Cumulative impacts: Minor to moderate, indirect, adverse impacts over the short and long term.	PWC use impacts: Minor, indirect, adverse impacts over the short and long term. Cumulative impacts: Similar to alternative A.	PWC use impacts: Minor, indirect adverse impacts only in the Shrewsbury River channel over the short and long term. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts from banning PWC use. Cumulative impacts: Similar to alternative A, but no contribution from PWC use.
Threatened, Endangered, or Special Concern Species	PWC use impacts: Not likely to be adversely affected by PWC use because use is restricted from the most sensitive areas of the unit. Cumulative impacts: Not likely to be adversely affected.	PWC use impacts: Similar to alternative A. Cumulative impacts: Similar to alternative A.	PWC use impacts: Similar to alternative A. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts from eliminating PWC use; not likely to be adversely affected. Cumulative impacts: Similar to alternative A, but no contribution from PWC use.
Shoreline Vegetation and Wetland Habitats	PWC use impacts: Minor, direct and indirect, adverse impacts over the short and long term. Cumulative impacts: Minor, direct and indirect, adverse impacts over the short and long term.	PWC use impacts: Beneficial impacts because all shoreline and nearshore areas closed to PWC use. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts because all shoreline and nearshore areas closed to PWC use (similar to alternative B). Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts from banning PWC use. Cumulative impacts: Similar to alternative A with no contribution to impacts from PWC use.
Visitor Use and Experience	PWC use impacts: Negligible to minor adverse impacts. Minor adverse impacts on swimmers, birdwatchers, and anglers during peak summer months. Cumulative impacts: Negligible impacts with little noticeable change in visitor experiences.	PWC use impacts: Beneficial impacts to most visitor experiences from restricting PWC use. Negligible to minor adverse impacts on PWC users. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts to most visitor experiences. Minor to moderate adverse impacts to PWC users. Cumulative impacts: Similar to alternative A.	PWC use impacts: Beneficial impacts on most visitors; minor to moderate adverse impacts on PWC users over the short and long term. Cumulative impacts: Similar to alternative A.
Visitor Safety	PWC use impacts: Negligible to minor adverse impacts as use increased. Cumulative impacts: Negligible to minor adverse impacts, depending on the type of water-oriented activity and its location.	PWC use impacts: Beneficial impacts in areas closed to PWC use; minor adverse impacts in areas remaining open to use. Cumulative impacts: Similar to alternative A, with beneficial impacts in areas closed to PWC use; minor impacts in areas remaining open to personal watercraft.	PWC use impacts: Beneficial impacts on swimmers and other boaters; minor potential for accidents in the Shrewsbury River Channel. Cumulative impacts: Similar to alternative A except beneficial impacts in areas closed to PWC use; negligible to minor impacts in adjacent areas if PWC use increased.	PWC use impacts: Beneficial impacts on other visitors. Cumulative impacts: Similar to alternative A except beneficial impacts within NPS waters and negligible to minor impacts in adjacent waters if PWC activities increased.
Socio-economic Environment	No measurable impacts are expected on the regional economy or the local communities.	Similar to alternative A.	Similar to alternative A.	Similar to alternative A.
Unit Management and Operations				
• Conflict with State and Local Ordinances	No conflict with state regulations or local ordinances.	Same as alternative A.	Same as alternative A.	Similar to alternative A.
• Enforcement Needs	Minor and long-term impacts due to additional law enforcement needs.	Same as alternative A.	Same as alternative A.	Negligible to minor, long-term impacts until the ban was understood by PWC users.

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Purpose of and Need for Action

INTRODUCTION

Gateway National Recreation Area is located in the heart of the New York City metropolitan area. The park, which extends through three New York City boroughs and into New Jersey, consists of more than 26,000 acres and has been assembled from city parks, military sites, and undeveloped land (see Location map). Congress established Gateway National Recreation Area in 1972 as one of the first urban parks in the national park system. Gateway National Recreation Area is composed of three distinct units:

> **Jamaica Bay Unit —** Jamaica Bay is the largest unit of Gateway National Recreation Area and is located along the southern shore of Brooklyn and Queens. This unit contains a variety of activity areas, including Frank Charles Memorial Park, Canarsie Pier, Bergen Beach, Plumb Beach, Breezy Point, Fort Tilden, Jacob Riis Park, Floyd Bennett Field, and the Jamaica Bay Wildlife Refuge. Some of the activities include biking, birdwatching, exhibits, gardening, group camping, hiking, military history, nature study, picnicking, basketball, golf, paddle tennis, sunbathing, swimming, volleyball, art exhibits, music and theater performances, playgrounds, and fishing.
>
> **Staten Island Unit —** Located along the eastern shore of Staten Island, this unit contains Fort Wadsworth, Miller Field, and Great Kills Park. In addition, two man-made islands offshore of the unit — Hoffman and Swinburne Islands — are under NPS jurisdiction. Fort Wadsworth is located beneath the Verazzano Narrows Bridge. Miller Field is a 187-acre park with opportunities for biking, hiking, and picnicking. Great Kills Park offers many coastal activities, including sun-bathing, biking, birdwatching, boating, fishing, hiking, in-line skating, flying model airplanes, jogging, nature study, picnicking, and swimming. Great Kills Park has a public launch that is very popular among users of personal watercraft and other watercraft. This marina is one of two available on Staten Island.
>
> **Sandy Hook Unit —** Located on a largely undisturbed peninsula at the northern end of the New Jersey coast, this unit encompasses approximately 1,665 land acres, including 7.5 miles of ocean beaches and sheltered bayside coves and hundreds of acres of ecologically significant barrier beach vegetation (NPS 1979). The area features ocean beaches, Sandy Hook Bay, salt marshes, historic Fort Hancock, and Sandy Hook lighthouse (Law Engineering et al. 2002). At the north end of the unit is the Fort Hancock complex. Hiking trails lead to dunes, ponds, a maritime holly forest, and some of the richest bird habitat in New Jersey.

These units comprise a seashore ecosystem of wildlife, private communities, and outdoor recreational activities, including the use of personal watercraft (PWC), in an urban environment.

More than one million personal watercraft[*] are estimated to be in operation today in the United States. Sometimes referred to as "Jet Skis" or "Wet Bikes," these vessels use an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. They are used for enjoyment,

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[*] Personal watercraft, as defined in 36 CFR 1.4(a) (2000), refers to a vessel, usually less than 16 feet in length, which uses an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. The vessel is intended to be operated by a person or persons sitting, standing, or kneeling on the vessel, rather than within the confines of the hull. The length is measured from end to end over the deck excluding sheer, meaning a straight line measurement of the overall length from the foremost part of the vessel to the aftermost part of the vessel, measured parallel to the centerline. Bow sprits, bumpkins, rudders, outboard motor brackets, and similar fittings or attachments, are not included in the measurement. Length is stated in feet and inches.

particularly for touring and maneuvers such as wave jumping, and they are capable of speeds in the 60 mph range.

The National Park Service (NPS) maintains that personal watercraft emerged and gained popularity in park units before it could initiate and complete a "full evaluation of the possible impacts and ramifications." While PWC use remains a relatively new recreational activity, it has occurred in 32 of the 87 park units that allow motorized boating.

The National Park Service first began to study PWC use in Everglades National Park. The studies showed that PWC use over emergent vegetation, shallow grass flats, and mud flats commonly used by feeding shorebirds damaged the vegetation, adversely impacted the shorebirds, and disturbed the life cycles of other wildlife. Consequently, managers at Everglades determined that PWC use remained inconsistent with the resources, values, and purposes for which the park was established. In 1994 the National Park Service prohibited PWC use by a special regulation at the park (59 FR 58781).

Other public entities have taken steps to limit and even to ban PWC use in certain waterways as national researchers study more about the effects of PWC use. At least 34 states have either implemented or have considered regulating the use and operation of personal watercraft (63 FR 49314). Similarly, various federal agencies, including the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration, have managed personal watercraft differently than other classes of motorized watercraft.

Specifically, the National Oceanic and Atmospheric Administration regulates PWC use in most national marine sanctuaries. The regulation resulted in a court case where the Court of Appeals for the District of Columbia declared such PWC-specific management valid. In *Personal Watercraft Industry Association v. Department of Commerce*, 48 F.3d 540 (D. C. Cir. 1995), the court ruled that an agency can discriminate and manage one type of vessel (specifically personal watercraft) differently than other vessels if the agency explains its reasons for the differentiation.

In February 1997 the Tahoe Regional Planning Agency (TRPA), the governing body charged with ensuring no derogation of Lake Tahoe's water quality, voted unanimously to ban all two-stroke, internal combustion engines, including personal watercraft, because of their effects on water quality. Lake Tahoe's ban began in 2000.

In July 1998 the Washington State Supreme Court in *Weden v. San Juan County* (135 Wash. 2d 678 [1998]) found that the county had the authority to ban the use of personal watercraft as a proper use of its police power in order to protect the public health, safety, or general welfare. Further, personal watercraft are different from other vessels, and Washington counties have the authority to treat them differently.

In recognition of its duties under its Organic Act and its *Management Policies,* as well as increased awareness and public controversy, the National Park Service reevaluated its methods of PWC regulation. Historically, the National Park Service had grouped personal watercraft with all vessels; thus, people could use personal watercraft when the unit's superintendent's compendium allowed the use of other vessels. Later the Park Service closed seven units to PWC use through the implementation of horsepower restrictions, general management plan revisions, and park-specific regulations such as those promulgated by Everglades National Park.

In May 1998 the Bluewater Network, a coalition of more than 70 organizations representing more than 4 million Americans, filed a petition urging the National Park Service to initiate a rulemaking process to prohibit PWC use throughout the national park system. In response to the petition, the Park Service issued an interim management policy requiring superintendents of parks where PWC use can occur but where the use had never occurred to close the unit to such use until the rule was finalized. In addition, the

National Park Service proposed a specific PWC regulation premised on the notion that personal watercraft differ from conventional watercraft in terms of design, use, safety record, controversy, visitor impacts, resource impacts, horsepower to vessel length ratio, and thrust capacity (63 FR 178 [Sept. 15, 1998]: 49312–17).

The National Park Service envisioned the servicewide regulation as an opportunity to evaluate impacts from PWC use before authorizing the use. The preamble to the servicewide regulation calls the regulation a "conservative approach to managing PWC use" considering the resource concerns, visitor conflicts, visitor enjoyment, and visitor safety. During a 60-day comment period the National Park Service received approximately 20,000 comments on the proposed regulation.

As a result of public comments and further review, the National Park Service promulgated an amended regulation that prohibited PWC use in most units and required the remaining units to determine the appropriateness of continued PWC use (36 CFR 3.24(a), 2000; 65 FR 55 [Mar. 21, 2000]: 15077–90). Specifically, the regulation allowed the National Park Service to designate PWC use areas and to continue their use by promulgating a special regulation in 11 units and by amending the superintendent's compendium in 10 units (36 CFR 3.24(b), 2000). The National Park Service based the distinction between designation methods on the unit's degree of motorized watercraft use.

In response to the PWC final regulation, Bluewater Network sued the National Park Service under the Administrative Procedures Act and its Organic Act. The organization challenged the National Park Service's decision to allow continued PWC use in 21 units while prohibiting PWC use in other units. In addition, the organization also disputed the National Park Service's decision to allow 10 units to continue PWC use after 2002 by making entries in superintendents' compendiums, which would not require the opportunity for public input through a notice and comments on the rulemaking process. Further, the environmental group claimed that because PWC use causes water and air pollution, generates increased noise levels, and poses public safety threats, the National Park Service acted arbitrarily and capriciously when making the challenged decisions.

In response to the suit, the National Park Service and the environmental group negotiated a settlement. The resulting settlement agreement, signed by the judge on April 12, 2001, changed portions of the National Park Service's PWC rule. While 21 units could continue PWC use in the short term, each of those parks desiring to continue long-term PWC use must promulgate a park-specific special regulation in 2002. In addition, the settlement stipulates that the National Park Service must base its decision to issue a park-specific special regulation to continue PWC use through an environmental analysis conducted in accordance with the National Environmental Policy Act (NEPA). The NEPA analysis at a minimum, according to the settlement, must evaluate PWC impacts on water quality, air quality, soundscapes, wildlife, wildlife habitat, shoreline vegetation, visitor conflicts, and visitor safety.

In 2001 the National Park Service adopted its new management policy for personal watercraft. The policy prohibits PWC use in national park system units unless their use remains appropriate for the specific park unit (*Management Policies 2001,* sec. 8.2.3.3). The policy statement authorizes the use based on the park's enabling legislation, resources, values, other park uses, and overall management strategies.

With the settlement deadlines approaching and the units preparing to close for personal watercraft use, the National Park Service, Congress, and PWC user groups sought legal methods of keeping parks open for PWC use. However, no method was successful. Thus, on April 22, 2002 the following units closed for PWC use: Assateague Island National Seashore, Big Thicket National Preserve, Pictured Rocks National Lakeshore, Fire Island National Seashore, Gateway National Recreation Area, Gulf Islands National Seashore, and Cape Lookout National Seashore. Some of the units continue to draft environmental

assessments to analyze alternatives for PWC use. Units that identify a preferred alternative that continues PWC use must draft a special regulation to authorize PWC use.

PURPOSE OF AND NEED FOR ACTION

The purpose of and need for taking action is to evaluate a range of alternatives and strategies for the management of PWC use at Gateway National Recreation Area in order to ensure the protection of park resources and values while offering recreational opportunities as provided for in the recreation area's enabling legislation, purpose, mission, and goals. Upon completion of the NEPA process, the National Park Service may either take action to adopt special regulations to manage PWC use at Gateway National Recreation Area, or it may discontinue PWC use at this park, as allowed for in the March 2000 rule.

This environmental assessment evaluates four alternatives concerning the use of personal watercraft at each of the three park units of Gateway National Recreation Area: Jamaica Bay, Staten Island, and Sandy Hook. The alternatives considered include continuing PWC use under certain conditions: alternative A would continue use under a special regulation at each unit; alternative B would incorporate geographic restrictions within each unit; and alternative C would incorporate geographic restrictions and/or other management strategies within each unit. In addition, a no-action alternative is considered that would discontinue all PWC use within each unit at Gateway National Recreation Area.

Because park units vary based on their enabling legislation, natural resources, cultural resources, and missions, the recreational activities appropriate for each unit and for areas within each unit vary as well. An action appropriate in one unit may impair resources in another unit. The environmental effects of these alternatives are considered individually at each unit. If PWC use was banned at any unit (the no-action alternative), it is assumed that PWC users accustomed to recreating in that unit would not travel to another Gateway unit to use personal watercraft because of the distance involved (i.e., PWC users at Staten Island would not travel to Sandy Hook if Staten Island was closed to PWC use). Therefore, no cumulative impacts were assumed under the no-action alternative.

SCOPE OF THE ANALYSIS

Watercraft use in Gateway National Recreation Area has likely occurred since the national recreation area was established in 1972. Since some effects of PWC use are similar to those associated with other watercraft, and therefore are difficult to distinguish, the focus of this action is in support of decisions and rulemaking specific to PWC use. However, while the settlement agreement and need for action has defined the scope of this environmental assessment, NEPA regulations require an analysis of cumulative effects on resources of all past, present, and reasonably foreseeable actions when added to the effects of the proposal (40 CFR 1508.7, 2000). The scope of this analysis, therefore, is to define management alternatives specific to PWC use, in consideration of other uses, actions, and activities cumulatively affecting park resources and values.

Gateway National Recreation Area

New York / New Jersey

Location Map

National Park Service lands

Recreation area boundaries

United States Department of the Interior/National Park Service WASO/January '03/646-20122

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PURPOSE AND SIGNIFICANCE OF GATEWAY NATIONAL RECREATION AREA

National park system units are established by Congress to fulfill specified purposes, based on the park's unique and "significant" resources. A park's purpose, as established by Congress, is the fundamental building block for decisions to conserve resources while providing for the "enjoyment of future generations."

The enabling legislation for Gateway National Recreation Area, its purpose and significance, and its broad mission goals are summarized in this section and are taken from the recreation area's enabling legislation, the 1979 *General Management Plan,* unit amendments to that plan, the 1981 *Resources Management Plan*, and the 2000 *Strategic Plan* (NPS 1979; NPS 1981; NPS 2000d). In addition, the recreation area's purpose, significance, and management objectives are all linked to the impairment findings that are made in the NEPA process, as stated in section 1.4.5 of the National Park Service *Management Policies 2001* (NPS 2000c).

Establishment — Congress established Gateway National Recreation Area in October 27, 1972, as part of an effort to bring the national park system and its ethic of preserving and protecting outstanding resources closer to major urban areas:

> In order to preserve and protect for the use and enjoyment of present and future generations an area possessing outstanding natural and recreational features, the Gateway National Recreational Area . . . is hereby established (16 USC 460(c)).

Gateway National Recreation Area is a 26,000-acre recreation area located in the heart of the New York metropolitan area. The park extends through three New York City boroughs and into northern New Jersey. It consists of three units surrounding the entrance to New York Harbor — Jamaica Bay Unit and Staten Island Unit in New York, and Sandy Hook Unit in New Jersey.

Administration — Gateway National Recreation Area is managed under an arrangement that includes a general superintendent with three unit superintendents.

> The Secretary shall administer the recreation area in accordance with the provisions of [the Organic Act] . . . and such statutory authority available to him for the conservation and management of wildlife and natural resources. . . . The Secretary shall administer and protect the islands and waters within the Jamaica Bay Unit with the primary aim of conserving the natural resources, fish, and wildlife located therein . . . (16 USC 460cc(a)).

Mission — A mission statement for Gateway National Recreation Area is included in its *Strategic Plan* (NPS 2000d). The mission statement is based on the park's mandated purpose and its primary significance.

> Gateway encompasses the largest collection of natural systems, wildlife habitats, historic resources, and recreational opportunities in the New York City / New Jersey metropolitan area. We maintain, improve, and make these resources and opportunities available to the public for inspiration, education, and recreation. These areas include numerous sites of critical natural and cultural importance: to the health of local ecosystems; to the life of migratory and native species; and to the military, navigational, and aviation history of the region and the nation, especially in the context of the coastal defenses of New York Harbor. The responsibilities and attendant activities are inescapably shaped by the intense urban culture and value systems of the region. The park in turn endeavors to incorporate the NPS conservation ethic into those values. Established with the express purpose of bringing the "National Park Service Experience" to the urban population, we are truly the gateway to all National Parks for millions of people

***Significance* —** Gateway National Recreation Area's primary significance is provided in its *Strategic Plan* as follows:

- Gateway encompasses the largest collection of natural ecosystems, wildlife habitats, historic resources, and recreational opportunities in the New Jersey/New York metropolitan areas.
- Gateway endeavors to incorporate the NPS conservation ethic into those values.
- Natural and cultural resources and associated values are protected, restored, and maintained in good condition and managed within their broader ecosystem and cultural context.
- Visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park . . . recreational opportunities.

BACKGROUND

NPS ORGANIC ACT AND MANAGEMENT POLICIES

By enacting the National Park Service Organic Act of 1916, Congress directed the U.S. Department of the Interior and the National Park Service to manage units of the national park system "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 USC 1). The Redwood National Park Expansion Act of 1978 reiterates this mandate by stating that the National Park Service must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 USC 1a-1).

Despite these mandates, the Organic Act and its amendments afford the National Park Service latitude when making resource decisions that balance visitor recreation and resource preservation. By these acts Congress "empowered [the National Park Service] with the authority to determine what uses of park resources are proper and what proportion of the parks resources are available for each use" (*Bicycle Trails Council of Marin v. Babbitt,* 82 F.3d 1445, 1453 (9th Cir. 1996)).

Yet, courts have consistently interpreted the Organic Act and its amendments to elevate resource conservation above visitor recreation. *Michigan United Conservation Clubs v. Lujan,* 949 F.2d 202, 206 (6th Cir. 1991) states, "Congress placed specific emphasis on conservation." The *National Rifle Ass'n of America v. Potter,* 628 F. Supp. 903, 909 (D.D.C. 1986) states, "In the Organic Act Congress speaks of but a single purpose, namely, conservation." The NPS *Management Policies* also recognize that resource conservation takes precedence over visitor recreation. The policy dictates "when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant" (*Management Policies 2001,* sec. 1.4.3).

Because conservation remains predominant, the National Park Service seeks to avoid or to minimize adverse impacts on park resources and values. Yet, the National Park Service has discretion to allow negative impacts when necessary (*Management Policies 2001,* sec. 1.4.3). However, while some actions and activities cause impacts, the National Park Service cannot allow an adverse impact that constitutes a resource impairment (*Management Policies 2001,* sec. 1.4.3). The Organic Act prohibits actions that permanently impair park resources unless a law directly and specifically allows for the acts (16 USC 1a-1). An action constitutes an impairment when its impacts "harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (*Management Policies 2001,* sec. 1.4.4). To determine impairment, the National Park Service must evaluate "the particular resources and values that would be affected; the severity, duration, and

timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts" (*Management Policies 2001,* sec. 1.4.4).

Because park units vary based on their enabling legislation, natural resources, cultural resources, and missions, the recreational activities appropriate for each unit and for areas within each unit vary. An action appropriate in one unit may impair resources in another unit. Thus, this environmental assessment analyzes the context, duration, and intensity of impacts related to PWC use at the three units — Jamaica Bay, Staten Island, and Sandy Hook — of Gateway National Recreation Area, as well as the potential for resource impairment, as required by *Director's Order #12: Conservation Planning, Environmental Impact Analysis and Decision-making (DO #12)* (NPS 2001b).

SUMMARY OF VARIOUS RESEARCH STUDIES ON THE EFFECTS OF PERSONAL WATERCRAFT

Over the past two decades PWC use in the United States increased dramatically. However, there are conflicting data about whether PWC use is continuing to increase. While the National Transportation Safety Board (NTSB) estimates that retailers sell approximately 200,000 personal watercraft each year and people currently use another 1 million (NTSB 1998), the PWC industry argues that PWC sales have decreased by 50% from 1995 to 2000 (American Watercraft Association [AWA] 2001). National PWC ownership increased every year between 1991 and 1998; the rate of annual increase peaked in 1994 at 32% and dropped slightly in 1999, 2000, and 2001 (see Table 1).

TABLE 1: NATIONAL PWC REGISTRATION TREND

Year	No. of Boats Owned	Boat Ownership Trend (Percentage Change)	No. of Personal Watercraft Owned	PWC Ownership Trend (Percentage Change)
1991	16,262,000	--	305,915	--
1992	16,262,000	0%	372,283	21.7%
1993	16,212,000	0%	454,545	22.1%
1994	16,239,000	0%	600,000	32.0%
1995	15,375,000	-5%	760,000	26.7%
1996	15,830,000	3%	900,000	18.4%
1997	16,230,000	3%	1,000,000	11.1%
1998	16,657,000	3%	1,100,000	10.0%
1999	16,773,000	1%	1,096,000	-0.4%
2000	16,965,000	1%	1,078,400	-1.6%
2001			1,053,560	-2.4%

SOURCES: M. Schmidt, USCG, e-mail comm. for boat numbers, Sept. 4, 2001; National Marine Manufacturers Association (NMMA) for PWC numbers, 2002.

The majority of personal watercraft used today are powered by conventional two-stroke, carbureted engines (NPS 1998b; California Air Resources Board [CARB] 1999). However, multiple studies have demonstrated that four-stroke engines are substantially cleaner than two-stroke, carbureted engines, generating approximately 90% fewer emissions (British Columbia Ministry of Water, Land and Air Protection 1993; Oregon Department of Environmental Quality [ODEQ] 1999; TRPA 1999). The Personal Watercraft Industry Association (PWIA) notes that direct-injection engines have been available in personal watercraft for four years; and three PWC manufacturers introduced four-stroke engines for the 2002 model year (PWIA to NPS, May 28, 2002, comment on the *Lake Mead National Recreation Area Lake Management Plan and Draft Environmental Impact Statement).* The U.S. Environmental Protection Agency assumes that the existing two-stroke engines would not be completely replaced by newer PWC technology until 2050 (40 CFR 89, 90, 91).

The average operating life of a personal watercraft is 5 to 10 years, depending on the source. The formula for determining the operating life of personal watercraft was published in the *Federal Register* on October

4, 1996 (US EPA 1996a). Based on this formula, the National Park Service expects that by 2012 most boat owners will already be in compliance with the 2006 EPA marine engine standards. The Personal Watercraft Industry Association believes that the typical operating life of a personal watercraft rental is 3 years and of a privately owned vessel approximately 5 to 7 years (PWIA to NPS, May 28, 2002, comment on *Lake Mead National Recreation Area Lake Management Plan and Draft Environmental Impact Statement*).

Environmental groups, PWC users and manufacturers, and land managers express differing opinions about the environmental consequences of PWC use, and about the need to manage or to limit this recreational activity. Research conducted by various sources on the effects of PWC use is summarized below for water pollution, air pollution, noise, wildlife, vegetation and shoreline erosion, and health and safety.

Water Pollution

Two-stroke, carbureted engines discharge as much as 30% of their fuel directly into the water (NPS 1999; CARB 1999). Hydrocarbons, including benzene, toluene, ethylbenzene, and xylene (BTEX) and poly-aromatic hydrocarbons (PAHs), are also released, as well as methyl tertiary-butyl ether (MTBE) in states that use this additive. The amount of pollution correctly attributed to PWC use compared to other motorboats and the degree to which PWC use affects water quality remains debatable. As noted in a report by the Oregon Department of Environmental Quality, every waterbody has different conditions (e.g., water temperature, air temperatures, water mixing, motorboating use, and winds) that affect the pollutants' impacts (ODEQ 1999).

A recent study conducted by the California Air Resources Board consisted of a laboratory test designed to comparatively evaluate exhaust emissions from marine and PWC engines, in particular two- and four-stroke engines (CARB 2001). The results of this study showed a difference in emissions (in some cases 10 times higher total hydrocarbons in two-stroke engines) between these two types of engines. An exception was air emissions of NO_x, which was higher in four-stroke than in two-stroke engines. Concentrations of pollutants (MTBE, BTEX) in the tested water were consistently higher for two-stroke engines.

In 1996 the Environmental Protection Agency promulgated a rule to control exhaust emissions from new marine engines, including outboard motors and personal watercraft (US EPA 1996a). As a result of the rule, the Environmental Protection Agency estimated an overall 52% reduction in hydrocarbon emissions from marine engines from present levels by 2010, and a 75% reduction by 2030, based on converting polluting machines. The 1997 EPA rule delayed implementation by one year (US EPA 1996a, 1997).

Discharges of MTBE and PAHs particularly concern scientists because of their potential to adversely affect the health of people and aquatic organisms. Scientists need to conduct additional studies on PAHs (Allen et al. 1998) and on MTBE (NPS 1999), as well as long-term studies on the effect of repeated exposure to low levels of these pollutants (Asplund 2001).

At Lake Tahoe concern about the negative impact on lake water quality and aquatic life caused by the use of two-stroke marine engines led to at least 10 different studies relevant to motorized watercraft in the Tahoe Basin in 1997 and 1998. The results of these studies (Allen et al. 1998) confirmed that (1) petroleum products are in the lakes as a result of motorized watercraft operation, and (2) watercraft powered by carbureted two-stroke engines discharge pollutants at an order of magnitude greater than do watercraft powered by newer technology engines (TRPA 1999).

On June 25, 1997, the Tahoe Regional Planning Agency adopted an ordinance prohibiting the "discharge of unburned fuel and oil from the operation of watercraft propelled by carbureted two-stroke engines" beginning June 1, 1999. Following the release of an environmental assessment in January 1999, this prohibition was made permanent.

PAHs (which include benzo(a)pyrene, naphthalene, and 1-methyl naphthalene) are released during the combustion of fuel, although some PAHs are also found in unburned gasoline. PAHs, as well as other hydrocarbon emissions, could potentially be reduced as new four-stroke engines replace older carbureted two-stroke engines (Kado et al. 2000). The conversion of carbureted two-stroke engines would be an important step toward substantially reducing petroleum-related pollutants.

Some research shows that PAHs, including those from PWC emissions, adversely affect water quality by means of harmful phototoxic effects on ecologically sensitive plankton and other small water organisms (US EPA 1998; Oris et al. 1998; Landrum et al. 1987; Mekenyan et al. 1994; Arfsten et al. 1996). This in turn can affect aquatic life and ultimately aquatic food chains. The primary concern is in shallow water ecosystems.

Air Pollution

Personal watercraft emit various compounds that that may adversely affect air quality. In two-stroke engines commonly used in personal watercraft the fuel oil is used once and is expelled as part of the exhaust; and the combustion process results in emissions of air pollutants such as nitrogen oxides (NO_x), volatile organic compounds (VOC), particulate matter (PM), and carbon monoxide (CO). In areas with high PWC use some air quality degradation likely occurs (US EPA 1996a, 2000a). Kado et al. (2000) found that two-stroke engines had considerably higher emissions of airborne particulates and PAHs than four-stroke engines tested. Changing from two-stroke, carbureted engines to two-stroke direct-injected engines may result in increases of airborne-particulate associated PAHs (Kado et al. 2000). Further research is needed to identify what impact this would have on PAH concentrations in water. It is assumed that the 1996 EPA rule concerning marine engines will substantially reduce air emissions from personal watercraft in the future (US EPA 1996a).

In August 2002 the U.S. Environmental Protection Agency proposed additional rules that would further reduce boating emissions. The proposal includes evaporative emission standards for all boats and would reduce emissions from fuel tanks, etc., by 80% (67 FR 157 [Aug. 14, 2002]: 53049–115).

Noise

Noise levels emitted by PWC engines vary from vessel to vessel, depending on many factors. No literature was found that definitively described scientific measurements of PWC noise. Some PWC industry literature states that all recently manufactured watercraft emit fewer than 80 decibels (dB) at 50 feet from the vessel, whereas some literature from public interest groups attribute levels as high as 102 dB without specifying distance. None of this literature adequately describes the methodology for collecting the data to determine those levels. Because of this, the National Park Service contracted noise measurements of personal watercraft and other boat types in 2001 at Glen Canyon National Recreation Area; preliminary analysis of this data indicates maximum levels for PWC-generated noise at 82 feet (25 meters) of approximately 68 to 78 A-weighted dB (dBA). Other motorboat types were measured during that study at approximately 65 to 86 dBA at 82 feet (Harris Miller Miller & Hanson, Inc., 2002).

Regulations for boating and water use activities established by the National Park Service prohibit vessels from operating at more than 82 dB measured at 82 feet (25 meters) from the vessel (36 CFR 3.7). However, this regulation does not imply that there are no noise impacts from vessels operating below that limit. Noise impacts from PWC use are caused by a number of factors. Noise from human sources, including personal watercraft, can intrude on natural soundscapes, masking the natural sounds that are an intrinsic part of the environment. This can be especially true in quiet places. Also, PWC use in areas where there are nonmotorized users (such as canoeists, sailors, people fishing or picnicking, and kayakers) can disrupt the "passive" experience of park resources and values.

Komanoff and Shaw (2000) note that the biggest difference between noise from personal watercraft and that from motorboats is that the former continually leave the water, which magnifies noise in two ways. Without the muffling effect of water, the engine noise is typically 15 dBA louder and the smacking of the craft against the water surface results in a loud "whoop" or series of them. With the rapid maneuvering and frequent speed changes, the impeller has no constant "throughput" and no consistent load on the engine. Consequently, the engine speed rises and falls, resulting in a variable pitch. This constantly changing noise is often perceived as more disturbing than the constant noise from motorboats.

PWC users tend to operate close to shore, to operate in confined areas, and to travel in groups, making noise more noticeable to other recreationists. Motorboats traveling back and forth in one area at open throttle or spinning around in small inlets also generate complaints about noise levels; however, most motorboats tend to operate away from shore and to navigate in a straight line, thus being less noticeable to other recreationists (Vlasich 1998).

Research conducted by the Izaak Walton League (IWL) indicates that one PWC unit can emit between 85 and 105 dB of sound, and that wildlife or humans located 100 feet away may hear sounds of 75 dB. This study also stated that rapid changes in acceleration and direction may create a greater disturbance and emit sounds of up to 90 dB (IWL 1999). Other studies conducted by the New Jersey State Police indicate that a PWC unit with a 100-horsepower (hp) engine emits up to 76 dBA, while a single, 175-hp outboard engine emits up to 81 dBA. The Personal Watercraft Industry Association believes that through the 2002 model year the output on a limited number of higher rated models was around 155–165 hp (PWIA e-mail to NPS, Sept. 23, 2002).

Sea-Doo research indicates that in three out of five distances measured during a sound level test, PWC engines were quieter than an outboard motorboat. Sea-Doo also found that it would take approximately four personal watercraft operating 50 feet from shore to produce 77 dBA, and it would take 16 personal watercraft operating 15 feet from shore to emit 83 dBA of sound, which is equal to one open exhaust boat at 1,600 feet from the shore. In response to public complaints, the PWC industry has employed new technologies to reduce sound by about 50% to 70% on 1999 and newer models (Sea-Doo 2000; Hayes 2002). Additionally, by 2006 the EPA requirements will reduce PWC noise, in association with improvements to engine technology (US EPA 1996b). EPA research also indicated that one PWC unit operating 50 feet from an onshore observer emits a sound level of 71 dBA, and studies conducted using the Society of Automotive Engineers (2001) found that two PWC units operating 50 feet from the shore emit similar sound levels of about 74 dBA (PWIA 2000).

Most studies on the effects of noise on soundscapes and human receptors have focused on highway and airport noise. Komanoff and Shaw (2000) used the analytical approaches of these studies to perform a noise-cost analysis of personal watercraft. They concluded that the cost to beachgoers from PWC noise was more than $900 million per year. The cost per personal watercraft was estimated to be about $700 per vessel each year or $47 for each three-hour "personal watercraft day." They further concluded that the cost per beachgoer was the highest at secluded lake sites, where beachgoers had a higher expectation of experiencing natural quiet and usually invested a larger amount of time and personal energy in reaching

the area. However, because there are many more visitors to be affected at popular beaches, noise costs per personal watercraft were highest at crowded sites (*Drowning in Noise: Noise Costs of Jet Skis in America* [Komanoff and Shaw 2000]).

Wildlife Impacts

Although relatively few studies have specifically examined PWC effects on wildlife, several researchers have documented wildlife disturbances from personal watercraft and motorboats. A study recently completed in Florida examined the distance at which waterbirds are disturbed by both personal watercraft and outboard-powered boats (Rodgers and Schwikert 2002). Flush distances varied from 65 to 160 feet for personal watercraft, and flush distances for most species were greater for motorboats than for personal watercraft 80% of the time. The authors note that PWC use may be more threatening to waterbirds since PWC users can navigate in shallow secluded waterways where birds typically eat and rest. Burger (2000) examined the behavior of common terns in relation to PWC use and other boats and noted that PWC users traveled faster and came closer to banks, resulting in more flight response in terns and contributing to lower reproductive success.

Shoreline Vegetation

The effects of PWC use on aquatic communities have not been fully studied, and scientists disagree about whether PWC use adversely impacts aquatic vegetation. The majority of concern arises from the shallow draft of personal watercraft, which allows access to shallow areas that conventional motor-boats cannot reach. Like other vessels, personal watercraft may destroy grasses that occur in shallow water ecosystems. Anderson (2000) studied the effect of PWC wave-wash on shallow salt marsh vegetation and found that although the waves from personal watercraft are not different from those generated by other boats, personal watercraft can enter marsh channels and create sediment suspension problems in these areas.

Erosion Effects

Some studies have examined the erosion effects of waves generated by personal watercraft, and other studies suggest that personal watercraft may disturb sediments on river or lake bottoms and cause turbidity. Conflicting research exists concerning whether PWC-caused waves result in erosion and sedimentation. PWC-generated waves vary in size depending on the environment, including weight of the driver, number of passengers, and speed. Anderson (2000) studied the effect of PWC wave-wash on shallow salt marsh vegetation and found that although the waves from personal watercraft are not different from those generated by other boats, personal watercraft can enter marsh channels and create sediment suspension problems in these areas.

Health and Safety Concerns

Industry representatives report that PWC accidents decreased in some states in the late 1990s. The National Transportation Safety Board reported that in 1996 personal watercraft represented 7.5% of state-registered recreational boats but accounted for 36% of recreational boating accidents (NTSB 1998). In the same year PWC operators accounted for more than 41% of people injured in boating accidents. PWC operators accounted for approximately 85% of the persons injured in accidents studied in 1997 (NTSB 1998).

Increased PWC use in recent years has resulted in more concern about the health and safety of operators, swimmers, snorkelers, divers, and other boaters. A 1998 NTSB study revealed that while recreational boating fatalities have been declining in recent years, PWC-related fatalities have increased (NTSB 1998). Nationwide PWC accident statistics provided by the U.S. Coast Guard support the increase in PWC-related fatalities. As shown in Table 2, since a peak of 84 PWC-related fatalities in 1997, accidents, injuries, and fatalities involving personal watercraft have decreased (M. Schmidt, U.S. Coast Guard [USCG], pers. comm., Sept. 4, 2001). The U.S. Coast Guard's Office of Boating Safety studied exposure data to assess boating risks. This method allows for a comparison between boat types based on comparable time in the water. PWC use ranked second in boat type for fatalities per million hours of exposure in 1998, with a 0.24 death rate per million exposure hours.

TABLE 2: NATIONWIDE PWC ESTIMATES AND ACCIDENT STATISTICS

Year	Recreational Boats Owned*	PWC Owned*	No. of PWC in Accidents	No. of PWC Injuries	No. of PWC Fatalities	No. of All Boats Involved in Accidents	Percentage of PWC Involved in Accidents
1987	14,515,000	N/A	376	156	5	9,020	4.2
1988	15,093,000	N/A	650	254	20	8,981	7.2
1989	15,658,000	N/A	844	402	20	8,020	10.5
1990	15,987,000	N/A	1,162	532	28	8,591	13.5
1991	16,262,000	305,915	1,513	708	26	8,821	17.2
1992	16,262,000	372,283	1,650	730	34	8,206	20.1
1993	16,212,000	454,545	2,236	915	35	8,689	25.7
1994	16,239,000	600,000	3,002	1,338	56	9,722	30.9
1995	15,375,000	760,000	3,986	1,617	68	11,534	34.6
1996	15,830,000	900,000	4,099	1,837	57	11,306	36.3
1997	16,230,000	1,000,000	4,070	1,812	84	11,399	35.7
1998	16,657,000	1,100,000	3,607	1,743	78	11,368	31.7
1999	16,773,000	1,096,000	3,374	1,614	66	11,190	30.2
2000	16,965,000	1,078,400	3,282	1,580	68	11,079	29.6
Total			**33,851**	**15,238**	**645**		

SOURCE: M. Schmidt, USCG, e-mail comm., Sept. 4, 2001.
*Estimates provided by the NMMA (M. Schmidt, USCG, pers. comm., Sept. 4, 2001).
N/A: Not available.

Since PWC operators can be as young as 12 in several states, accidents can involve children. The American Academy of Pediatrics (2000) recommends that no one younger than 16 operate personal watercraft.

Some manufacturing changes on throttle and steering may reduce potential accidents. For example, on more recent models, Sea-Doo developed an off-power assisted steering system that helps steer during off-power as well as off-throttle situations. This system, according to company literature, is designed to provide additional maneuverability and improve the rate of deceleration (Sea-Doo 2001a).

PWC USE AND REGULATION AT GATEWAY NATIONAL RECREATION AREA

Recreation Area Visitation and Uses

Gateway National Recreation Area consists of three units surrounding the entrance to New York Harbor. Gateway provides natural, historical, and recreational resources to more than 8 million visitors each year. Most visitors come during the summer months, when they participate in the park's warm weather activities. In 2001 the Jamaica Bay and Staten Island Units in New York received more than 6 million visitors and Sandy Hook Unit in New Jersey received over 1 million visitors.

Entrance fees are not required for park access; however, beach parking fees are applied at Sandy Hook and Jacob Riis Park during the summer. Fees are also applied for parking in fishing lots at all Gateway National Recreation Area sites, and fishing permits are required for this activity. Single-use permits are available for purchase to use the athletic field, picnic areas, community garden plots, boat trailer parking areas, and nature study areas. The Navy Lodge at Fort Wadsworth, in the Staten Island Unit, is open year round for Navy veterans and active duty personnel, but is not open to the general public.

PWC Use

PWC use within Gateway National Recreation Area has probably occurred since personal watercraft were introduced to the public. Users are not allowed to launch, sell, rent, or dock personal watercraft on or from recreation area land, excluding launching from the boat ramp at Great Kills Park (Staten Island Unit). The primary PWC use season runs from the beginning of June to the end of August in all three units. Motorized watercraft accessing the recreation area typically range from 15 to 23 feet in length. Some yachts and fishing boats in the park are 50 to 100 feet in length. Personal watercraft represent 10% to 15% of the motorized watercraft within the recreation area. Other water activities include sailing, kayaking, canoeing, windsurfing, and kite-skiing.

The majority of the personal watercraft use occurs in the Staten Island Unit, followed closely by the Jamaica Bay Unit. PWC use at Sandy Hook is limited.

Public Safety and Resource Concerns

Gateway National Recreation Area abides by New York and New Jersey State boating regulations. Due to park fragmentation across two states, legal enforcement is implemented by the U.S. Park Police and two separate entities — the New York City Police Department patrols the Jamaica Bay and Staten Island Units and the New Jersey State Police patrol the Sandy Hook Unit. The New York State Department of Environmental Conservation enforces environmental regulations. Six PWC-related accidents or incidents have been reported to the National Park Service at Gateway National Recreation Area since 1995. An increase in PWC use and accidents has occurred in recent years, with one fatality and two major accidents reported.

OBJECTIVES IN TAKING ACTION

Objectives are what must be achieved to a large degree for an action to be considered a success. All alternatives selected for detailed analysis must meet all objectives to a large degree and must also resolve the purpose of and need for action.

Relevant statements from the national recreation area's enabling legislation, the *Strategic Plan*, and other management documents are shown below in italics. These statements are followed by management objectives for personal watercraft, which are derived from the legislation and mandates, and they are compatible with the purpose and significance statements of Gateway National Recreation Area presented above.

Water Quality

Maintain, improve and make [natural systems, wildlife habitats] . . . available to the public for inspiration, education, and recreation.

Continue to closely monitor water quality, especially during the bathing beach season on the ocean beaches, to work on estuarine restoration projects that can help improve water quality and to work against developments around the [Jamaica] bay that have the potential to expand pollution sources into [Gateway] waters.

Management Objectives:

- Prevent further degradation of water quality in estuarine and ocean waters.
- Manage PWC emissions that enter the water in accordance with anti-degradation policies and goals.
- Protect plankton and other aquatic organisms from PWC emissions and sediment disturbances so that the viability of dependent species is conserved.

Air Quality

The park . . . endeavors to incorporate the NPS conservation ethic into [the value systems of the region].

Provide for the public use and enjoyment and visitor experience of the park.

Management Objective:

- Manage PWC activity so that PWC air emissions of harmful compounds do not contribute to air quality degradation, and do not adversely affect visitor health and safety.

Soundscapes

Visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities.

Management Objectives:

- Manage noise from PWC use in affected areas so that visitors' health and safety is not adversely affected.
- Improve conditions so visitor enjoyment will not be disturbed by PWC.

Wildlife and Wildlife Habitat

Gateway encompasses the largest collection of natural systems, wildlife habitats, historic resources and recreational opportunities in the New York City / New Jersey metropolitan area.

Gateway maintains, improves, and makes the resources and opportunities available to the public for inspiration, education, and recreation.

Gateway includes numerous sites of critical natural . . . importance: to the health of local ecosystems; to the life of migratory and native species.

Management Objectives:

- Protect the largest collection of natural ecosystems and wildlife habitats in the metropolitan area.
- Protect birds and other wildlife from the effects of PWC-generated noise, especially during nesting seasons and other critical life stages.
- Protect fish and wildlife from the adverse effects that result from the bioaccumulation of contaminants, such as PAHs, emitted from personal watercraft.
- Encourage increasing biodiversity of flora and fauna.

Threatened and Endangered Species

Gateway is home to hundreds of species of plants and animals that are identified as "of concern" by the states of New York and New Jersey.

Protect critical habitat on park lands for Gateway's four identified populations of federally listed threatened and endangered species.

Management Objectives:

- Improve the status of Gateway's four listed threatened and endangered and protected species and their habitats.

Shoreline Vegetation and Wetland Habitats

Gateway encompasses the largest collection of natural systems, wildlife habitats, historic resources, and recreational opportunities in the New York City / New Jersey metropolitan area.

Gateway includes numerous sites of critical natural . . . importance: to the health of local ecosystems; to the life of migratory and native species.

Management Objectives:

- Regulate PWC use to prevent erosion in areas where shoreline vegetation is extremely sensitive, such as the islands in Jamaica Bay.
- Protect sensitive salt marshes in the Staten Island Unit.
- Manage PWC use to protect sensitive shoreline areas (vegetation/erosion) from PWC activity and access.

Visitor Use and Experience

Visitors safely enjoy and are satisfied with the availability, accessibility, and quality of park . . . recreation activities.

Management Objectives:

- Manage the potential conflicts between PWC use and park visitors.
- Help ensure that visitors safely enjoy and are satisfied with the quality of park recreational activities.

Visitor Safety

Ensure visitors safely enjoy and are satisfied with the . . . quality of park . . . recreation activities.

Strengthen and preserve natural and cultural resources and enhance recreational opportunities managed by partners.

Management Objectives:

- Minimize or reduce the potential for PWC user accidents.
- Minimize or reduce the potential safety conflicts between PWC users and other water recreationists.
- Decrease visitor accident and incident rates.

- Help ensure that visitors safely enjoy and are satisfied with the quality of park recreation activities.

Socioeconomic Resources

- Continue to work cooperatively with local businesses that rent or sell personal watercraft.
- Implement informative programs for businesses.

Recreation Area Management and Operations

Ensure organizational effectiveness.

Management Objectives:

- Seek cooperation with local and state entities that manage or regulate PWC use.
- Increase staff to levels appropriate to manage PWC activities.

ISSUES AND IMPACT TOPICS

Issues associated with PWC use at Gateway National Recreation Area were identified during scoping meetings with NPS staff. Many of these issues were identified in the settlement agreement with the Bluewater Network, which requires that at a minimum the effects of PWC use be analyzed for the following: water quality, air quality, soundscapes, wildlife and wildlife habitat, shoreline vegetation, visitor conflicts and visitor safety. Potential impacts to other resources were considered as well. The following impacts topics are discussed in the "Affected Environment" sections of each unit chapter and are analyzed in the "Environmental Consequences" sections. If no impacts are expected, based on available information, then the issue was eliminated from further discussion, as discussed beginning on page 21.

WATER QUALITY

The main issues associated with PWC use and water resources at Gateway National Recreation Area are those related to water quality. Impacts to water quality result from emissions of hydrocarbons directly into the water. Discharges from PWC two-stroke engines have the potential to adversely affect water quality in Gateway National Recreation Area, especially in areas of poor circulation and low flushing (NPS 1997, 1998a; US EPA 1990). Other water quality issues may include indirect effects on fish, marine mammals, submerged aquatic vegetation, and any threatened and endangered species, sensitive to water quality changes and degradation.

The New York State Division of Natural Resources monitors particular areas within the Jamaica Bay Unit for petroleum contamination. Weekly monitoring of all beaches for bacteria contamination associated with the combined sewer overflows also occurs within the recreation area. Several studies have been conducted within the recreation area to manage combined sewer overflow discharges as part of the New York City *Draft Final Report: Combined Sewer Overflow Abatement Study Master Plan* (CH2M Hill and Dufresne-Henry, Inc. 1992).

AIR QUALITY

Pollutant emissions, particularly nitrogen oxides and volatile organic compounds from personal watercraft, may adversely affect air quality. These compounds react with sunlight to form ozone. Gateway National Recreation Area is in an area classified by the Environmental Protection Agency as nonattainment for ozone. The state implementation plans and state monitoring data were used for this assessment (NJ DEP 2001a; NY DEC 2001).

SOUNDSCAPES

PWC-generated noise varies from vessel to vessel. No literature was found that definitively described scientific measurements of personal watercraft noise. Some literature states that all recently manufactured watercraft emit fewer than 80 dB at 50 feet from the vessel, while other sources attribute levels as high as 102 dB without specifying distance. None of this literature fully describes the method used to collect noise data.

The National Park Service contracted for noise measurements of personal watercraft and other motorized vessels in 2001 at Glen Canyon National Recreation Area (Harris Miller Miller & Hanson, Inc. 2002). The results show that maximum PWC noise levels at 50 feet ranged between 68 to 76 dBA. Noise levels for other motorboat types measured during that study ranged from 65 to 86 dBA at 50 feet.

Noise limits established by the National Park Service require vessels to operate at less than 82 dB at 82 feet from the vessel. Personal watercraft may be more disturbing than other motorized vessels because of rapid changes in acceleration and direction of noise. All motorized watercraft, including personal watercraft, produce noise that may impact park soundscapes, wildlife, and visitor experiences. Any watercraft that does not meet the NPS watercraft noise regulation of 82 dB at 82 feet at full acceleration is subject to fine and removal from the park. Noise impacts vary dramatically between the units. Background noise is greater at the Jamaica Bay and Staten Island Units than at the Sandy Hook Unit. Because there is less background noise at Sandy Hook, noise impacts related to watercraft may be proportionately higher. The restriction of PWC through the Sandy Hook "Superintendent's Compendium" has eliminated many PWC noise impacts in that unit of Gateway National Recreation Area.

WILDLIFE AND WILDLIFE HABITAT

Impact of PWC Use on Wildlife and Habitat

Personal watercraft may impact wildlife through a combination of PWC speed, noise, and ability to access sensitive areas, especially where water is shallow. This may affect marine mammals prevalent at the national recreation area by interrupting normal activities, causing alarm or flight, causing animals to avoid habitat, displacing habitat, and affecting reproductive success. Numerous shorebirds, waterfowl, and other birds, including many migratory bird species that utilize Gateway National Recreation Area, are most likely to be affected by PWC activities (NPS 1993).

Personal watercraft may have a greater impact on nesting birds than other types of watercraft because of their noise, speed, and ability to access shallow-water areas. This may force nesting birds at Gateway National Recreation Area, such as the threatened piping plover, to abandon eggs during crucial embryo development stages and flush other waterfowl from habitat, causing stress and associated behavior changes. Noise from personal watercraft and other boats, as well as the physical presence of the craft, might affect the distribution of birds such as shorebirds, raptors, and waterfowl.

Impact of PWC Use on Aquatic Fauna

PWC use may have a greater impact on marine mammals, specifically dolphins and whales that frequent the waters of the recreation area, because of their noise, speed, and ability to access shallow-water areas. Although the full impact that noise has on marine mammals is not completely understood, the increase in man-made underwater noises could be a serious problem to their survival as it can interfere with their methods of communication and hunting strategy.

THREATENED, ENDANGERED, OR SPECIAL CONCERN SPECIES

In some areas, PWC use is believed to cause harm to threatened or endangered species and protected species because the machine's engine, submerged under the water, muffles the warning sounds some species depend on to escape from imminent danger. At Gateway National Recreation Area, PWC users may affect federally listed sea turtles and marine mammals that access the area by colliding with and harassing them, resulting in harm to the animals and decreased distribution (NPS 1993; NPS 1995). Piping plover might be affected by PWC noise and presence.

SHORELINE VEGETATION AND WETLAND HABITATS

Personal watercraft are able to access areas where most other watercraft cannot go, which may disturb sensitive shoreline and wetland plant species. In addition, PWC users may land on the shoreline, allowing visitors to access areas where sensitive vegetation and plants species exist.

There is potential for shoreline vegetation disturbance within the various marshes and around islands in the Jamaica Bay and Staten Island Units (NPS 1993). PWC users can access shallow channel areas, and excessive use has resulted in a loss of wetlands, crumbling of marshes, and increasing mudflats in the interior sections of Jamaica Bay (NPS 2001c). PWC use should not be an issue for sensitive shoreline vegetation or wetland habitats at the Sandy Hook Unit because use is essentially banned from this area.

VISITOR USE AND EXPERIENCE

Some research suggests that PWC use is viewed by some segments of the public as a nuisance due to the noise, speed, and overall environmental effects, while others believe that PWC use is no different from other watercraft, and recreationists have a "right" to enjoy this sport.

Personal watercraft are banned from the Sandy Hook Unit by the "Superintendent's Compendium." However, some anglers have complained during surf casting season in Jamaica Bay because PWC infringe upon their area. Anglers at Canarsie Pier have complained about PWC in the area, and anglers in the Staten Island Unit have complained about PWC cutting their lines. Visitors in this area have complained about PWC user encroachment on swimming areas, specifically at the Staten Island Unit.

VISITOR SAFETY

In the Jamaica Bay Unit there was a fatal crash related to PWC use at the Memorial Bridge. The perimeter of this bay is a very deep channel and PWC users race here. In the past three years, two personal water-craft collided in this area when one hit a shoal near a swimming beach. The crash was near fatal. Banning personal watercraft at Sandy Hook Unit has decreased visitor safety issues related to PWC use.

SOCIOECONOMIC EFFECTS

Most PWC use in Gateway National Recreation Area is by local residents using their privately owned machines (Law et al. 2002). NPS staff identified only one rental shop in the vicinity of Gateway National Recreation Area. Although substitute areas exist for PWC use outside the park, some local PWC dealerships indicated that restricting PWC use in the park would have a significant negative impact on their business. In particular, PWC owners who moor their craft in the Brooklyn or Queens canals or who use private docks in Jamaica Bay may not have access to areas outside of Gateway National Recreation Area if PWC use was banned.

RECREATION AREA MANAGEMENT AND OPERATIONS

Conflict with State and Local Ordinances and Policies Regarding PWC Use

Some states and local governments have taken action, or are considering taking action, to limit, ban, and otherwise manage PWC use. New York and New Jersey has strict boating regulations applicable to PWC use.

Impact to Recreation Area Operations from Increased Enforcement Needs

Personal watercraft, because of their increased accident rates and visitor conflicts, require additional park staff to enforce standards, limits, or closures. The National Park Service, the U.S. Park Police, New York State Department of Environmental Conservation, New Jersey State Police, and the U.S. Coast Guard share jurisdiction.

ISSUES ELIMINATED FROM FURTHER CONSIDERATION

As explained below, the following impact topics and issues have been dismissed from further consideration:

> *Cultural Resources:* The determination that there would be no cultural resource impacts is based on the park's existing documentation, readily available historical sources pertaining to the New York metropolitan area, and information provided orally by NPS employees (D. Linck, NPS, pers. comm., C. LeeDecker, LBG, July 25, 2002).
>
> Beginning with the earliest European exploration in the 16th century, Gateway National Recreation Area has been a vital location for shipping and military defense. As the metropolitan New York City area developed, the area has gained importance in the areas of civil aviation and recreational bathing. Numerous historic structures and archeological sites remain at the park as testimony to this long and colorful heritage. Areas within the park that preserve complexes of buildings and other features associated with important historic periods have been designated as historic districts, wherein preservation of the historic character and appearance is a requirement. Individual buildings or structures of historic significance have also been identified.
>
> The federal reservation at Sandy Hook, which has been designated as a historic district, has assumed various roles in the nation's military history. It is the site of both the Army Ordnance Board's proving ground from 1874 to 1919 and the location of Fort Hancock, the chief unit in the defense of New York Harbor from the Spanish-American War through the Cold War. The Sandy Hook Proving Ground is significant for its association with development of artillery.

In the Staten Island Unit, Miller Field was established between 1919 and 1921 as the Army Air Service Field for the Coast Defenses of New York. The hangar at Miller Field is an important remnant of the facility's role in harbor defense and military aircraft support. Fort Wadsworth contains important elements of the nation's seacoast defense system, including Battery Weed.

At the Jamaica Bay Unit, Fort Tilden is another important historic site associated with seacoast defenses. The Jamaica Bay Unit also includes the Floyd Bennett Field, which was New York City's first municipal airport. In recognition of the importance of Floyd Bennett Field in civil aviation, a portion of the field has been designated a historic district.

Given the long, complex occupational history of the Gateway National Recreation Area, there are many archeological sites in the various park units, which contain a record of thousands of years of human occupation and use. Archeological surveys have not been completed for the entire national recreation area, although an archeological overview study is in progress for the Sandy Hook Unit, and a similar study is planned for the Jamaica Bay Unit. It is often assumed that the dynamic processes of coastal geomorphology would have destroyed much of the archeological record. But there are many unique archeological resources associated with the shoreline zone, such as shipwrecks, ballast deposits, fishermen's dwelling's, waterfront structures such as piers and wharves, and the remains of derelict or shipwrecked vessels that were reused as dwellings or taverns. Other types of archeological resources include the remains of Native American camps, colonial settlements, and early military fortifications and occupation sites.

No known cultural resources have been identified within the vicinity of existing or potential future landing areas or PWC use areas in Gateway National Recreation Area (D. Linck, NPS, pers. comm., C. LeeDecker, LBG, July 25, 2002). Therefore, this topic was eliminated from further consideration.

Sacred Sites/Native American Concerns: This is not an issue at Gateway National Recreation Area because there are no known sacred sites or Native American concerns at Gateway National Recreation Area or, more specifically, within the vicinity of existing or potential future landing areas for PWC use areas.

Wetlands: Any potential impacts to wetlands or marshes in the vicinity of the shoreline are evaluated under the topic "Shoreline Vegetation and Wetland Habitats." Wetlands that occur farther inland within the national recreation area would not be affected by PWC use because of the limited distance that PWC users generally walk when not using their machines.

Submerged Aquatic Vegetation: Submerged aquatic vegetation (SAV) is a diverse assemblage of rooted macrophytes that grow in shallow water, under the surface, but not above it. These plants are beneficial to aquatic ecosystems because they provide a protective habitat for young and adult fish and shellfish, as well as food for waterfowl, fish, and mammals; and they aid in oxygen production, absorb wave energy and nutrients, and improve the clarity of the water. In addition, SAV beds stabilize bottom sediments and suspended sediments present in the water. No submerged aquatic vegetation is documented as occurring in the units of Gateway National Recreation Area; therefore, no adverse impacts as a result of PWC use are expected.

Floodplains: The level of PWC use and associated PWC activities identified in each alternative would have no adverse impacts on floodplains. No development is proposed in the alternatives; thus, no flooding would result as a result of PWC use and cause impacts to human safety, health, or welfare.

Environmental Justice: Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," directs federal agencies to address environmental and human health conditions in minority and low-income communities so as to avoid the disproportionate placement of any adverse effects from federal policies and actions on these populations. Local residents may include low-income populations; however, these populations would not be particularly or disproportionately affected by PWC use. Other areas near the park are available to all PWC users. This issue is dismissed from further analysis for the following reasons:

1. Personal watercraft are used by a cross section of ethnic groups and income levels.
2. Other areas are available and open to personal watercraft and are used by all ethnic groups and income levels.
3. NPS actions would not disproportionately affect minority or low-income populations.
4. Any NPS actions to limit PWC use would not displace PWC use to low-income or ethnically sensitive areas.

Prime and Unique Agricultural Lands: No prime and unique agricultural farmland exists in the vicinity of areas that would be affected by PWC use.

Energy Requirements and Natural or Depletable Resource Requirements: PWC operation requires the use of fossil fuels. While PWC use could be limited or banned within Gateway National Recreation Area, no alternative considered in this environmental assessment would affect the number of personal watercraft used within the region or the amount of fuel that is consumed. The level of PWC use considered in this environmental assessment is minimal. Fuel is not now in short supply and PWC use would not have an adverse effect on continued fuel availability.

RELATIONSHIP TO OTHER PLANS, POLICIES, AND ACTIONS

The following plans, policies, and actions could affect the alternatives being considered for personal watercraft. These plans and policies are also considered in the analyses of cumulative effects.

NATIONAL PARK SERVICE PLANS, POLICIES, AND ACTIONS

1979 General Management Plan and Related Plans

The 1979 *General Management Plan* was created to provide an environmentally sound management foundation for the national recreation area. Individual amendments have been drafted by each park unit. A *Development Concept Plan* was prepared for the Sandy Hook Unit in 1987 and an *Interpretive Prospectus* in 1989. In 1990 an amendment was drafted for the Staten Island Unit to address Great Kills Park.

1981 Resources Management Plan

The *Resources Management Plan* for Gateway National Recreation Area identifies seven major categories for problems or critical issues at Gateway National Recreation Area. The categories include erosion and shoreline dynamics, fish and wildlife management, water pollution abatement and control, loss/preservation of wetlands, visitor use of natural resources, physical development, and special natural

resources management actions. The *Resources Management Plan* also includes a cultural resources management plan for the recreation area identifying areas for treatment and/or study. In addition, the "Jamaica Bay Wildlife Refuge Natural Resources Maintenance Plan" is included in the *Resources Management Plan*.

2000 Strategic Plan, Fiscal Years 2001–2005

The *Strategic Plan* addresses topics such as the mission of Gateway National Recreation Area, the goals for accomplishing and maintaining its mission, and strategies for achieving these goals from 2001 to 2005. A general overview of the park's organizational structure, financial resources, available facilities, and evaluation techniques is provided in this document (NPS 2000d).

Gateway's mission goals fall under one of the following four categories:

Preserve park resources.

Provide for visitor experience at the park.

Strengthen and preserve natural and cultural resources and enhance recreational opportunities.

Ensure organizational effectiveness.

Within these four categories each specific long-term goal is highlighted in measurable ways. Although there are specific goals addressing recreational uses, educational opportunities, and resource improvement, no specific PWC and motorized watercraft use recommendations are proposed.

Jamaica Bay Wildlife Refuge Visitor Contact Station

The National Park Service is proposing to remodel and expand the existing structure to improve interpretive program spaces and visitor areas. PWC users are not permitted to land near the contact station.

OTHER FEDERAL AGENCY PLANS, POLICIES, AND ACTIONS

1972 Coastal Zone Management Act

In recognition of the increasing pressures of over-development on the nation's coastal resources, Congress enacted the Coastal Zone Management Act in 1972. The act encourages states to preserve, protect, develop, and where possible, restore or enhance valuable natural coastal resources such as wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and coral reefs, as well as the fish and wildlife using those habitats. A unique feature of the coastal zone management program is that participation by states is voluntary. To encourage states to participate, the act makes federal financial assistance available to any coastal state or territory that is willing to develop and implement a comprehensive coastal management program. In addition, once a state adopts a plan consistent with the Coastal Zone Management Act, that state's coastal plan agency can make consistency determinations on federal actions subject to the plan.

State coastal zones include the coastal waters and adjacent shorelands that extend inland to the extent necessary to control activities that have a direct, significant impact on coastal waters. For federal approval, a coastal zone management plan must (1) identify the coastal zone boundaries; (2) define the

permissible land and water uses within the coastal zone that have a direct and significant impact on the coastal zone and identify the state's legal authority to manage these uses; (3) inventory and designate areas of particular concern; (4) provide a planning process for energy facilities siting; (5) establish a planning process to assess the effects of, and decrease the impacts from, shoreline erosion; and (6) facilitate effective coordination and consultation between regional, state, and local agencies. The National Oceanic and Atmospheric Administration approves coastal zone management plans and oversees subsequent implementation of the programs.

1982 Coastal Barriers Resources Act

Congress passed the Coastal Barriers Resources Act in 1982 to address problems caused by coastal barrier development. The act restricts federal expenditures and financial assistance, including federal flood insurance, in the Coastal Barrier Resource System, a defined list of undeveloped coastal barriers mapped along the Atlantic and Gulf of Mexico coasts. The Coastal Barrier Resources System is a collection of specific, undeveloped units of land and associated aquatic environments that serve as barriers protecting the Atlantic, Gulf, and Great Lakes coasts.

The system currently includes 585 units, which add up to almost 1.3 million acres and about 1,200 shoreline miles. There are also 274 "otherwise protected areas," a category added by the 1990 Coastal Barrier Improvement Act for coastal barriers within lands reserved for conservation purposes. The Sandy Hook Unit and portions of the Jamaica Bay Unit are designated as otherwise protected areas (P. Souza, USFWS, CBRA Coordinator, pers. comm., Aug. 8, 2002).

Three important goals of this act are to:

minimize loss of human life by discouraging development in high risk areas

reduce wasteful expenditure of federal resources

protect the natural resources associated with coastal barriers

Federal monies can be spent within the system for certain exempted activities, after consultation with the U.S. Fish and Wildlife Service. Examples of such activities include emergency assistance, military activities for national defense, and maintenance of existing federal navigational channels.

Gerritsen Creek Restoration Project

This project, which is adjacent to Gateway boundaries, is being undertaken by the U.S. Army Corps of Engineers, New York District. The New York City Parks Department is the local sponsor. The Parks Department has expressed concern about PWC usage and effects (e.g., erosion) at meetings. The U.S. Army Corps of Engineers, New York District, in coordination with the New York City Department of Parks and Recreation (Natural Resources Group), is restoring an approximately 30-acre tidal salt marsh along Gerritsen Creek in Brooklyn. The project includes developing restoration plans to help improve water quality, increase flood retention capabilities, and increase natural habitat diversity and productivity within this highly urbanized area.

The site, located within an existing park that is heavily used by the local population, was filled with dredge and landfill materials. Disturbed areas are now dominated by *Phragmites australis*. The project design will focus on restoring pre-existing functions by excavating disturbed areas to intertidal elevations that can support emergent tidal vegetation, removing and controlling *Phragmites* growth, replanting

desirable native vegetation, creating meandering tidal channels through the site, and reusing excavated materials onsite by creating a coastal grassland.

Jamaica Bay Ecosystem Restoration Project

This project by the U.S. Army Corps of Engineers, New York District, is aimed at restoring wetland and upland habitat throughout Jamaica Bay, as well as halting erosion and recontouring selected waterways to improve flushing of the bay. A reconnaissance study identified two approaches to aquatic ecosystem restoration in the bay: (1) recontouring selected areas of the bay bottom to restore flow patterns and flushing rates that will benefit benthic and fishery habitats, and (2) site-specific restoration measures, such as regrading, ditching, vegetative plantings, and dike removal designed to improve local habitat value. Plans for recontouring the bay bottom are being coordinated with current point and nonpoint source control efforts, such as combined sewer overflow controls. The feasibility study commenced in 1996 and was scheduled for completion in 2002.

Jamaica Bay Shoreline Protection Project

A component of the Jamaica Bay Ecosystem Restoration Project, this project by the U.S. Army Corps of Engineers, New York District, is examining potential shoreline protection options at eight sites within Jamaica Bay. The tidal marshes of Jamaica Bay have historically experienced geomorphologic degradation, resulting in shoreline recession and loss of wetlands, presumably caused in large part by increased navigation and land development. The eight sites are currently being analyzed by the Corps for shoreline stability, including a recession analysis and characterization of erosion problems (if any).

Jamaica Bay Ecological Research and Restoration Team

In coordination with several universities and the New York District of the U.S. Army Corps of Engineers, the National Park Service participated in a study of the disappearing salt marshes within Jamaica Bay. Salt marsh islands within the bay are disappearing at a rapid rate. The National Park Service is planning an experimental restoration site that will use a high-pressure spray dredge to restore a 3-acre area. The Corps is studying several areas now for possible island restoration.

STATE AND LOCAL GOVERNMENT PLANS, POLICIES, AND ACTIONS

New Jersey

New Jersey Coastal Management Program **—** Section 307 of the Coastal Zone Management Act requires federal actions, occurring inside or outside of a state's coastal zone, that have a reasonable potential to affect the coastal resources or uses of that state's coastal zone, to be consistent with that state's enforceable coastal policies, to the maximum extent practicable. In New Jersey, the enforceable coastal policies are known as the Coastal Zone Management Rules (New Jersey Administrative Code 7:7e). Federal consistency determinations are made by the New Jersey Department of Environmental Protection's Land Use Regulation Program.

New Jersey Water Quality Standards **—** The New Jersey "Surface Water Quality Standards" establish the designated uses to be achieved and specify the water quality (criteria) necessary to protect state waters (NJ DEP 1998b). Designated uses include potable water, propagation of fish and wildlife, recreation,

agricultural and industrial supplies, and navigation. These are reflected in use classifications assigned to specific waters. The criteria are numerical estimates of constituent concentrations, including toxic pollutants, protective of the uses. Narrative criteria describe instream conditions to be attained/maintained or avoided. State waters include wetlands, estuaries, and nearshore coastal waters. The "State Water Quality Standards" also contain technical and general policies to ensure that the designated uses are adequately protected. The "State Water Quality Standards" operate in conformance with the Clean Water Act and the "Federal Water Quality Standards" at 40 CFR 131.

2000 New Jersey Water Quality Inventory Report — The *Final 2000 New Jersey Water Quality Inventory Report* describes status and trends in water quality in rivers, lakes, estuaries, and oceans (NJ DEP 2002). The report also describes the attainment of designated uses specified in the New Jersey "Surface Water Quality Standards," including for aquatic life, recreation, industrial, agricultural, fish and shellfish consumption. The quantity of New Jersey's wetlands and an overview of groundwater resources are provided. Many of these assessments, as well as the use of a geographic information system to map assessments, are new and expanded analyses. In addition, ongoing and planned strategies to maintain and improve water quality are described, and the report provides recommendations for additional strategies.

New Jersey Watershed Management Area 12 — Watershed Management Area 12 (WMA12) extends from Perth Amboy to Point Pleasant Beach and includes portions of Middlesex, Monmouth, and Ocean Counties. The Area 12 Watershed Management Partnership is an active group of WMA12 stakeholders that is in the process of developing a comprehensive watershed management plan. Funding to begin the initial phase of this process was provided to the Monmouth County Freeholders by the New Jersey Department of Environmental Protection in August 2000. During the first phase, the Area 12 Watershed Management Partnership will conduct education and outreach activities, establish a vision, establish an issues list, identify "action now" projects, identify open space acquisition priorities, establish existing water quality and determine target water quality in conjunction with the New Jersey Department of Environmental Protection, assist and advise the New Jersey Department of Environmental Protection in the development of a water budget, and assist and advise the New Jersey Department of Environmental Protection in the development of total maximum daily loads for 303(d) listed segments in the Manasquan subwatershed. The final comprehensive watershed management plan will be completed in four years.

New York State

New York State Implementation Plan — A state implementation plan is a state proposal on how to reduce air pollution to levels that are below the national ambient air quality standards within the state. These plans are approved by the U.S. Environmental Protection Agency and include the following information: (1) descriptions of current emission control programs, (2) future programs; (3) an inventory of emission sources, including stationary sources (as an example, factories) and mobile sources (on-road and off-road cars and trucks); (4) modeling demonstrations used to predict future air quality, and (5) rate-of-progress determinations that show how emissions will decrease over set periods of time. It should be noted that the New York State Department of Environmental Conservation has adopted the California Air Resource Board regulations for marine engines (New York State Assembly 2000). According to California regulations, hydrocarbon emissions in all new outboard and PWC engines must be reduced by 90% by 2008 (CARB 1998a), with an overall reduction of hydrocarbon emissions estimated to be 60% by 2012.

The Air Resources Division of the New York State Department of Environmental Conservation is responsible for drafting and implementing the implementation plan. The current plan consists of a series of revisions and is not contained in one volume.

***New York Comprehensive Watershed Management Plan* —** Jamaica Bay was designated one of three special natural waterfront areas by New York City's Department of City Planning. A comprehensive watershed management plan for the bay was completed in 1993 by the New York City Department of Environmental Protection in order to better protect and restore habitats and improve water quality.

Wetlands are regulated in New York under the state's Freshwater Wetlands Act of 1975 and Tidal Wetlands Act of 1977; these statutes are in addition to federal regulation under section 10 of the Rivers and Harbors Act of 1899, section 404 of the Clean Water Act of 1977, and various executive orders.

***2000 Nonpoint Source Management Program* —** The mission of New York's nonpoint source program is to control, reduce, or treat polluted runoff through the implementation of structural, operational or vegetative management practices; to administratively coordinate various state agencies and other interested partners having regulatory, outreach, incentive-based, or funding programs that foster installation of management practices for any of the identified sources of nonpoint pollution threatening or impairing the waters of New York; and to conduct local implementation and statewide coordination and evaluation on a watershed basis.

***New York Coastal Management Program* —** The New York State Department of State, Division of Coastal Resources, reviews projects and activities of federal agencies for consistency with the policies of the New York State coastal management program. The state's program establishes New York's vision for its coast by clearly articulating specific policies on development, fish and wildlife, flooding and erosion hazards, recreation, historic and scenic resources, agricultural lands, energy and ice management, public access, water and air resources, and general policy (New York State Department of State [NYSDOS] 2002). Federal activities (e.g., development projects, permits, and funding) are reviewed by the Division of Coastal Resources to ensure adherence to the state program. The Division of Coastal Resources advises agencies on the consistency of their activities with state or local programs.

The consistency provisions of the federal Coastal Zone Management Act of 1972 require federal agency activities to be consistent with the state's federally approved coastal management program. This requirement applies to all federal activities and federally authorized activities within, as well as activities outside, the state's coastal zone that affect the zone. Applicants for federal agency approvals or authorizations are required to submit copies of federal applications to the New York State Department of State, together with a federal consistency assessment form and consistency certification, so that the state can review the consistency certification and proposal for consistency with the program. Applicants for federal funding must submit an identification of the proposed funding source and a description of the project. If the Department of State determines that the proposed activity would be inconsistent with the state program, federal agencies may not fund or approve the proposal. Direct activities by federal agencies are subject to similar requirements.

***1998 New York State Watershed Assessment* —** Each state must prepare a unified watershed assessment to determine where additional funding will help achieve "fishable and swimmable" waters for all Americans. On October 1, 1998, New York submitted to the Environmental Protection Agency an assessment bringing together water quality and natural resource factors in each of the state's 54 watersheds. Based on the state's unified watershed assessment, the state established restoration priorities for those watersheds that did not meet clean water or natural resource goals. Personal and motorized watercraft are not specifically addressed in the plan.

***New York Water Quality Standards* —** The New York "Water Quality Regulations" (6 NYCRR Part 703) provide standards, guidance values, and or groundwater effluent limitations including all (total) forms of a substance, unless indicated otherwise. Where a standard or guidance value is for a specific form of the substance, water quality based effluent limitations for permits may include other forms of the

substance to account for changes in the substance that occur in the receiving water. Part 703.5 lists water quality standards for toxic and other deleterious substances.

***Significant Coastal Fish and Wildlife Habitats* —** Jamaica Bay and Breezy Point have been designated as significant coastal fish and wildlife habitats by the New York State Department of State, and the bay up to the high tide line was designated as a critical environmental area by the New York State Department of Environmental Conservation.

New York and New Jersey State Boating Laws

The New York and New Jersey State Boating Laws require that PWC users follow all boating laws. However, there are some restrictions placed on personal watercraft that do not apply to other boats. These restrictions establish requirements and standards for operating hours, the type of gear that must be worn on board, the potential uses for personal watercraft, use in proximity to other watercraft and swimmers, and mandatory PWC user education. Speed limits, safety operating rules, and boating courtesy are also recommended.

Jamaica Bay Unit

ALTERNATIVES

Alternatives selected for full analysis in this environmental assessment must meet the objectives of the national recreation area to a large degree, while also meeting the purpose of and need for action. Four alternatives are described for PWC use in the Jamaica Bay Unit of Gateway National Recreation Area, along with alternatives that were considered and eliminated from further consideration. The alternatives analyzed in this document are in accordance with the National Environmental Policy Act. The action alternatives include options to continue PWC use under a special regulation that would stipulate various management strategies and mitigation measures for adverse effects; the no-action alternative would not allow PWC use in the Jamaica Bay Unit.

The alternatives for the Jamaica Bay Unit are summarized in Table 3, and the environmental consequences in Table 4.

ALTERNATIVE A — CONTINUE PWC USE UNDER A SPECIAL REGULATION

A special regulation would be promulgated to allow PWC use in the Jamaica Bay Unit to resume, as provided for in the current "Superintendent's Compendium," which states that in accordance with 36 CFR 1.5, "the use of 'Jet Skis' within specific park waters will be restricted in the interest of public safety and environmental values" (see appendix A). The launching or recovery of personal watercraft by trailer from any NPS lands or launches within the unit would be prohibited, and all marsh creeks within Jamaica Bay would be closed to PWC use (see Alternative A map). All state and federal regulations governing the use of motorized watercraft would be enforced. This is considered the "baseline" alternative to compare against other management strategies, including closure of the unit to PWC use.

All local, state, and federal regulations regarding PWC use would remain in effect and be enforced by the National Park Service. These include the following:

- no operation from sunset to sunrise
- no operating a vessel that exceeds 90 dB or 82 dB at 82 feet
- no operation within 500 feet of a marked bathing area unless the waterbody is less than 500 feet wide, then cannot operate in excess of 10 mph
- must operate below 5 mph when within 100 feet of the shore, a dock, pier, raft, float, or anchored boat
- no reckless PWC operation or maneuvering in a manner that unnecessarily endangers life, limb, or property
- must be 16 years old and have a boating certificate to operate a personal watercraft or be accompanied by a person with a boating certificate
- no operation while impaired or intoxicated from alcohol or drugs
- must have a visual distress flag and an auditory distress signal (horn or whistle)
- must have a mandatory personal flotation device
- personal watercraft must have at least two ventilators to remove any explosive gases
- an engine cut off lanyard (if equipped) must be attached to the operator

- personal watercraft sold or manufactured in New York must be consistent with the California air emissions reduction and regulations for new spark-ignition PWC marine (New York Environmental Conservation Law, sec. 19-0306-A; New York State Assembly 2000). According to California regulations, hydrocarbon emissions in all new outboard and PWC engines must be reduced by 90% by 2008 (CARB 1998a).

ALTERNATIVE B — CONTINUE PWC USE UNDER A SPECIAL REGULATION WITH ADDITIONAL GEOGRAPHIC RESTRICTIONS (PREFERRED ALTERNATIVE)

PWC operators would be prohibited from landing or launching their craft within the unit, as under alternative A. Additional geographic restrictions on PWC use would be promulgated in a special regulation as follows (see Alternative B map):

> PWC use would be prohibited in all areas of the unit except in the following navigational channels: North Channel (Island Channel), Beach Channel (South Channel), Grass Hassock Channel, Rockaway Inlet, and Broad Channel to the trestle bridge (the Raunt).
>
> PWC owners living on the adjacent creeks, basins, and waterways would be allowed access through the unit; however, they must stay within the buoyed route (if one is present) or take the most direct route to access the designated navigational channels from Gerritsen Creek, Mill Basin, Paerdegat Basin, Shellbank Basin, Hawtree Creek, Breezy Point, or Roxbury.
>
> PWC use would be prohibited in all waters along Breezy Point, and a 150-foot buffer would be established around all protected areas within Jamaica Bay (even if they occur within a channel).

Operational restrictions and equipment requirements would include those mandated by New York State boating regulations, as stated under alternative A.

ALTERNATIVE C — CONTINUE PWC USE UNDER A SPECIAL REGULATION WITH GEOGRAPHIC RESTRICTIONS

PWC operators would be prohibited from landing or launching their craft within the unit, the same as alternatives A and B. As in alternative B, landowners in the area who own personal watercraft would have to follow a buoyed route (if one exists), or the most direct route to access the navigational channels from Gerritsen Creek, Mill Basin, Paerdegat Basin, Shellbank Basin, Hawtree Creek, Breezy Point, or Roxbury (see Alternative C map). PWC use would also be restricted from waters along Breezy Point and a 150-foot buffer would be implemented around all protected areas (even if they occur within a channel). PWC use would be allowed in the same navigational channels outlined under alternative B; however, Winhole Channel would be open to PWC use, maintaining a circuitous route around Jamaica Bay, eliminating the need for PWC users to turn around in navigational channels, and allowing more area for PWC use in Jamaica Bay.

Operational restrictions and equipment requirements would include those mandated by New York State boating regulations, as stated under alternative A.

NO-ACTION ALTERNATIVE — NO PWC USE

Under the no-action alternative the National Park Service would take no further action to adopt a special regulation to resume PWC use within the Jamaica Bay Unit of Gateway National Recreation Area.

Gateway National Recreation Area

New York / New Jersey

Jamaica Bay Unit

Location Map

United States Department of the Interior/National Park Service WASO/January '03/646-20123

National Park Service lands

Recreation area boundary

Boat launch

Fishing area (PWC Use Restricted)

Swimming area (PWC Use Restricted)

Shorebird nesting area (PWC Use Restricted)

back of map

Gateway National Recreation Area

New York / New Jersey

Jamaica Bay Unit

Alternative A -- Continue PWC Use under a Special Regulation

United States Department of the Interior/National Park Service WASO/January '03/646-20124

National Park Service lands

PWC use prohibited

Recreation area boundary

Boat launch

Fishing area (PWC Use Restricted)

Swimming area (PWC Use Restricted)

Shorebird nesting area (PWC Use Restricted)

* Due to scale, the map does not reflect that the unit is closed to PWC use in all marsh creeks of Jamaica Bay and within a 500 foot buffer of all marked beaches.

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Gateway National Recreation Area

New York / New Jersey

Jamaica Bay Unit

Alternative B -- Continue PWC Use under a Special Regulation with Additional Geographic Restrictions

United States Department of the Interior/National Park Service WASO/January '03/646-20125

- National Park Service lands
- PWC use prohibited
- Navigational channel route (PWC use allowed)
- Recreation area boundary
- Boat launch
- Fishing area
- Swimming area
- Shorebird nesting area
- Landowner PWC access from Gerristen Creek, Mill Basin, Paerdegat Basin, Shellbank Basin, Hawtree Creek, Breezy Point, and Roxbury

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Gateway National Recreation Area

New York / New Jersey

Jamaica Bay Unit

Alternative C -- Continue PWC Use under a Special Regulation with Geographic Restrictions

United States Department of the Interior/National Park Service WASO/January '03/646-20126

National Park Service lands
PWC use prohibited
Navigational channel route (PWC use allowed)
Recreation area boundary
Boat launch
Fishing area
Swimming area
Shorebird nesting area
Landowner PWC use only

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Gateway National Recreation Area

New York / New Jersey

Jamaica Bay Unit

No-Action Alternative -- No PWC Use

United States Department of the Interior/National Park Service V/ASO/January '03/646-20127

- National Park Service lands
- PWC use prohibited
- Recreation area boundary
- Boat launch
- Fishing area
- Swimming area
- Shorebird nesting area

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ALTERNATIVE OPTIONS CONSIDERED BUT NOT ANALYZED FURTHER

Alternative management options considered by park staff include restricting personal watercraft from oceanside waters of the unit only; implementing a 150-foot buffer around all areas closed to PWC use when a channel comes close to marshes; implementing a buffer zone on the north and west sides of Breezy Point; providing a buffer from Floyd Bennett Field Marine Park Bridge; closing interior islands to PWC use; closing any area within 150 feet of any colonial waterbird colony; closing any area within 150 feet of documented locations of threatened, endangered, or species of special concern; closing any area within 150 feet of salt marshes; and closing any area within 100 feet of wading anglers or swimmers.

Current management restrictions under the "Superintendent's Compendium" do not eliminate PWC use in the Jamaica Bay Unit (see appendix A). Park staff considered implementing each of the options above separately and have incorporated variations of each into the alternatives analyzed in this document (Table 3). These strategies are used in the alternatives considered.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is the alternative that would promote the National Environmental Policy Act, as expressed in section 101 of the act. The identification of the environmentally preferred alternative is that which best meets the following requirements:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
- Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

This discussion also summarizes the extent to which each alternative meets section 102(1) of the National Environmental Policy Act, which asks that agencies administer their own plans, regulations, and laws so that they are consistent with the policies outlined above to the fullest extent possible.

Alternative A would not satisfy the majority of the six requirements detailed above. Alternative A would attain the widest range of beneficial park uses to PWC users and would preserve an environment that supports diversity and variety of individual choice; however, it would not achieve a balance between population and resource use that permits a high standard of living and a wide sharing of life's amenities. Although PWC use would be prohibited in the marshes of Jamaica Bay, and users could not access the beaches at Fort Tilden, there would still be opportunities for visitor conflict and impacts to visitor safety. Alternative A would result in the continued degradation of water and air quality and would limit the protection of wildlife and wildlife habitats. Alternative A would not fulfill the responsibilities of each generation as trustee of the environment for succeeding generations due to continued degradation resulting from PWC use within the unit and the continued potential for visitor conflict.

Alternative B would have a reduced potential for impacts on park resources in shoreline areas, as well as visitor use and experience, at the Jamaica Bay Unit of Gateway National Recreation Area. Alternative B would restrict PWC use to the navigational channels within the unit, maintaining access for landowners within the area. Alternative B would allow for landowners who own personal watercraft to access the navigational channel from Gerritsen Creek, Mill Basin, Paerdegat Basin, Shellbank Basin, Hawtree Creek, Breezy Point, and Roxbury. Alternative B would provide for the protection of wildlife and wildlife habitats within the Jamaica Bay Wildlife Refuge, prohibiting PWC use in this area. Alternative B would attain a wide range of beneficial uses of the environment, but the potential for visitor conflicts would potentially rise within the navigational channels as PWC users were congested in areas used heavily by other motorized watercraft operators.

Alternative C would have impacts on park resources and visitor use and experience at the Jamaica Bay Unit very similar to those described for alternative B. PWC use would be restricted to the navigational channels within the unit, as defined under alternative B. Alternative C, however, would allow for PWC use in Winhole Channel, establishing a circuitous route around Jamaica Bay. Alternative C would provide for the protection of wildlife and wildlife habitats within the Jamaica Bay Wildlife Refuge because PWC use would be prohibited in this area; however, there would be less protection of resources in the eastern part of the bay. Alternative C would allow landowners who own personal watercraft to access the navigational channel from Gerritsen Creek, Mill Basin, Paerdegat Basin, Shellbank Basin, Hawtree Creek, Breezy Point, and Roxbury. Alternative B would attain a wide range of beneficial uses of the environment but the potential for visitor conflict would potentially rise within the navigational channels as PWC users were congested in areas used heavily by other motorized watercraft operators.

The no-action alternative would ensure safe, healthful, productive, and aesthetically and culturally pleasing surroundings for visitors without the threat of PWC users entering the area and introducing noise and safety considerations. The no-action alternative would attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences. The no-action alternative would ensure the highest degree of protection to wildlife and wildlife habitat by excluding PWC use within the Jamaica Bay Wildlife Refuge and the piping plover nesting areas at Breezy Point. However, the no-action alternative would completely exclude PWC users from access to the unit and would inhibit access by landowners around the unit. Therefore, the no-action alternative would not maintain an environment that supports diversity and variety of individual choice, nor would it achieve a balance between population and resource use that permits a wide sharing of life's amenities.

Based on the analysis prepared for PWC use at the Jamaica Bay Unit, alternative B is the environmentally preferred alternative, best fulfilling park responsibilities as trustee of this habitat; ensuring safe, healthful, productive, and aesthetically and culturally pleasing surroundings; and attaining a wider range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.

TABLE 3: SUMMARY OF PWC MANAGEMENT ALTERNATIVES — JAMAICA BAY UNIT

	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions	No-Action Alternative — No PWC Use
Management	Allow PWC use under a special regulation.	Allow PWC use under a special regulation.	Allow PWC use under a special regulation.	Ban PWC use.
Use Area	All waters within the Jamaica Bay Unit, excluding protected zones (salt marshes).	The following navigational channels: North Channel (Island Channel), Beach Channel (South Channel), Rockaway Inlet, and Broad Channel to the trestle bridge (the Raunt).	Same as alternative B except also allow PWC use in the Winhole Channel.	Close all areas to PWC use.
Other Restrictions	No PWC launching or landing from NPS lands and facilities within the unit. Prohibit PWC operation within 500 feet of marked beaches. No PWC renting, selling, or docking within the unit.	No PWC launching or landing from NPS lands and facilities within the unit. Landowners who own personal watercraft must use a buoyed route (if one exists) or the most direct route to access the navigational channels from Gerritsen Creek, Mill Basin, Paerdegat Basin, Shellbank Basin, Hawtree Creek, Breezy Point, and Roxbury. No PWC use along Breezy Point or within 150 feet of protected areas within Jamaica Bay (even if they occur within a channel).	Same as alternative B.	Not applicable.
Engine Type	PWC sold or manufactured in New York must be consistent with California air emissions reduction and regulations for new spark-ignition marine engines in personal watercraft (i.e., hydrocarbon emissions in all new outboard and PWC engines must be reduced by 90% by 2008).	Same as alternative A.	Same as alternative A.	Not applicable.
Use Hours	Sunrise to sunset.	Same as alternative A.	Same as alternative A.	Not applicable.
Numbers	No limits.	Same as alternative A.	Same as alternative A.	Not applicable.
State Regulations	Enforce all state regulations.	Same as alternative A.	Same as alternative A.	Not applicable.

TABLE 4: SUMMARY OF ENVIRONMENTAL CONSEQUENCES — JAMAICA BAY UNIT

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions	No-Action Alternative — No PWC Use
Water Quality	Water quality impacts from PWC use based on ecotoxicological and human health benchmarks would be negligible for all pollutants in all areas in 2002. By 2012, all water quality impacts are expected to remain negligible due to	Water quality impacts from PWC emissions based on ecotoxicological and human health benchmarks would be negligible for all pollutants in all areas in 2002 and 2012. Closing Breezy Point to PWC use would have a beneficial	Water quality impacts from PWC emissions on ecotoxicological and human health benchmarks would be negligible for all pollutants in all areas in 2002 and 2012. Closing Breezy Point to PWC use would have a beneficial effect on	Banning PWC use within the Jamaica Bay Unit would have a beneficial impact on water quality by reducing sediment resuspension and eliminating PWC pollutants in the unit's waters. On a cumulative basis, other motorized watercraft would

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions	No-Action Alternative — No PWC Use
	reduced emission rates and banning MTBE in gasoline in 2004. Cumulative impacts from all motorized watercraft based on ecotoxicological benchmarks would be negligible for all pollutants in all areas in 2002 and 2012. Cumulative impacts based on human health benchmarks would be minor in 2002 and negligible in 2012. In 2012, cumulative water quality impacts from all watercraft are expected to be lower than in 2002 due to reduced emission rates mandated by New York State and banning MTBE. No impairment.	effect on water quality. Restricting PWC use to the main navigational channels within Jamaica Bay and Rockaway Inlet would have beneficial effects on shoreline areas, but would not reduce the number of personal watercraft or emissions and would result in more localized adverse effects of PWC pollutants. Cumulative impacts based on ecotoxicological benchmarks would be negligible in all areas in 2002 and 2012. Cumulative water quality impacts based on human health benchmarks are expected to be minor in 2002 and negligible in 2012. No impairment.	water quality in that area. Restricting PWC use to the main navigational channels of Rockaway Inlet and Jamaica Bay, including Winhole Channel, would have beneficial effects on shoreline areas, but would not reduce the number of PWC users or emissions within Jamaica Bay. This alternative would result in more localized adverse effects on PWC-emitted pollutants. Cumulative impacts based on ecotoxicological benchmarks would be negligible in all areas in 2002 and 2012. Cumulative water quality impacts based on human health benchmarks would be minor in 2002 and negligible in 2012 in all areas. No impairment.	continue to have minor to negligible adverse impacts on water quality of the unit's waters due to their discharge of organic pollutants. No impairment.
Air Quality				
• Impacts on Human Health (Jamaica Bay is in a maintenance area for CO and a severe non-attainment area for ozone.)	PWC use would result in major adverse impacts from CO in 2002 and 2012, and negligible adverse impacts from PM emissions. For ozone precursors, the unit would experience major adverse impacts from VOC emissions in 2002 (as defined by the federal conformity rule), decreasing to moderate by 2012; impacts from NO_x would be minor adverse. Cumulatively, emissions from all boating activities would result in major adverse impacts from CO emissions in 2002 and 2012 and negligible adverse impacts from PM. For ozone precursors, impacts from VOC would be major adverse and impacts from NO_x would be moderate in 2002, increasing to major by 2012. No impairment.	PWC annual emissions in 2002 and 2012 would result in major adverse impacts from CO emissions and negligible adverse impacts from PM emissions. For ozone precursors, impacts from VOC would be major adverse in 2002, decreasing to moderate adverse in 2012; impacts from NO_x would be minor adverse in 2002 and 2012. The cumulative impacts would be similar to alternative A, with major adverse impacts from CO and negligible impacts from PM. For ozone precursors, impacts from VOC would be major adverse throughout the assessment period; impacts from NO_x would be moderate adverse in 2002, increasing to major adverse in 2012. No impairment.	PWC annual emissions in 2002 and 2012 would result in major adverse impacts from CO and negligible adverse impacts from PM. For ozone precursors, impacts from VOC would be major in 2002, decreasing to moderate by 2012; impacts from NO_x would be minor in 2002 and 2012. Cumulative impacts would be similar to alternative A, with major adverse impacts from CO and negligible adverse impacts from PM emissions. For ozone precursors, impacts from VOC would be major adverse throughout the assessment period, and impacts from NO_x would be moderate adverse in 2002, increasing to major adverse by 2012. No impairment.	The no-action alternative would have beneficial impacts on air quality with the ban of PWC use throughout the Jamaica Bay Unit. Cumulative impacts would be similar to alternative A, with major adverse impacts from CO and negligible adverse impacts from PM. For ozone precursors, impacts from VOC would be major adverse in 2002 and 2012, and impacts from NO_x would be moderate adverse in 2002, increasing to major by 2012. There would be no contribution from PWC use. No impairment.
• Impacts on Air Quality Related Values	PWC annual emissions would result in moderate adverse impacts from ozone in 2002 and 2012. Currently, there are no perceptible qualitative visibility impacts or observed ozone injury to plants. Impacts on visibility	PWC annual emissions would result in moderate adverse impacts from ozone in 2002 and 2012. Currently, there are no perceptible qualitative visibility impacts or observed ozone injury on plants. Impacts on visibility would be negligible.	PWC annual emissions would result in moderate adverse impacts for all pollutants in 2002 and 2012. Currently, there are no perceptible qualitative visibility impacts or observed ozone injury on plants. Impacts on visibility from PWC emis-	The no-action alternative would have beneficial impacts because PWC use would no longer be allowed. Ozone impacts from airborne pollutants related to all other boating activities would be moderate and visibility impacts negligible.

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions	No-Action Alternative — No PWC Use
	would not be perceptible. Cumulative impacts from all boating activities would be moderate adverse for ozone and negligible for visibility. No impairment.	Cumulative impacts would be moderate adverse for ozone and negligible for visibility in 2002 and 2012. No impairment.	sions would be negligible. Future cumulative ozone impacts from all motorized marine boating activities would be moderate; visibility impacts would be negligible. No impairment.	No impairment.
Soundscapes	PWC use would continue to have negligible to minor, adverse impacts on visitors throughout the unit over the short and long term. Noise from all motorized watercraft, as well as ambient noise levels outside the unit, would have negligible to moderate adverse impacts on other recreational users within the unit. Noise impacts would be minor to other visitors and minor to moderate compared to the natural soundscape. No impairment.	PWC-related noise would have negligible to minor, adverse impacts over the short and long term in and near navigational channels open to PWC use. Visitors at Breezy Point would experience beneficial impacts with the removal of PWC use. Noise from all motorized watercraft, as well as ambient noise levels outside the unit, would have negligible to moderate adverse impacts on other recreational users within the unit, similar to alternative A. Noise impacts would be minor to other visitors and minor to moderate compared to the natural soundscape. No impairment.	Noise impacts would range from negligible to minor over the short and long term due to continued PWC use in navigational channels (including Winhole Channel). Visitors at Breezy Point would experience beneficial impacts with the removal of PWC use. Noise from all motorized watercraft, as well as ambient noise levels outside the unit, would have negligible to moderate adverse impacts on other recreational users within the unit, similar to alternative A. Noise impacts would be minor to other visitors and minor to moderate compared to the natural soundscape. No impairment.	Banning PWC use within the Jamaica Bay Unit would have beneficial impacts on visitors by eliminating this noise source within the unit boundary. Noise from all motorized watercraft, as well as ambient noise levels occurring outside the unit, would have negligible to moderate adverse impacts on other recreational users within the unit, similar to alternative A. Noise impacts would be minor to other visitors and minor to moderate compared to the natural soundscape. No impairment.
Wildlife and Wildlife Habitat	Impacts would be minor to moderate, direct and indirect, and adverse over the short and long term. Minor effects are expected because species sensitive to a high level of noise and human activity are not expected to regularly use areas frequented by PWC users during peak periods. If PWC users operate at 5 mph within 100 feet of the shoreline, as required by state regulations, adverse effects associated with rapid approach, noise disturbance to wildlife utilizing shoreline habitats, and the potential for collisions would be minimized. Moderate adverse impacts could be caused by continuous PWC use in nearshore areas, potentially affecting habitat suitability for shallow water fish species. Onshore activities associated with PWC use could also adversely affect wildlife and habitat due to species disturbance or trampling of nests and	Impacts in areas remaining open to PWC use would be minor and adverse over the short and long term because species sensitive to noise and human activity are not expected to regularly occur in these areas during peak periods. Restricting PWC use to navigational channels and requiring 150-foot buffers around all protected areas would result in beneficial impacts. Cumulative impacts would be adverse and minor to moderate over the short and long term, similar to alternative A. In areas closed to PWC use (all areas outside of existing navigational channels) impacts would be beneficial; however, impacts associated with use by other motorized watercraft would continue to impact areas throughout the unit. Wildlife in areas closed to PWC use could be adversely affected by uses in the navigational channels as a result of noise and possible water quality impacts;	Impacts in areas remaining open to PWC use would be minor, adverse, and short and long term because species sensitive to noise and human activity are not expected to regularly occur in these areas during high use periods. Restricting PWC use to existing navigational channels and requiring 150-foot buffers around all protected areas would result in beneficial impacts to wildlife and habitat. On a cumulative basis impacts to wildlife species would be adverse, minor to moderate, and short and long term, similar to those discussed under alternative B, but with possibly more impacts in the eastern end of the bay since Winhole Channel would remain open to PWC use. In areas closed to PWC use, impacts would be beneficial; however, impacts on wildlife as a result of noise and possible water quality impacts associated with other motorized watercraft uses would	Eliminating PWC use within the Jamaica Bay Unit would have beneficial impacts on wildlife species and habitat. Cumulative impacts are expected to be adverse, short and long term, and minor to moderate, similar to alternative A, because other motorized uses would continue. No impairment.

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions	No-Action Alternative — No PWC Use
	habitat. Although background noise associated with the surrounding urban environment tends to be greater than that from personal watercraft, noise from all motorized watercraft could be a problem in certain areas. Impacts would be minor to moderate and adverse over the short and long term. Shorebird nesting areas would remain closed to landing or launching of any vessels, including personal watercraft. No impairment.	however, considering existing background conditions, these effects are expected to be negligible. No impairment.	continue throughout the unit. Considering existing background conditions, these effects are expected to be minor. No impairment.	
Aquatic Fauna	Alternative A would have short- and long-term, indirect, minor to moderate adverse impacts on aquatic fauna in the Jamaica Bay Unit. Cumulative impacts would be similar to those discussed for PWC use alone; however the intensity of adverse impacts would be moderate because of the degree of use. No impairment.	In areas remaining open to PWC use, impacts would be short and long term, indirect, and minor, similar to alternative A. Restricting PWC access to navigational channels and not allowing access in oceanside waters along Breezy Point would have beneficial impacts compared to alternative A. Cumulative impacts would be moderate over the short and long term, similar to alternative A. No impairment.	In areas remaining open to PWC use, impacts would be short and long term, indirect, and minor, similar to alternative A. Restricting PWC use to navigational channels (including Winhole Channel) and prohibiting access to oceanside waters along Breezy Point would reduce the potential for adverse effects compared to alternative A. Cumulative impacts would be moderate over the short and long term, similar to alternative A. No impairment.	Banning PWC use within the Jamaica Bay Unit would result in beneficial impacts to aquatic fauna. Cumulative impacts would be minor and adverse, similar to alternative A, because of future increases in PWC use in the areas outside the unit, along with increases in other motorized watercraft throughout the unit. However, PWC use within NPS jurisdictional waters would not contribute to those impacts. No impairment.
Threatened, Endangered, or Special Concern Species	PWC use may affect but is not likely to adversely affect the piping plover, roseate tern, or other state listed avian species. PWC access to nesting and foraging areas could disturb sensitive species in these areas. Background noise is expected to reduce the potential for PWC noise-related impacts to sensitive shorebirds. State regulations requiring speed limits of 5 mph within 100 feet of the shoreline would help minimize the potential for adverse effects caused by rapid approaches to the shore. Sea turtles are not likely to be adversely affected because they would likely avoid high use areas due to noise and activity; however, where PWC users rapidly access areas where sea turtles do occur, collisions could occur.	PWC use may affect but is not likely to adversely affect federal or state threatened or endangered species in the Jamaica Bay Unit. Impacts could occur where species access or forage in channel areas remaining open to PWC use, similar to alternative A. Closing waters adjacent to Breezy Point would eliminate the potential for PWC-related adverse effects to species foraging in nearshore ocean habitats or resting or foraging along the shoreline. On a cumulative basis, threatened or endangered species may be affected but are not likely to be adversely affected, similar to alternative A. The potential for adverse effects would be slightly less than under alternative A because of restricting PWC use to navigational channels within	PWC use may affect but is not likely to adversely affect federal or state threatened or endangered species in the Jamaica Bay Unit. Impacts would be similar to those discussed under alternative A, where species access or forage in channel areas remaining open to PWC use. Cumulative impacts to threatened or endangered species would be similar to those discussed under alternative A; however, the potential for adverse effects would be higher than under alternative B because Winhole Channel would remain open to PWC use. No impairment.	Eliminating PWC use within the Jamaica Bay Unit would have no adverse effect on threatened or endangered species. Restricting PWC access from marine habitats in the unit would also enhance the quality of habitat for sea turtles that may occur in the unit. Cumulative impacts would be similar to those discussed under alternative A, because other motorized watercraft use would continue; however, there would be no contribution to impacts from PWC use. No impairment.

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions	No-Action Alternative — No PWC Use
	Cumulative impacts would be similar to those for PWC use; however, the potential for adverse impacts would be higher because motorized uses would continue throughout the bay. Threatened or endangered species may be affected but are not likely to be adversely affected. No impairment.	the bay, but other motorized watercraft uses would continue throughout the bay. No impairment.		
Shoreline Vegetation and Wetland Habitats	Minor, direct and indirect adverse impacts could occur over the short and long term to shoreline vegetation from PWC-related foot traffic in accessible areas. Impacts to wetland habitats would be short and long term and minor to moderate because of low levels of PWC use and limited access to shallow water areas. Minor to moderate, direct and indirect, adverse cumulative effects to shoreline vegetation and wetland habitats are expected over the short and long term from continued foot traffic around landing areas and limited access by boaters to shallow water habitats. No impairment.	Impacts would be negligible over the short and long term as a result of restricting PWC use to navigational channels, prohibiting shoreline access, and establishing buffers around protected areas. Minor adverse direct and indirect cumulative effects similar to those discussed under alternative A are expected. Even though PWC use would be restricted to navigational channels, other watercraft could access shallow water areas outside the channels, potentially resulting in short- and long-term impacts. No impairment.	Impacts would be negligible over the short and long term as a result of restricting PWC use to navigational channels (including Winhole Channel), restricting shoreline access, and establishing buffers around protected areas. Minor adverse direct and indirect cumulative effects similar to those discussed under alternative A are expected. Although PWC use would be restricted to navigational channels, other motorized watercraft could access shallow water areas outside the channels, potentially resulting in impacts over the short and long term. No impairment.	Impacts as a result of closing the Jamaica Bay Unit to PWC use would be beneficial to shoreline vegetation and wetland habitats. On a cumulative basis, impacts would be minor and adverse over the short and long term because other motorized watercraft users would continue to have access to shallow water areas and to shoreline habitats. PWC use would no longer contribute to any shoreline impacts within the unit. No impairment.
Visitor Use and Experience	Continued PWC use in the Jamaica Bay Unit would result in negligible to moderate adverse impacts on visitor experiences, depending on the location and seasonal variations in visitor activities. There would be moderate adverse impacts on the experiences of bird-watchers and anglers during the peak summer months. Alternative A would partially meet the park's strategic goal for improved visitor satisfaction by continuing to allow for unrestricted PWC use. Cumulative impacts related to all other motorized watercraft users and other visitors would result in negligible impacts, since there would be little noticeable change. Most visitors would continue to be satisfied with their experiences.	Restricting PWC use to navigational channels within the bay (except for Winhole Channel), and closing ocean waters off Breezy Point to PWC use would have negligible to moderate adverse impacts on PWC recreationists. There would be a minor to moderate impact on other boaters to the unit as congestion would increase in the navigational channels. For other visitors these restrictions would result in beneficial impacts to their experiences, depending on the location and seasonal variations in activities, as described for alternative A. Alternative B would partially meet the park's strategic goal for improved visitor satisfaction for boaters and other visitors by restricting PWC use to certain navigational channels. Cumulative effects would be	Restricting PWC use to navigational channels within the bay and closing ocean waters off Breezy Point to PWC use would have negligible to moderate adverse impacts on PWC users. Keeping Winhole Channel open to PWC use would allow recreationists to travel around the bay, potentially enhancing their experiences. Restricting PWC use to certain areas would result in beneficial impacts for visitors enjoying land-based activities, depending on the location and seasonal variations in visitor use. There would be minor to moderate impacts on other boaters in the unit as congestion would increase in navigational channels. Alternative C would partially meet the park's strategic goal for improved visitor satisfaction (in the case of non-boating visitors) by restricting PWC	The no-action alternative would have moderate to major adverse impacts on PWC users, who could no longer ride their craft within the Jamaica Bay Unit. Impacts on other visitors would be beneficial. Except for PWC users, cumulative impacts of banning PWC use would be beneficial for most visitors. Banning PWC use within NPS jurisdictional waters could force users to other areas within the region that are used by others (e.g., other boaters), creating a minor adverse cumulative impact in those areas.

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions	No-Action Alternative — No PWC Use
		negligible, similar to alternative A. Most visitors would continue to be satisfied with their experiences at the unit.	use to areas away from nearshore environments. Cumulative impacts would be negligible, similar to alternative A. Most visitors would continue to be satisfied with their experiences at the unit.	
Visitor Safety	The potential for conflicts between PWC users and swimmers would result in minor, adverse impacts because PWC users are restricted from operating near swimming areas and must travel at no-wake speeds within 100 feet of the shore. The potential for conflicts between PWC users and other boaters would be moderate adverse because of the level of activity in the waters around Jamaica Bay. Cumulative impacts would continue at minor to potentially moderate levels over the next 10 years as a result of increased use by all types of watercraft.	Alternative B would eliminate the potential for PWC-related accidents within those areas of the unit closed to PWC use, a beneficial impact. PWC users and other boaters would experience minor to moderate adverse impacts in the North Channel when turning around at the trestle bridge. Cumulative impacts would be reduced compared to alternative A as a result of restricting PWC use, with negligible to minor impacts depending on the type of activity and its location. Cumulative minor adverse impacts to areas outside unit waters could increase if PWC use in these areas increased.	Alternative C would eliminate the potential for PWC-related accidents outside the navigational channels, a beneficial impact. Experiences for other boaters in the North Channel would be safer compared to alternative B because PWC users would not have to turn around. Impacts in the navigational channels would be minor and adverse over the short and long term. Cumulative impacts would be reduced compared to alternative A as a result of restricting PWC use, with negligible to minor impacts depending on the type of activity and its location. Cumulative minor adverse impacts to areas outside unit waters could increase if PWC use in these areas increased.	Banning PWC use in the Jamaica Bay Unit would result in beneficial impacts with an overall reduction in accident potential. On a cumulative basis this alternative would result in negligible to minor impacts because other recreational activities in the park have the potential to affect visitor safety. Increased PWC use in non-NPS waters could increase potential safety hazards in these areas.
Socio-economic Environment	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.
Unit Operations and Management				
Conflict with State and Local Ordinances	PWC and boating regulations within the unit boundaries would continue to be the same as New York State regulations. There would be no conflict with state regulations or local ordinances.	PWC and boating regulations within the unit boundaries would continue to be the same as New York State regulations. There would be no conflict with state regulations or local ordinances, the same as alternative A.	PWC and boating regulations within the unit boundaries would continue to be the same as New York State regulations. There would be no conflict with state regulations or local ordinances, the same as alternative A.	PWC and boating regulations within the unit boundaries would continue to be the same as New York State regulations. There would be no conflict with state regulations or local ordinances, the same as alternative A.
Enforcement Needs	Impacts would be long term and minor to moderate due to needs for additional law enforcement capability within the unit to enforce federal and state boating regulations.	Impacts would be long term and minor to moderate due to needs for additional law enforcement capability within the unit to enforce federal and state boating regulations.	Impacts would be long term and minor to moderate due to needs for additional law enforcement capability within the unit to enforce federal and state boating regulations.	The no-action alternative would result in short-term, minor to moderate impacts as a result of enforcing the PWC ban; once the ban was understood, impacts would be minor.

THE AFFECTED ENVIRONMENT

Jamaica Bay, the largest unit of Gateway National Recreation Area, can be divided into three areas — Breezy Point, Rockaway Inlet, and Jamaica Bay (see the Jamaica Bay Location map). The unit's jurisdictional waters consist of the majority of Jamaica Bay and Rockaway Inlet, as well as waters within 0.25 mile of Breezy Point. Located at the tip of Rockaway peninsula, Breezy Point's marine component includes fringing salt marshes on the bay side, a stone jetty at Breezy Point, and oceanside beaches. Rockaway Inlet provides the tidal exchange and navigable connection between Jamaica Bay and the Atlantic Ocean. Jamaica Bay contains the 9,000-acre Jamaica Bay Wildlife Refuge and is bordered by John F. Kennedy International Airport, as well as the Brooklyn and Queens Boroughs.

WATER RESOURCES

Sensitive aquatic systems around the Jamaica Bay Unit that may be affected by water quality include marshes, resident and nonresident nektonic communities (fish, reptiles, and marine mammals), and shellfisheries. The following section describes existing water quality conditions that have a direct impact on these aquatic systems.

SURFACE WATER

Jamaica Bay is an urban, estuarine embayment with approximately 11,500 acres of surface water. The bay drains a watershed of approximately 85,000 acres (USFWS 1997). The center of the bay is dominated by subtidal open water and extensive low-lying islands, with areas of salt marsh, intertidal mudflats, and uplands. The mean tidal range varies from 4.9 to 5.4 feet in the bay (NOAA 2002e). Maximum currents at the Beach Channel Bridge reach more than 4 feet per second (NOAA 2002a). Depths in the bay range from just a few feet in the narrow channels of the salt marsh islands to nearly 50 feet in the larger channels that rim the outer bay. Dredging of the bay for fill to construct JFK International Airport increased the mean depth from 3 to 13 feet and likewise increased the residence period of water from 11 to 33 days (USFWS 1997).

WATER QUALITY

Water quality in Jamaica Bay is a high priority concern, as virtually the entire watershed of Jamaica Bay is developed land, and the bay receives substantial pollution, including nutrient loading, from a variety of point and nonpoint sources. Areas within the bay's tributaries and dead-end canals are subject to reduced water quality due to direct surface runoff and poor flushing. Extensive dredging for airport construction has resulted in poorly oxygenated water and accumulation of toxins in the deeper parts of the bay. Nutrient inputs result in high fecal bacteria concentrations, phytoplankton blooms, low levels of light transmission, and low bottom dissolved oxygen concentrations. Combined sewer overflows are a major source of untreated discharges into the bay, especially following heavy rains. The New York State Department of Health has a standing fish consumption advisory for several fish species in Jamaica Bay (NYS DOH 2002).

FEDERAL / STATE REGULATIONS AND STANDARDS

The U.S. Environmental Protection Agency has developed national recommended water quality criteria for priority pollutants in ambient water for the protection of aquatic life and human health (US EPA 1998). These criteria have been adopted as enforceable standards by most states. The Clean Water Act and Federal Pollution Control Act regulate and protect all national waters. Under these laws all states must submit a 305(b) report, which characterizes the quality of their waters on a watershed level, and a 303(d) list, which establishes which specific waterbodies do not meet federal or state water quality standards for designated uses. Table 5 shows the watershed category for Jamaica Bay.

New York classifies its saline waters based on five use designations (NYS DEC 1998b); the designations for Jamaica Bay and the Atlantic Ocean are shown in Table 5.

Once a waterbody is classified, the numeric water quality standards for various chemical, biological, and physical constituents established by New York State Department of Environmental Conservation are applied. These numeric standards determine whether or not a waterbody can support the designated uses. If a waterbody does not meet the numeric standards, it is considered impaired and placed on the 303(d) list. In New York water quality standards may be more stringent than the federal criteria and regulations established by the U.S. Environmental Protection Agency.

TABLE 5: WATERBODY CLASSIFICATIONS AT JAMAICA BAY UNIT

Waterbody	Watershed	Federal Designation: EPA Watershed Category**	State Use Designation*	303(d) Listed Impairment
Jamaica Bay	Southern Long Island (02030202)	Category I	Class SB	Oxygen demand, nitrogen, pathogens
Atlantic Ocean	Southern Long Island (02a030202)	Category I	Class SA	Oxygen demand, nitrogen, pathogens

SOURCE: NYS DEC 1998b; NYS DEC 2002b; US EPA 1998b.

*Class SA: Best usages are shellfishing for market purposes, primary and secondary contact recreation, and fishing. Waters suitable for fish propagation and survival.

Class SB: Best usages are primary and secondary contact recreation and fishing. Waters suitable for fish propagation and survival.

** Category I: Watersheds need restoration and do not meet clean water and natural resource goals.

OTHER WATER QUALITY DATA

Gateway National Recreation Area initiated a water quality program in 1977 to form a database for the management of the recreation area's waters for public health and ecological quality. The water quality information collected assists in the evaluation of health conditions at public beaches and provides baseline data for management decisions. The water quality sampling program at Breezy Point consists of two oceanside sites, which are tested weekly at the surf zone for total and fecal coliform during summer months (NPS 1998a). The water quality sampling program at Jamaica Bay consists of nine stations sampled during summer months for water temperature, pH, salinity, conductivity, dissolved oxygen, nitrates, Secchi transparency, chlorine, orthophosphate, chlorophyll-a, and fecal coliform counts.

The Bureau of Marine Resources of the New York State Department of Environmental Conservation conducts a shellfish land certification program approved by the Food and Drug Administration, the objective of which is to safeguard the public health by determining those waters that are safe for shellfishing and closing areas deemed unsafe. Certification is based on actual bacteriological sampling results and the evaluation of potential pollution sources along the shore. Approximately 200,000 acres, about 17% of the state's total growing waters, are closed to harvesting because sampling indicates waters are not clean

enough. All shellfish lands in Westchester, Bronx, Kings, New York, Richmond, and Queens Counties are designated as uncertified areas (NYS DEC 2002c). This includes the Jamaica Bay area.

The New York City Department of Environmental Protection has a water quality survey program in New York Harbor dating back to 1909. The survey's purpose is to document the impact of the city's various water pollution control programs on water quality in the harbor. Currently, the survey monitors over a dozen water quality parameters at 45 sites throughout the harbor, including 9 stations in the Jamaica Bay area. Key parameters monitored include fecal coliform bacteria, chlorophyll-a, dissolved oxygen, and Secchi transparency. None of the PWC pollutants of concern (hydrocarbons) were monitored.

Throughout the summer, the New York City Department of Health tests the water at Jacob Riis Park and Rockaway Beach weekly to determine the sanitary quality of coastal waters used by bathers. Swimming in the waters surrounding New York City is permitted only at approved beaches and is prohibited in Jamaica Bay, including Plum, Howard, and Canarsie Beaches, as well as Broad Channel.

AIR QUALITY

The Environmental Protection Agency defines ambient air as "that portion of the atmosphere, external to buildings, to which the general public has access" (40 CFR Part 50). In compliance with the 1970 Clean Air Act and the 1977 and 1990 Clean Air Act Amendments, the U.S. Environmental Protection Agency has promulgated national ambient air quality standards (NAAQS) and regulations. The standards were enacted for the protection of the public health and welfare, allowing for an adequate margin of safety. To date, the agency has issued standards for six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), particles with a diameter less than or equal to a nominal 10 micrometers (PM_{10}), ozone (O_3), nitrogen dioxide (NO_2), and lead (Pb). Areas that do not meet national standards are called non-attainment areas.

There are primary and secondary air quality standards. Primary standards are designed to protect sensitive segments of the population from adverse health effects, with an adequate margin of safety, which may result from exposure to criteria pollutants. Secondary standards are designed to protect human health and welfare and may be different from the primary standards. Human welfare is considered to include both the natural and man-made environments. Each state and locality has the primary responsibility for air pollution prevention and control. Under the Clean Air Act as amended, state and local air pollution control agencies have the authority to adopt and enforce ambient air quality standards that are more stringent than the national standards. New York has adopted specific standards that relate to various classifications of areas. In some cases, these differ from the national air quality standards.

Jamaica Bay is designated as a class II airshed by New York State, which means that the air quality is protected by allowing limited increases (i.e., allowable increments) over baseline concentrations for SO_2, nitrogen oxides (NO_x), and particulate matter (PM).

Jamaica Bay is in Queens County, within the New York Metropolitan Area and the NY-NJ-CT Air Quality Control Region (40 CFR 81.13, Nov. 6, 1991). Existing ambient air quality levels within or near the impact analysis area are monitored by the state and tabulated in annual reports. The Environmental Protection Agency has designated the Queens County area as being in attainment for NO_2, PM_{10}, SO_2, CO, and Pb. The area was previously designated as a moderate non-attainment area for CO, but this classification was changed to attainment effective May 20, 2002, with an approved maintenance plan. The area is severe non-attainment for O_3; therefore, the proposed actions are subject to the requirements and emission threshold set by the federal conformity rules (40 CFR Part 93), and the emission threshold set

for ozone precursor pollutants — NO_x and volatile organic compounds (VOC) — is 25 tons per year. Conformity thresholds for CO are 100 tons/year in a maintenance area.

Most personal watercraft run on small gasoline powered outboard engines that contribute to approximately 5% of the national mobile source VOC emissions. In areas dominated by boats, personal watercraft can contribute 10% or more of the regional hydrocarbon emissions (US EPA 2000a). When compared to all nonroad engines, recreational marine engines contribute approximately 30% of the total nonroad engines emissions, the second highest level of hydrocarbon emissions nationally. Other small marine spark-ignition engines contribute 50% annually to hydrocarbon emissions (US EPA 1996b).

Currently, most personal watercraft utilize two-stroke, outboard technology, in which the resulting gases from the combustion of an air/fuel/oil mixture are pushed through the cylinders along with exhaust gases. PWC two-stroke, carbureted models discharge as much as 30% of their fuel directly into the water (NPS 1999; CARB 1999). To reduce hydrocarbon emissions, newer technology utilizes four-stroke, spark-ignition technology, which reduces the amount of exhaust emissions. Four-stroke engines comprise less than 1% of the PWC market (US EPA 1996b).

Based on the design, two-stroke engines produce more power than the current four-stroke engines by burning higher amounts of fuel, resulting in higher ozone emissions. The four-stroke inboard engines used on larger marine vehicles would usually operate on carbureted and fuel-injection systems that can better regulate combustion activities (US EPA 1996b).

As a result of the increasing use of personal watercraft and other small marine vehicles, as well as the increasing potential effects on air quality, the Environmental Protection Agency requires outboard personal watercraft, wave-runners, and other small vessels to meet more stringent emissions regulations as outlined in 40 CFR Parts 89–91. These regulations began with the 1999 model year for all recreational marine vessels (Mace et al. 1998). This program allows the Environmental Protection Agency to work closely with outboard motor and PWC manufacturers for the development of better engine construction and technological solutions to meet the targeted air emission reductions in the marine environment (US EPA 1996b). The New York State Department of Environmental Conservation has adopted the California Air Resources Board regulations for marine engines (CARB 1998a), a more expedited schedule for PWC air emissions reduction requirements (New York Environmental Statutes, sec. 19-050 2000). According to California regulations, hydrocarbon emissions in all new outboard and PWC engines must be reduced by 90% by 2008, with an overall reduction of hydrocarbon emissions estimated to be 60% by 2012.

SOUNDSCAPES

"Noise" is defined as unwanted sound. Sounds are described as noise if they interfere with an activity or disturb the person hearing them. When elevated against the natural soundscape, which is all the sounds of nature in the absence of any human sound, all human sound is considered "noise." This does not, however, imply that all human sounds are inappropriate or unacceptable; such evaluations must consider management guidance such as park purpose, management zoning, resource sensitivity, impacts from an activity, and similar factors.

Sound pressure levels are commonly measured in decibels (dB), a logarithmic unit. The human ear is not equally sensitive to all sound frequencies, being generally less sensitive to very low and very high frequency sounds; therefore, the A-weighted decibel scale (dBA), which is calibrated to the human ear's response, is often used in impact analysis. Table 6 illustrates common sounds and their associated sound levels using this scale.

TABLE 6: SOUND LEVEL COMPARISON CHART

Decibels	How it Feels	Equivalent Sounds	Sound Levels in the Jamaica Bay Unit
140–160	Near permanent damage level from short exposure	Large caliber rifles (e.g., .243, 30-06)	
130–140	Pain to ears	.22 caliber weapon	Watching planes take off from JFK International Airport
100	Very loud	Air compressor at 20 feet; garbage trucks and city buses	
	Conversation stops	Power lawnmower; diesel truck at 25 feet	
90	Intolerable for phone use	Steady flow of freeway traffic; 10 HP outboard motor; garbage disposal	
80		Muffled jet ski at 50 feet; automatic dishwasher; near drilling rig; vacuum cleaner	Standing on the beach at Breezy Point on a windy day.
70		Drilling rig at 200 feet; window air conditioner outside at 2 feet	
60	Quiet	Window air conditioner in room; normal conversation	Fishing from Canarsie Pier.
50	Sleep interference	Quiet home in evening	
		Bird calls	Surf-fishing at night.
40		Library	
30		Soft whisper	
20		In a quiet house at midnight; leaves rustling	

Note: Modified from *Final Environmental Impact Statement,* Miccosukee 3-1 Exploratory Well, Broward County, Florida (U.S. Department of the Interior).

For the average human a 10 dB increase in the measured sound level is subjectively perceived as being twice as loud, and a 10 dB decrease is perceived as half as loud. The decibel change at which the average human would indicate that the sound is just perceptibly louder or perceptibly quieter is 3 dB. There is generally a 6 dB reduction in sound level for each doubling of distance from a noise source due to spherical spreading loss (e.g., if the sound level at 25 feet from a PWC is 86 dB, the sound level at 50 feet is expected to be 80 dB, at 100 feet 74 dB, etc.).

Many factors affect how an individual responds to noise. Primary acoustical factors include the sound level, the distribution of sound levels across the frequency spectrum, and the duration (and other time-related factors such as how often it occurs, and timing sensitivity) of the sound. Secondary acoustical factors include the spectral complexity, sound level fluctuations, frequency fluctuation, rise-time of the noise, and localization of the noise source (Mestre Greve Associates 1992).

Non-acoustical factors also play a role in how an individual responds to sounds. Non-acoustical factors vary from the past experience and adaptability of an individual to the predictability of when a noise will occur. The listener's activity will also affect how he/she responds to noise.

PWC and outboard motors are similar in the actual noise level they generate (in terms of decibels), which is generally around 80 dB or less at 50 feet from a motorized boat or personal watercraft (US EPA 1974) but can range from below 80 to as much as 102 dB (Sea-Doo 2000; Bluewater Network 2001). Personal watercraft generate noise that varies in pitch and frequency due to the nature of their construction and use. The two-stroke engines are often used at high speeds, and the craft bounce along the top of the water such that the motor discharges noise below and above the water surface. To visitors this irregular noise seems to be more annoying than that of a standard motorboat that is cruising along the shoreline, even though the maximum noise levels may be similar for the two watercraft. Additionally, visitors who expect to

experience natural quiet may consider the irregular noise of personal watercraft more annoying, especially if the craft is operating in one location for extended periods of time (Komanoff and Shaw 2000).

Ambient noise levels throughout the Jamaica Bay Unit are reflective of its urban location. Sources of noise include automobiles, boat motors, personal watercraft, motorcycles, all-terrain vehicles, various types of equipment (e.g., tractors, lawn mowers, etc.), power lines and transformers, and air traffic. Ambient noise levels are higher at the northeastern side of the unit near JFK International Airport. Transportation corridors create a high ambient noise level throughout the unit. The Shore (Belt) Parkway borders the unit to the north; Cross Bay Boulevard and a rapid transit line bisect Jamaica Bay north to south; and the southern boundary of the unit includes the Rockaway Freeway. A single automobile produces noise levels in the range of 70 dBA near the vehicle, while moderately heavy traffic may produce noise levels in the range of 85 to 90 dBA near the roadway (Miyara 1998). Noise related to recreational watercraft use is generally localized or seasonal in duration. All areas of Jamaica Bay are affected by noise from watercraft in the bay and Rockaway Inlet. Smaller boats in this area use outboard engines, similar to PWC engines, with 15 to 130 horsepower. Larger fishing and performance vessels use both inboard and outboard diesel engines (compression ignition), ranging from 90 to 660 horsepower. Altogether, noise related to boating activity and background noise can be very high, especially during summer months. Natural sounds can be heard occasionally; but motorized noise is the primary noise, especially during daylight hours.

WILDLIFE AND WILDLIFE HABITAT

MAMMALS

Based on a limited number of inventory studies and observational lists, 18 species of land mammals and bats are known to occur in the Jamaica Bay Unit. These include opossum, masked shrew, little brown myotis, silver-haired bat, red bat, hoary bat, black-tailed jack rabbit, cottontail rabbit, gray squirrel, white-footed mouse, meadow vole, muskrat, house mouse, Norway rat, feral dog, raccoon, and feral cat. Eastern chipmunk was introduced to the unit to help reestablish this species in the area.

Marine mammals documented in the area include bottle-nosed dolphin, harbor seal, gray seal, sperm whale, and humpback whale. Sperm whale and other whale species occur in the ocean waters of the region. While not regularly seen from land, individuals occasionally strand on beaches or in shallow waters of the unit (NPS 1989a; USFWS 1997).

The harbor seal, although not abundant in the area, is the most common marine mammal observed in the vicinity of Jamaica Bay (NYC DOH 2001). Seals are winter visitors to the bay and inlet area and use local docks, the jetty at Breezy Point, and other locations as haulout areas. Although less common, gray seals are also observed in these areas.

AMPHIBIANS AND REPTILES

The eight amphibian species documented in Jamaica Bay include the spotted salamander, red-spotted newt, redback salamander, Fowler's toad, northern spring peeper, gray treefrog, green frog, and eastern spadefoot toad. All species, excluding the red-spotted newt, were introduced to the area.

Reptiles known to occur in the Jamaica Bay Unit include the snapping turtle, eastern box turtle, diamond-back terrapin, eastern painted turtle, red-eared slider, northern brown snake, eastern garter snake, eastern hognose snake, northern black racer, smooth green snake, and eastern milk snake. Several species of sea

turtle are known to occur in the offshore habitats and may feed in Jamaica Bay (see "Threatened, Endangered, or Special Concern Species," page 62).

Diamondback terrapins use habitats throughout the Jamaica Bay Unit for feeding and nesting. Terrapin activity in the waters of Jamaica Bay is predominantly associated with salt marshes and mudflats (NPS n.d. (a)). The turtles forage in shallow tidal creeks and tidal flats, feeding on marine snails, clams, and worms. Terrapins typically nest in sandy habitats with sparse to moderate vegetative cover. Much of the shoreline of Jamaica Bay is comprised of this habitat type and provides potential nesting areas. Female diamondback terrapins come ashore in June to lay eggs, which hatch in late summer. Ruler's Bar Hassock in Jamaica Bay is used extensively for nesting. Other known terrapin nesting areas include Dubos Point, Floyd Bennett Field, and the community of Broad Channel. Specific sites in the bay where terrapins are regularly observed include Jo Co and Silver Hole Marshes, East High Meadow, and the complex of marsh and tidal flats in western Jamaica Bay that occur west of Ruler's Bar Hassock and east of Canarsie Pol-Ruffle Bar (USFWS 1997).

BIRDS

More than 335 species of birds have been identified in Jamaica Bay, including 62 breeding species that use its salt marshes, dredge spoil areas, and upland islands as nesting habitat. Table 7 lists birds common to the Jamaica Bay Wildlife Refuge (NPS 1996). The bay is on the Atlantic flyway.

TABLE 7: AVIAN SPECIES COMMON TO THE JAMAICA BAY UNIT

Bird Species	Spring	Summer	Early Fall	Late Fall	Winter
Coastal Birds					
Double-crested cormorant	abundant	abundant	abundant	rare	rare
Common loon	uncommon	-	-	uncommon	rare
Laughing gull *	abundant	abundant	abundant	uncommon	-
Greater black-backed gull *	abundant	common	abundant	abundant	abundant
Ring-billed gull	common	uncommon	common	common	common
Herring gull *	abundant	abundant	abundant	abundant	abundant
Common tern *	common	common	abundant	rare	-
Least tern *	common	common	common	-	-
Gull-billed tern *	rare	rare	rare	-	-
Royal tern	-	rare	rare	-	-
Shorebirds					
Semipalmated plover	abundant	abundant	abundant	uncommon	rare
Piping plover *	rare	rare	rare	-	-
Black-bellied plover	abundant	common	abundant	abundant	uncommon
American oystercatcher *	common	common	abundant	abundant	rare
Willet *	common	common	common	rare	-
Spotted sandpiper *	uncommon	uncommon	uncommon	rare	-
Marbled godwit	-	rare	rare	rare	rare
Sanderling	rare	rare	uncommon	uncommon	rare
Semipalmated sandpiper	abundant	abundant	abundant	common	-
Western sandpiper	rare	rare	common	uncommon	rare
Least sandpiper	abundant	common	abundant	uncommon	-
Dunlin	common	-	uncommon	abundant	common
Wading and Marsh Birds					
American bittern	rare	rare	rare	rare	rare
Great egret *	common	common	common	uncommon	rare
Snowy egret *	common	common	abundant	common	rare
Black crowned night heron *	common	common	common	common	uncommon
Little blue heron	uncommon	uncommon	uncommon	uncommon	rare
Green heron *	uncommon	uncommon	uncommon	rare	-
Tricolored heron	uncommon	uncommon	uncommon	rare	rare
Glossy ibis *	abundant	abundant	abundant	uncommon	rare
Waterfowl					
Tundra swan	-	-	-	rare	rare
Mute swan	common	abundant	abundant	common	common
Snow goose	abundant	rare	rare	abundant	abundant
Brant	abundant	rare	rare	abundant	abundant

Bird Species	Spring	Summer	Early Fall	Late Fall	Winter
Canada goose *	abundant	abundant	abundant	abundant	abundant
Wood duck	uncommon	rare	uncommon	uncommon	-
Black duck *	abundant	abundant	abundant	abundant	abundant
Black scoter	-	-	-	rare	rare
Bufflehead	abundant	rare	rare	abundant	abundant
Canvasback	common	rare	rare	abundant	uncommon
Greater scaup	abundant	uncommon	uncommon	abundant	abundant
Lesser scaup	uncommon	-	-	uncommon	uncommon
Common eider	-	-	rare	-	-
Oldsquaw	-	-	-	rare	rare
Red-breasted merganser	common	rare	uncommon	abundant	abundant
Ruddy duck *	abundant	common	common	abundant	abundant
Common goldeneye	rare	-	-	uncommon	uncommon
Surf scoter	-	-	-	rare	rare
White winged scoter	-	-	-	rare	rare

SOURCE: Modified from NPS 1996.
* Birds known to nest on or near the Jamaica Bay Unit.
Italics = threatened/endangered species.

Shorebirds

The salt marsh, dredged material, and upland islands in Jamaica Bay are somewhat separated from disturbance and predation that occurs on the surrounding mainland. These islands and marshes support large numbers of nesting waterbirds throughout the year. Common terns occur on several islands in the Jamaica Bay Unit including the Jo Co and Silver Hole Marshes, with smaller numbers at Duck Creek Marsh, East High Meadow, Ruffle Bar, and Subway Island. From 1984 though the mid 1990s an average of 1,000 common terns have nested in colonies in Jamaica Bay. Laughing gulls re-colonized the bay in 1979 and now occur at three colonies in the bay at East High Meadow, Silver Hole Marsh, and Jo Co Marsh, with a total of more than 5,800 pairs in 1995. These colonies, along with a small colony in West Hempstead Bay, represent the only colonies for this species in New York State. American oystercatchers nest on several islands in Jamaica Bay and have also nested along the shoreline of JFK International Airport (USFWS 1997).

Jamaica Bay is one of the most important migratory shorebird stopover sites in the New York Bight region, especially during fall migration (July to November). Shorebirds utilize much of Jamaica Bay, but tend to focus on the intertidal areas during low tide and move to East and West Ponds on Ruler's Bar Hassock in the Jamaica Bay Wildlife Refuge during higher tides. Water in East Pond is artificially lowered after July 1 each year. From 1981 to 1990 an average of 27 and a maximum of 36 shorebird species were counted at the East and West Ponds during the fall. The most abundant species were the black-bellied plover, semipalmated plover, greater yellowlegs, ruddy turnstone, sanderling, semipalmated sandpiper, least sandpiper, dunlin, and short-billed dowitcher. The Jamaica Bay ponds are also important during spring migration (March to June) for the black-bellied plover, semipalmated plover, ruddy turnstone, red knot, semipalmated sandpiper, least sandpiper, and dunlin. Shorebirds known to breed in or around Jamaica Bay include killdeer, American oystercatcher, willet, spotted sandpiper, upland sandpiper, and American woodcock (USFWS 1997).

Waterfowl

Jamaica Bay supports significant concentrations of migrating and wintering waterfowl, particularly greater scaup, American black duck, brant, Canada goose, bufflehead, canvasback, mallard, ruddy duck, red-breasted merganser, snow goose, and American wigeon. Jamaica Bay supports some of the largest wintering populations of greater scaup and American black duck in New York State. Regularly occurring waterfowl in lesser numbers include horned grebe, green-winged teal, gadwall, northern shoveler, and common goldeneye. Concentrations of waterfowl also occur in the bay during spring and fall migrations.

Based on surveys in 1978 and 1979, the most abundant ducks year-round were greater scaup, American black duck, canvasback, and mallard. Waterfowl confirmed to breed in Jamaica Bay include the Canada goose, American black duck, mallard, northern shoveler, gadwall, redhead (introduced), and ruddy duck (USFWS 1997).

A few islands in Jamaica Bay support or have supported heronries, including one located on Canarsie Pol, which has supported a variety of nesting waders, including glossy ibis, great egret, snowy egret, cattle egret, black-crowned night-heron, and tricolored heron. None of the wading birds identified in the area have nested there in recent years. Clapper rail and common moorhen are known to nest in the salt marshes in the bay (USFWS 1997).

Raptors

Jamaica Bay is a concentration area for raptors, particularly during summer and fall migrations. A total of 2,414 birds were banded at Breezy Point from 1978 to 1987, and 15,715 raptors were sighted. The most numerous species include the American kestrel and sharp-shinned hawk, along with the Cooper's hawk, northern harrier, osprey, peregrine falcon, and merlin. State-listed endangered peregrine falcons have nested on the Marine Parkway Bridge and feed throughout the bay (USFWS 1997).

FISHERIES

More than 80 species of fish occur in Jamaica Bay, a highly productive and regionally significant habitat for finfish. Many species use the estuarine waters for spawning, young-of-the-year and nursery habitat, seasonal feeding grounds, and general living space. The winter flounder, one of the most important commercial and recreational fish in the bay, occurs in great numbers during all life stages, and the bay is believed to be an important breeding area for this fish. Forage fish species include Atlantic silverside, bay anchovy, mummichog, Atlantic menhaden, and striped killifish, which form a prey base for other fish and birds that use the area. Some of the other common species include scup, bluefish, windowpane flounder, tautog, weakfish, black sea bass, summer flounder, American eel, and searobin (NPS n.d. (b)). Anadromous species that use the area include blueback herring, Atlantic sturgeon, alewife, American shad, and striped bass (USFWS 1997).

The 1996 Magnuson-Stevens Fishery Conservation and Management Act requires cooperation among the National Marine Fisheries Service, fishing participants, and federal and state agencies to protect, conserve, and enhance essential fish habitat. Essential fish habitat is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (16 USC 1802(10)). Jamaica Bay and the adjacent ocean waters provide essential fish habitat for various life stages of several fish species (see Table 8).

TABLE 8: ESSENTIAL FISH HABITAT IN THE VICINITY OF THE JAMAICA BAY UNIT

Species	Eggs	Larvae	Juvenile	Adult	Spawning Adult
Atlantic herring (*Clupea harengus*)		x	x	x	
Monkfish (*Lophius americanus*)	x	x			
Red hake (*Urophycis chuss*)	x (Atlantic Only)	x	x	x (Bays Only)	
Whiting (*Merluccius bilinearis*)	x	x	x	x	
Windowpane flounder (*Scophthalmus aquosus*)	x	x	x	x	x
Winter flounder (*Pleuronectes americanus*)	x	x	x	x	x

SOURCE: NOAA 2002b.

SHELLFISH

Several species of common mollusks occur in the waters of Jamaica Bay, including the northern quahog and intertidal soft-shelled clam; the Atlantic surf calm occupies nearshore and inlet areas. The Atlantic ribbed mussel is a major biomass component of salt marshes and mudflats. The blue mussel is also common and is found attached to structures, especially piers and jetties. The mud snail is ubiquitous throughout the habitat (USFWS 1997).

Jamaica Bay was historically an important shellfish nursery on the Atlantic Coast, but it has been closed to shellfishing since 1921 because of shellfish contamination by human pathogens. Without fishing pressures, the shellfish population in Jamaica Bay has increased, and bivalves are an important food source for shorebirds, waterfowl, and wading birds. The Atlantic ribbed mussel is abundant in the *Spartina alterniflora* marshes that border the bay (NYC DOH 2001).

Examples of crustacean shellfish found in Jamaica Bay include the blue crab, fiddler crab, and hermit crab. Horseshoe crabs breed from mid-May through mid-June in large contiguous mudflats associated with the Plumb Beach area of Jamaica Bay. In late spring they lay eggs, providing a crucial food source for migrant shorebirds (USFWS 1997).

THREATENED, ENDANGERED, OR SPECIAL CONCERN SPECIES

WILDLIFE

Jamaica Bay supports seasonal or year-round populations of 214 species of listed and species of concern, including 48 fish species, 120 birds species, and the federal and/or state-listed threatened or endangered species shown in Table 9. Informal consultation with the U.S. Fish and Wildlife Service has been initiated but a written response has not been received to date.

Threatened or endangered marine wildlife species that the National Marine Fisheries Service has documented in New York and New Jersey waters include the three species of sea turtles listed above and three whales. Federally protected whales that occur seasonally off the coast of New York and New Jersey include the endangered northern right whale, humpback whale, and fin whale (see appendix B).

Sea turtles occurring in nearshore waters are typically juveniles. Large loggerhead and juvenile Kemp's ridley regularly enter the New York harbor and bays in the summer and fall. Kemp's ridley, the second most abundant sea turtle found in the New York Bight area, occurs from June to October. Long Island's waters have been identified as critical habitat for immature Kemp's ridleys during its early stages of life, but some Kemp's ridley have also been seen in the Jamaica Bay area (USFWS 1997).The leatherback sea turtle, most commonly observed May through October, utilizes offshore areas and is not found in the estuaries or backbay areas (USFWS 1997). Loggerhead sea turtles prefer estuaries, coastal streams, and salt marshes, and some individuals may become stranded on beaches during summer migrations. Most observations in New York have occurred in Long Island waters. Loggerheads are omnivorous, feeding on a variety of benthic and pelagic invertebrates and sea grass species (USFWS 1997).

The piping plover has been listed as a federally threatened species since 1986. Breezy Point consistently supports one of the largest piping plover nesting sites in the entire New York Bight coastal region, with an average of 22 pairs and a maximum of 33 pairs from 1985 to 1995 (USFWS 1997). As of July 2002, 12 pairs of piping plover were documented at Breezy Point and Jacob Riis Park (D. Riepe, NPS, pers. comm., June 27, 2002). Piping plovers arrive in March; egg laying and incubation occurs from April

TABLE 9: THREATENED OR ENDANGERED SPECIES DOCUMENTED IN THE JAMAICA BAY AREA

Species	State Listing	Federal Listing
Common tern	Threatened	
Kemp's ridley sea turtle	Endangered	Endangered
Loggerhead sea turtle	Threatened	Threatened
Leatherback sea turtle	Endangered	Endangered
Least tern	Threatened	--
Northern harrier	Threatened	--
Peregrine falcon	Endangered	--
Piping plover	Endangered	Threatened
Roseate tern	Endangered	Endangered

SOURCE. USFWS 2002.

through June; and chicks typically hatch from May through August. Plovers generally forage on the intertidal beach, but may also forage in dune swales.

The northeast breeding population of roseate terns has been listed as federally endangered since 1987. Exclusively a coastal bird, roseate tern breeds on small islands or occasionally on barrier beaches. Roseate terns arrive to the coastal areas in April with egg laying, incubation, and rearing of chicks occurring from May through August (NPS 2001c). Small numbers of roseate terns began nesting at Breezy Point in 1993 (USFWS 1997); as of July 2002, two pairs had been documented, along with common terns, at Breezy Point (D. Riepe, NPS, pers. comm., June 27, 2002). Roseate tern nesting sites are always associated with common tern colonies in New York. Most roseate terns leave the coastal areas for wintering areas by the end of September (NPS 2001c).

The state threatened common tern arrives in the Jamaica Bay area in April and May and remains in the area until September or October. The common tern nests from late May through July, and most young are fledged by September. Breezy Point supports one of the largest common tern colonies on the south shore of Long Island, with an average of about 1,060 pairs from 1990 to 1995 (USFWS 1997). Common terns also occur on several islands in the bay, including Jo Co Marsh and Silver Hole Marsh, with smaller numbers at Duck Creek Marsh, East High Meadow, Ruffle Bar, and Subway Island. An average of 1,000 common terns (and a maximum of 1,630) have nested in seven colonies on Jamaica Bay since 1984 (USFWS 1997).

The state threatened least tern arrives in the Jamaica Bay area in April and remains through September. Egg laying, incubation, and rearing typically occur from May through August. Breeding habitat consists of flat, open sand, gravel, or dredge spoil with little vegetation. Nesting sites are typically associated with piping plover nesting sites. Least terns forage in the bay areas or in the ocean when the water is calm, with the most active foraging time in the early morning. They commonly rest on beaches during and after foraging. The Breezy Point area supports one of the largest concentrations of least terns, with an average of 340 nesting pairs from 1985 to 1995 and a maximum of 703 pairs in 1992.

Breezy Point is also the site of one of the largest black skimmer colonies in New York State and in the New York Bight region in recent years. An average of about 160 pairs of black skimmers nested at Breezy Point from 1990 to 1995, with a maximum of 227 pairs in 1995 (USFWS 1997).

The state endangered peregrine falcon nests on Marine Park Bridge, just outside Jamaica Bay. Foraging areas include Jamaica Bay.

The state threatened northern harrier occurs in the area of the unit in association with Floyd Bennett Field. The northern harrier has been documented to nest and overwinter in grassland habitats associated with the field (USFWS 1997).

The state special concern osprey also occurs in Jamaica Bay (USFWS 1997), and as of 2002, there were seven active nests (D. Riepe, NPS, pers. comm., June 27, 2002).

PLANT SPECIES

The federally threatened seabeach amaranth occurs at Breezy Point on overwash flats on the accreting ends of barrier islands, on lower foredunes of beaches, and on non-eroding beaches landward of the wrackline. The plant also occurs on blowouts and dredge spoil. Seabeach amaranth seems to be incapable of competing with other plants and is typically found in areas with little or no vegetation (D. Riepe, NPS, pers. comm., June 27, 2002).

The New York State Natural Heritage Program lists 23 species of threatened or endangered plant species that occur in Gateway National Recreation Area. Four species (including the state threatened red pigweed, and state endangered globose flatsedge, narrow-leaf sea blite, and Roland's sea blite occur) in association with salt marsh habitats and could potentially occur in Jamaica Bay. The state threatened dune sandspur and hop sedge occur in coastal sands, sand dunes, and dune swales and could also occur in association with these habitats in Jamaica Bay.

SHORELINE VEGETATION AND WETLAND HABITATS

Jamaica Bay and its surrounding uplands, as well as much of the Breezy Point and Rockaway Point, are dominated by urban, residential, commercial, and industrial development. The bay itself has been disturbed by dredging, filling, and development, including the construction of Floyd Bennett Field and JFK International Airport. Approximately 12,000 of the historic 16,000 acres of wetlands in the bay have been filled. Extensive areas of the bay are dredged for navigational channels and to provide fill for the airport and other construction projects (USFWS 1997).

The center of the bay is dominated by subtidal open water and extensive low-lying islands, with areas of salt marsh, intertidal flats, and uplands important for colonial nesting waterbirds. The average mean low tide exposes 350 acres of mudflat, 925 acres of low salt marsh dominated by smooth cordgrass, and 526 acres of high marsh dominated by salt meadow hay. The extensive intertidal areas are rich in food resources, including macroalgaes dominated by sea lettuce. Two freshwater impoundments created on Ruler's Bar Hassock in Jamaica Bay include the 54-acre freshwater West Pond (maintained as open water) and the larger 120-acre, slightly brackish East Pond which is controlled to expose mudflats. Some of the islands in the bay support upland communities, including grasslands dominated by little bluestem, switchgrass, and seaside goldenrod; scrub/shrub containing bayberry, beach plum, sumac, and poison ivy; developing woodland consisting of hackberry, willow, black cherry, and tree-of-heaven; and beachgrass dunes. Vegetative species introduced in the unit to attract wildlife include autumn olive, Japanese black pine, and Japanese barberry (USFWS 1997).

Breezy Point includes approximately 200 acres of natural area at the western tip of the Rockaway peninsula, with an accreting wide ocean beach, beachgrass dunes, grassland/shrub thicket, and fringing salt marshes on the bay side. A stone jetty extends out from the tip of Breezy Point. East of the natural area, the barrier behind the beach front has been largely developed into residential, commercial, and recreational areas. The ocean beach narrows to the east and contains numerous short groins (USFWS 1997).

Floyd Bennett Field includes a 1,448-acre historic civic aviation facility dominated by human-made structures and runways but with extensive areas of open space between the runways, including a 140-acre grassland area restored and maintained by the National Park Service and the New York City Audubon

Society as the Grassland Restoration and Management Project. In addition, the area includes smaller areas of shrub thicket dominated by bayberry, winged sumac, and Japanese knotweed; developing woodland consisting of black cherry, gray birch, and cottonwood; common reed marsh; and small areas of low marsh and mudflat along the shoreline of the bay (USFWS 1997).

VISITOR USE AND EXPERIENCE

The Jamaica Bay Unit supports an average of more than 3 million recreational visitors a year. The unit is comprised of the Jamaica Bay Wildlife Refuge, Jacob Riis Park, Fort Tilden, Breezy Point Park, and Floyd Bennett Field. The unit is open year-round. Peak visitation occurs May through September. There are no entrance fees; however, some permit fees are charged for fishing.

The National Park Service classifies visitation to the Jamaica Bay Unit as either a *recreation visit* or a *nonrecreation visit*.

> A *visit* is defined as the entry by any person (except NPS personnel) onto lands and waters administered by the National Park Service. Same-day re-entries, negligible transits, and entries into detached portions of the same park on the same day are considered as a single visit.
>
> A *recreation visit* is defined as the entry of persons onto lands and waters administered by the National Park Service for recreational purposes.
>
> A *nonrecreation visit* is defined as through-traffic, persons going to and from inholdings, tradespeople doing business in the park, and government personnel (other than NPS) with business in the park.

In 2001 the Jamaica Bay Unit received 3,747,044 visitors, a 20% increase from 2000, when there were 3,124,388 visitors.

VISITOR ACTIVITIES

Jamaica Bay offers a variety of outdoor recreational activities, including sunbathing, sailing, fishing, canoeing, kayaking, windsurfing, parasailing, birdwatching, boating, educational programs, nature walks, horseback riding, stargazing, and wildlife viewing. Beaches, recreation fields, fishing piers, playgrounds, and educational centers are located throughout the unit.

One of the main attractions of the Jamaica Bay Unit is the Jamaica Bay National Wildlife Refuge. This major wildlife refuge includes 9,155 acres of diverse habitat, consisting of salt marsh, upland field, woods, fresh and brackish water ponds, and an open expanse of bays and islands. Numerous trails, benches, and gardens make the refuge visitor-friendly and offer opportunities to observe shorebirds, amphibians, and many small mammals.

During the spring nesting season and the fall migration, thousands of ducks and geese on the Atlantic flyway stop over on two ponds in the refuge. During these times school programs are provided on weekday mornings and for public programs in the evenings and on weekends. Dead Horse Bay provides school groups and the public with a living laboratory for exploring the natural environment.

Floyd Bennett Field, one of the largest segments within the unit, offers recreational programs for organized groups, community gardening, and educational programs for teachers and children through the Gateway Environmental Study Center, which is run cooperatively with the New York City Board of Education.

Other attractions and activities include:

Boating and vessels — Plumb Beach and the Canarsie Pier and Marina allow year-round docking of private vessels.

Beaches — Beaches include Bergen and Plumb Beaches in Rockaway Inlet and Breezy Point, including Jacob Riis Park.

Camping — Floyd Bennett Field offers seasonal campgrounds.

VISITOR SATISFACTION

NPS visitor survey cards provide information on how visitors view the quality of various aspects of their park experience, from visitor center exhibits to concessions to recreational opportunities. Since 1998, NPS staff at the Jamaica Bay Unit have provided visitors the opportunity to rate park services. Visitor satisfaction scores of 48% (2000) and 57% (2001) were tabulated. Park staff intend to increase overall visitor satisfaction scores by improving customer service and communications in all areas, including providing recreational opportunities and better meeting basic visitor needs (Law et al. 2002).

PWC USE

PWC use is currently allowed within the Jamaica Bay Unit but is restricted within specific areas. In accordance with 36 CFR 1.5, the use of motorized vessels is prohibited within 500 feet of swimming beaches or within 100 feet of a diver's marker, downed water-skier, or swimmer. Also, motorized vehicles cannot land in any harbor or bay beach area unless designated. The "Superintendent's Compendium" for Jamaica Bay closes ocean beaches, designated swimming beaches, shorebird-nesting areas, and areas of potential visitor use to landing or launching of all motorized watercraft, including personal watercraft (see "Compendium Appendix L, January 1992" in appendix A of this document).

In the Jamaica Bay Unit most of the PWC users launch from city property located along Brooklyn and Queens or private docks along the inlets to Jamaica Bay. Launching occurs at various points around the bay, including Paerdegat Basin Marina, Shellbank Basin, Sheepshead Bay, and homeowner piers, although the Gateway Marina in Floyd Bennett Field prohibits PWC use. PWC users usually race along the shore, explore coves, circle around the marsh islands, and sometimes venture into the small channels connecting the marshes. However, the majority of PWC users operate primarily within Jamaica Bay, out to Breezy Point, and in open waters facing the ocean. Jamaica Bay has no speed limits, making it attractive to PWC users (Law et al. 2002).

Of the 3,747,044 visitors to the Jamaica Bay Unit in 2001, 43,062 used some form of watercraft. The National Park Service estimates that approximately 15% of boaters in the Jamaica Bay Unit are PWC users. The heaviest PWC use is during the summer season.

VISITOR SAFETY

Industry representatives report that PWC accidents decreased in some states in the late 1990s. The National Transportation Safety Board reported that in 1996 personal watercraft represented 7.5% of state-registered recreational boats but accounted for 36% of recreational boating accidents. In the same year PWC operators accounted for more than 41% of people injured in boating accidents. PWC operators accounted for approximately 85% of the persons injured in accidents studied in 1997 (NTSB 1998). In part, this is believed to be a boater education issue (i.e., inexperienced riders lose control of the craft), but

it is also a function of the PWC operation (i.e., no brakes or clutch; when drivers let up on the throttle to avoid a collision, steering becomes difficult).

STATE BOATING REQUIREMENTS

PWC users must abide by the New York State watercraft laws and regulations when operating inside the boundaries of the Jamaica Bay Unit. New York boating laws applicable to PWC use are as follows:

Safety:

- Operator must wear a personal flotation device.
- Operator must have completed a boater safety course.

Age:

- Operator must be 16 years old or be accompanied by a person with a boating certificate to operate personal watercraft.

Timing Restrictions:

- No operation from sunset to sunrise.

Restricted Activities:

- The PWC unit must operate below 90 dB, or below 82 dB at 82 feet.
- A PWC user cannot operate within 500 feet of a bathing area unless the waterbody is less than 500 feet wide, then cannot operate in excess of 10 mph.
- The PWC unit cannot operate at excessive speed within 100 feet of the shoreline.
- The PWC unit must operate below 5 mph when within 100 feet of the shore, a dock, pier, raft, float, or anchored boat.
- A person operating without caution in a manner that endangers or likely endangers a person or property is guilty of careless operation.
- Recklessly operating a personal watercraft or maneuvering in a manner that unnecessarily endangers life, limb, or property (including weaving through congested vessel traffic, jumping the wake of another vessel and coming close to such other vessel or when visibility is obstructed, or swerving at the last possible moment to avoid collision) is prohibited.

Other:

- The operator must have a visual distress flag and an auditory distress signal.
- The operator cannot be impaired or intoxicated from alcohol or drugs.
- The PWC unit must have at least two ventilators to remove any explosive gases.
- Personal watercraft sold or manufactured in New York must be consistent with the California air emissions reduction and regulations for new spark-ignition, marine engines.
- All personal watercraft must be registered with the state.

Enforcement responsibility within the Jamaica Bay Unit is shared by federal and state law enforcement agencies — the National Park Service, the U.S. Park Police, the New York City Police Department, the

New York State Police, and the Port Authority of New York. The U.S. Coast Guard does not patrol within Jamaica Bay.

PWC ACCIDENTS AND INJURIES

Increased PWC use in recent years has resulted in more concern about the health and safety of operators, swimmers, snorkelers, divers, and other boaters. A 1998 National Transportation Safety Board study revealed that while recreational boating fatalities have been declining in recent years, PWC-related fatalities have increased (NTSB 1998). Nationwide PWC accident statistics provided by the U.S. Coast Guard supports the increase in PWC-related fatalities (see Table 2, page 14); however, since a peak of 84 PWC-related fatalities in 1997, accidents, injuries, and fatalities involving personal watercraft have decreased (M. Schmidt, U.S. Coast Guard [USCG], pers. comm., Sept. 4, 2001). The U.S. Coast Guard's Office of Boating Safety studied exposure data to assess boating risks. This method allows for a comparison between boat types based on comparable time in the water. PWC use ranked second in boat type for fatalities per million hours of exposure in 1998, with a 0.24 death rate per million exposure hours.

PWC-related accidents, fatalities, and injuries in New York State during the 1990s are shown in Table 10. In 2000, 34 of the 85 accidents involving personal watercraft were caused by careless or reckless operator behavior (New York State Office of Parks, Recreation, and Historic Preservation [NYS OPRHP] 2000).

TABLE 10: PWC ACCIDENT TRENDS, NEW YORK STATE

Year	Accidents	Fatalities	Injuries
1991	40	0	21
1992	31	1	21
1993	45	1	32
1994	53	3	33
1995	117	3	48
1996	140	2	62
1997	121	6	65
1998	137	3	66
1999	117	4	70
2000	85	1	35

SOURCE: NYS OPRHP 2000.

In the Jamaica Bay Unit there was a fatal crash related to PWC use at the Memorial Bridge in 2001. U.S. Park Police track accident trends within the Jamaica Bay and Staten Island Units (Table 11); however, the statistics do not differentiate between units (S. Dermon, USPP, pers. comm., July 25, 2002).

TABLE 11: PWC ACCIDENT TRENDS, GATEWAY NATIONAL RECREATION AREA

Year	Accidents	Fatalities	Injuries
1995	--	--	--
1996	1	--	1
1997	--	--	--
1998	3	--	2
1999	1	2	--
2000	1	--	1
2001	--	1	--

SOURCE: S. Dermon, USPP, letter correspondence, July 25, 2002.

SOCIOECONOMIC ENVIRONMENT

A detailed description of the socioeconomic environment affected by PWC use at Gateway National Recreation Area is provided in the report "Economic Analysis of Personal Watercraft Regulations in Gateway National Recreation Area" (Law et al. 2002).

Based on aerial photographs of the canals leading to Jamaica Bay, NPS staff estimate there are approximately 2,457 houses with docks located in these canals. Observations from a site visit to the area suggest that about 25% of these docks have personal watercraft moored at them, implying that there are probably just over 600 personal watercraft at private docks near Jamaica Bay (Law et al. 2002).

One PWC rental shop is known to operate in the area. The shop is located along Broad Channel and operates seasonally. The rental shop limits PWC renters to using an area between Veterans Memorial Bridge and the railway trestle to the east of the bridge, which is outside the NPS boundary.

NPS MANAGEMENT AND OPERATIONS AT THE JAMAICA BAY UNIT

Currently 10 U. S. Park Police officers are assigned to patrols and enforcement activities in the Jamaica Bay Unit; officers have no jurisdiction over the use of private launches along the inland areas north and east of Jamaica Bay. The Jamaica Bay Unit has two personal watercraft for enforcement activities. As previously mentioned, enforcement responsibility is shared with the state, the city police, and the New York Port Authority, which patrols near JFK International Airport. The U.S. Coast Guard does not patrol within Jamaica Bay (Law et al. 2002).

ENVIRONMENTAL CONSEQUENCES

SUMMARY OF LAWS AND POLICIES

Three overarching environmental protection laws and policies guide the National Park Service — the National Environmental Policy Act (NEPA) of 1969, and its implementing regulations; the National Parks Omnibus Management Act of 1998; and the National Park Service Organic Act.

1. The National Environmental Policy Act is implemented through regulations of the Council on Environmental Quality (40 CFR 1500–1508). The National Park Service has in turn adopted procedures to comply with NEPA and the CEQ regulations, as found in *Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision-making* (2001b), and its accompanying handbook.

2. The National Parks Omnibus Management Act (16 USC 5901 et seq.) underscores the National Environmental Policy Act in that both are fundamental to park management decisions. Both acts provide direction for articulating and connecting the ultimate resource management decision to the analysis of impacts, using appropriate technical and scientific information. Both also recognize that such data may not be readily available, and they provide options for resource impact analysis should this be the case.

   The Omnibus Act directs the National Park Service to obtain scientific and technical information for analysis. The National Park Service handbook for *Director's Order #12* states that if "such information cannot be obtained due to excessive cost or technical impossibility, the proposed alternative for decision will be modified to eliminate the action causing the unknown or uncertain impact or other alternatives will be selected" (section 4.4).

   Section 4.5 of *Director's Order #12* adds to this guidance by stating "when it is not possible to modify alternatives to eliminate an activity with unknown or uncertain potential impacts, and such information is essential to making a well-reasoned decision, the National Park Service will follow the provisions of the regulations of CEQ (40 CFR 1502.22)." In summary, the Park Service must state in an environmental assessment or impact statement (1) whether such information is incomplete or unavailable; (2) the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (3) a summary of existing credible scientific adverse impacts that is relevant to evaluating the reasonably foreseeable significant adverse impacts; and (4) an evaluation of such impacts based on theoretical approaches or research methods generally accepted in the scientific community.

3. The 1916 NPS Organic Act (16 USC 1) commits the National Park Service to making informed decisions that perpetuate the conservation and protection of park resources unimpaired for the benefit and enjoyment of future generations.

GENERAL METHODOLOGY FOR ESTABLISHING IMPACT THRESHOLDS AND MEASURING EFFECTS

While much has been observed and documented about the overall effects of personal watercraft on the environment, as well as public safety concerns, the impacts on any particular resource under all conditions and scenarios are more difficult to measure and affirm. Even with monitoring, data collected

and interpreted since personal watercraft were introduced in parks, and their effects on park resources relative to other uses and influences, are difficult to define and quantitatively measure.

Recognizing this dilemma, the interdisciplinary planning team created a process for impact assessment, based on the directives of the *DO #12 Handbook* (section 4.5(g)). Planning teams are directed to assess the extent of impacts to park resources as defined by the context, duration, and intensity of the effect. While measurement by quantitative means is useful, it is even more crucial for the public and decision-makers to understand the implications of those impacts in the short and long term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists.

Potential impacts are described in terms of type (Are the effects beneficial or adverse?), context (Are the effects site-specific, local, or even regional?), duration (Are the effects short-term, lasting less than one year, or long-term, lasting more than one year?), and intensity (Are the effects negligible, minor, moderate, or major?). Because definitions of intensity (negligible, minor, moderate, or major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this document.

Issues and concerns, as presented in the "Purpose of and Need for Action," were further defined and focused to assess the various PWC management alternatives, given the context, duration, and intensity of effects on park resources. Thresholds were established for each impact topic to help understand the severity and magnitude of changes in resource conditions, both adverse and beneficial, under each alternative. In general, the thresholds used come from existing literature on personal watercraft, federal and state standards, and consultation with subject matter experts and appropriate agencies. In the absence of quantitative data, best professional judgment was used.

Each alternative is compared to a baseline of existing conditions to determine the context, duration, and intensity of resource impacts. The baseline, for purposes of impact analysis, is the continuation of PWC use and current management projected over the next 10 years (alternative A).

In addition to establishing impact thresholds, the park's resource management objectives and goals (as stated beginning on page 15) were integrated into the impact analysis. In order to further define resource protection goals relative to PWC management, the park's *Strategic Plan* was used to ascertain the desired future condition of resources over the long term. The impact analysis then considered whether each PWC management alternative would contribute substantially to the park's achievement of its resource goals, or whether it would be an obstacle to achieving the resource goal as defined by the *Strategic Plan.* The planning team then considered potential ways to mitigate effects of personal watercraft on park resources, and modified the alternatives accordingly.

For the purposes of analysis, the following assumptions are used for all impact topics (the terms "impact" and "effect" are used interchangeably throughout this document):

> *Short-term impacts:* Those occurring from PWC use in the immediate future (per trip through a single season of use, usually one to six months).
>
> *Long-term impacts:* Those occurring from PWC use over several seasons of use through the next 10 years.
>
> *Direct impacts:* Those occurring from the direct use or influence of personal watercraft.
>
> *Indirect impacts:* Those occurring from PWC use that would indirectly alter a resource or condition.
>
> *Cumulative impacts:* Those occurring from continued PWC use at the park, when considered in context with other site-specific, local, or regional past, present, and reasonably foreseeable

actions/activities that could affect the same resources or conditions, both inside and outside park boundaries.

Impact analysis area: Each resource impact is assessed in direct relationship to those resources affected both inside and outside the park, to the extent that the impacts can be substantially traced, linked, or connected to PWC use inside park boundaries. Each impact topic, therefore, has an impact analysis area relative to the resource being assessed, and it is further defined in the impact methodology.

Unless otherwise noted in the analysis, impacts are considered to be adverse.

CUMULATIVE IMPACTS

The CEQ regulations to implement the National Environmental Policy Act require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for all alternatives, including the no-action alternative.

Cumulative impacts were determined by combining the impacts of the alternative being considered with other past, present, and reasonably foreseeable future actions. The following projects were identified within the vicinity of Jamaica Bay and are more fully described in the "Relationship to Other Plans, Policies, and Actions" section (beginning on page 23).

Jamaica Bay Wildlife Refuge Visitor Contact Station — PWC users are not permitted to land near the contact station, so no cumulative impacts are expected.

Gerritsen Creek Restoration Project — The New York City Parks Department has expressed concern about PWC usage and effects (e.g., erosion) at meetings. The project includes developing restoration plans to help improve water quality, increase flood retention capabilities, and increase natural habitat diversity and productivity within this highly urbanized area. PWC users access the area from private boat docks along the shoreline or from the Jamaica Bay Unit. PWC use from outside the unit is not expected to add to use within the park, and the preferred alternative is not expected to increase PWC use in Gerritsen Creek because only local users are able to access the area from the unit. Therefore, no cumulative impacts are expected.

Jamaica Bay Ecosystem Restoration Project — This project by the New York District Corps of Engineers is aimed at restoring wetland and upland habitat throughout Jamaica Bay, as well as halting erosion and recontouring selected waterways to improve flushing of the bay. Plans for recontouring the bay bottom are being coordinated with current point and nonpoint source control efforts, such as combined sewer overflow controls. The feasibility study commenced in 1996 and was scheduled for completion in 2002. The National Park Service currently restricts PWC use in marsh areas and restricts landing and launching of personal watercraft from within the unit. PWC use is not expected to impact wetland and upland restoration effort throughout Jamaica Bay, and no cumulative impacts are expected.

Jamaica Bay Shoreline Protection Project — A component of the Jamaica Bay Ecosystem Restoration Project, this project is examining potential shoreline protection options at eight sites within Jamaica Bay. The National Park Service currently restricts PWC use in marsh areas and restricts landing and launching of personal watercraft from within the unit. PWC use is not

expected to impact shoreline protection efforts throughout Jamaica Bay, and no cumulative impacts are expected.

Jamaica Bay Ecological Research and Restoration Team — The National Park Service is planning an experimental restoration site that will use a high-pressure spray dredge to restore a 3-acre area. The Corps is studying several areas now for possible island restoration. The National Park Service currently restricts PWC use in marsh areas and restricts landing and launching of personal watercraft from within the unit. PWC use is not expected to impact shoreline protection efforts throughout Jamaica Bay, and no cumulative impacts are expected.

IMPAIRMENT ANALYSIS

The NPS *Management Policies 2001* require an analysis of potential effects to determine whether or not actions would impair park resources. The fundamental purpose of the national park system, as established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values 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. Although Congress has given the National Park Service the management discretion to allow certain impacts within a park system unit, that discretion is limited by the statutory requirement that the agency must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values. An impact to any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park; or
- identified as a goal in the park's *General Management Plan* or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park.

The following process was used to determine whether the various PWC management alternatives had the potential to impair park resources and values:

1. The park's enabling legislation, *General Management Plan, Strategic Plan,* and other relevant background information was reviewed to ascertain the park's purpose and significance, resource values, and resource management goals or desired future conditions.
2. PWC management objectives specific to resource protection goals at the park were identified.
3. Thresholds were established for each resource of concern to determine the context, intensity, and duration of impacts, as defined above.
4. An analysis was conducted to determine if the magnitude of impact reached the level of "impairment," as defined by NPS *Management Policies.*

The impact analysis includes any findings of impairment to park resources and values for each of the management alternatives.

PWC AND VISITOR USE TRENDS

PWC use trends were identified to determine direct and indirect impacts on the environment of the Jamaica Bay Unit. Other visitor use trends were identified to help assess cumulative effects. PWC and visitor use trends were determined using NPS data, discussions with staff, discussions with the staff of New York State agencies (New York State Department of Environmental Conservation; New York State Department of State's Division of Coastal Resources), and information available from local governments (Kings, Queens, and Richmond Counties). Typical motorized watercraft use patterns, including numbers and hours used, were determined from boating registration data for Kings, Queens, and Richmond Counties, the *New York State 2000 Recreational Boating Report* (NYS OPRHP 2000), and observations by NPS personnel. National trends in PWC ownership were also used, as shown in Table 1 on page 9.

Even though Gateway National Recreation Area does not have detailed information specific to PWC use, staff record annual watercraft visitation by counting vessels at each of the units, including Jamaica Bay. PWC use tends to be concentrated within a number of areas, spread throughout the unit, along with non-PWC uses (D. Riepe, NPS, pers. comm., June 26, 2002). For the purpose of this analysis the unit was divided into Jamaica Bay, Breezy Point, and Rockaway Inlet, and watercraft were distributed by available surface acreage accordingly. According to NPS records, in 2000 and 2001 the Jamaica Bay Unit had an annual average of 53,623 watercraft-related visits, or an average of 335 watercraft per day, assuming usage during a 160-day period during the summer months. NPS staff estimate that 15% of watercraft that access the waters within the Jamaica Bay Unit are personal watercraft, resulting in 50 craft operating within the unit daily.

Regional PWC ownership, as determined from registration data provided by the New York State Office of Parks, Recreation, and Historic Preservation, shows a continual increase through 2001. New York State does not segregate PWC registrations from other boat types; all vessels less than 16 feet are categorized as class A vessels. For this analysis PWC registration trends were assumed to be consistent with the class A vessel registration trends, which have paralleled national boat registration in Kings, Queens, and Richmond Counties over the past five years (see Table 12). National trends indicate that dramatic increases in ownership ended in 1996 and 1997, followed by a decline through 1998; now trends are stabilizing, showing low percentage increases. Regional registration trends for class A vessels indicate an average annual increase of 0.3% from 1998 to 2001. Based on regional information and surveys, combined with national trends, the analyses in this environmental assessment assume an annual increase in PWC use within the Jamaica Bay Unit of 0.3% over the next 10 years.

TABLE 12: COUNTY AND STATE WATERCRAFT REGISTRATION TREND

	Region — Kings, Queens, Richmond Counties				New York State			
Year	Total Boat	Class A Vessels (<16 feet)	Boat % Change	Class A Vessels % Change	Total Boat	Class A Vessels (<16 feet)	Boat % Change	Class A Vessels % Change
1996	17,305	6,402	-	-	458,092	193,967	-	-
1997	19,561	7,449	14.95	16.4	514,538	217,307	12.3	12.0
1998	19,439	7,508	0.92	0.8	516,783	217,500	0.4	0.1
1999	19,618	7,668	2.20	2.1	526,321	220,394	1.8	1.3
2000	19,705	7,653	0.95	-0.2	522,943	217,388	-0.6	-1.4
2001	19,488	7,532	0.96	-1.6	528,113	217,811	1.0	0.2
Average*	19,186	7,368	1.26	0.3	523,540	218,273	0.6	0.1

SOURCE: L. Migliozzi, NYS OPRHP, pers. comm., April 1, 2002.
* 1998–2001

According to the *New York State 2000 Recreational Boating Report*, personal watercraft comprise less than 10% of the total registered vessels in New York State, 5% lower than NPS estimates for the Jamaica Bay Unit. Park estimates, together with the county average total boat and class A vessel use trends, and

NPS observations, helped establish current user levels and develop user trends for the next 10 years. Table 13 shows the baseline conditions at the Jamaica Bay Unit for personal watercraft compared to all other boats, assuming that the projected annual increase is 0.3% and that the annual average determined above remains constant.

TABLE 13: JAMAICA BAY UNIT BOATING AND PWC DAILY USE TRENDS

	Motorized Vessels		Personal Watercraft		Total	
	2002	2012	2002	2012	2002	2012
Jamaica Bay	201	208	35	37	236	245
Rockaway Inlet	57	58	10	10	67	68
Breezy Point	27	28	5	5	32	33
Total	**285**	**294**	**50**	**52**	**335**	**346**

NOTE: Due to qualitative nature of NPS surveys, analysis was based on a highest use estimate; therefore, 50 personal watercraft/day was the value used in all estimated projections. It is assumed that all personal watercraft would operate for a total of four hours per day.

WATER QUALITY

BACKGROUND

Most research on the effects of personal watercraft on water quality focuses on the impacts of two-stroke engines, and it is assumed that any impacts caused by these engines also apply to the personal watercraft powered by them. There is general agreement that two-stroke engines (and personal watercraft) discharge a gas-oil mixture into the water. Fuel used in PWC engines contains many hydrocarbons, including benzene, toluene, ethylbenzene, and xylene (collectively referred to as BTEX). Polycyclic aromatic hydrocarbons (PAHs) also are released from boat engines, including those in personal watercraft. These compounds are not found appreciably in the unburned fuel mixture, but rather are products of combustion. Discharges of all these compounds — BTEX and PAHs — have potential adverse effects on water quality. Some research shows that PAHs, including those from PWC emissions, adversely affect water quality by means of harmful phototoxic effects on ecologically sensitive plankton and other small water organisms (US EPA 1998; Oris et al. 1998; Landrum et al. 1987; Mekenyan et al. 1994; Arfsten et al. 1996). This in turn can affect aquatic life and ultimately aquatic food chains. The primary concern is in shallow water ecosystems.

A typical conventional (i.e., carbureted) two-stroke PWC engine discharges as much as 30% of its fuel unburned directly into the water (NPS 1999; CARB 1999). At common fuel consumption rates, an average two-hour ride on a personal watercraft may discharge 3 gallons of fuel into the water (NPS 1999). According to data from the California Air Resources Board, two-stroke PWC engines may consume 5 to 10 gallons of fuel per hour, of which up to 3.3 gallons per hour may be discharged unburned (CARB 1998b). (As described in appendix C, an estimated discharge rate of 3 gallons per hour is used in the water quality impact calculations.)

GUIDING REGULATIONS AND POLICIES

The U.S. Environmental Protection Agency has developed national recommended ambient water quality criteria for approximately 120 priority pollutants and 45 non-priority pollutants to protect both aquatic life and human health (through ingestion of fish/shellfish or water) (US EPA 1999b). These criteria have been adopted as enforceable standards by most states. New York has adopted its own standards, some of which are more stringent than the federal criteria. There are no EPA water quality criteria for the protection of aquatic life for the PWC-related contaminants (US EPA 1999b). For human health, however, the Environmental Protection Agency has established benchmarks for benzene and several PAH compounds; there

are no benchmarks for xylene. Although there is no federal drinking water standard for MTBE, it is on the "Contaminant Candidate List" for consideration in setting health standards; there is no information about the long-term effects that MTBE can have (US EPA 2001a). However, in 2001, an MTBE Water Quality Criteria Work Group, consisting of representatives from private companies, trade associations, and the Environmental Protection Agency, generated toxicity data necessary to derive ambient water quality criteria for MTBE and calculated "preliminary" freshwater and marine criteria for acute and chronic exposure effects (Mancini et al. 2002).

The National Park Service's *Management Policies 2001* state that the National Park Service will perpetuate surface water and groundwater as integral components of park aquatic and terrestrial ecosystems (*Management Policies 2001,* sec. 4.6.1). Furthermore, the National Park Service will determine the quality of park surface and groundwater resources and avoid, whenever possible, the pollution of park waters by human activities occurring within and outside of parks, by

> working with appropriate governmental bodies to obtain the highest possible standards available under the Clean Water Act for the protection of park waters
>
> taking all necessary actions to maintain or restore the quality of surface water and groundwater within the parks consistent with the Clean Water Act and all other applicable federal, state, and local laws and regulations
>
> entering into agreements with other agencies and governing bodies, as appropriate, to secure their cooperation in maintaining or restoring the quality of park water resources (*Management Policies 2001,* sec. 4.6.3)

The mission statement for Gateway National Recreation Area is to "maintain, improve, and make [the natural systems, wildlife habitats, historic resources, and recreational opportunities] available to the public." To achieve this, one long-term water quality goal was identified in the recreation area's *Strategic Plan*:

> *Water Quality* — By September 30, 2005, Gateway estuarine and ocean waters have unimpaired water quality.

Gateway National Recreation Area does not have quantifiable water quality data documenting the effects of PWC emissions since they were introduced in the 1970s. To address water quality impacts potentially resulting from continued PWC use, water quality standards were used in the absence of park-specific data as a basic principle to guide the analysis.

Simply stated, a water quality standard defines the water quality goals of a waterbody by designating uses to be made of the water, by setting minimum criteria to protect the uses, and by preventing degradation of water quality through antidegradation provisions. The antidegradation policy is only one portion of a water quality standard. Part of this policy (40 CFR 131.12(a)(2)) strives to maintain water quality at existing levels if it is already better than the minimum criteria necessary to protect the uses. Antidegradation should not be interpreted to mean that "no degradation" can or will occur, as even in the most pristine waters, degradation may be allowed for certain pollutants as long as it is temporary and short term in nature (Rosenlieb, NPS, WRD, pers. comm., June 2001).

Other considerations in assessing the magnitude of water quality impacts is the effect on those resources that depend on a certain quality or condition of water. Sensitive aquatic organisms, submerged aquatic vegetation, riparian areas, and wetlands are affected by changes in water quality from direct and indirect sources.

METHODOLOGY AND ASSUMPTIONS

In order to assess the magnitude of water quality impacts to park waters under the various PWC management alternatives, the following methods and assumptions were used:

1. The regulation at 40 CFR 131.12(a)(2) represents an overall goal or principle with regard to PWC use in that the park will strive to fully protect existing water quality so that "fishable / swimmable" uses and other existing or designated uses are maintained. Therefore, PWC use could not be authorized to the degree that it would lower this standard and affect these uses. To do so would potentially violate 40 CFR 131.10, which basically forbids the removal of an existing use because the activity was authorized knowing this level of pollution would occur.
2. State water quality standards governing the waters of the park were examined; where standards or water quality criteria were not available for pollutants present in PWC emissions, ecotoxicological and human health benchmarks for certain pollutants were acquired from various literature sources. The classification of park waters by the state was defined, and the overall sources of water pollutants, both internal and external to the national recreation area's boundary, were identified in relation to the standards and classification.
3. Baseline water quality data, especially for pollutants associated with two-stroke engines (PAHs, hydrocarbons), were examined, if available.
4. Typical use patterns of motorized watercraft, including numbers and hours used, were determined from boating registration data for Kings, Queens and Richmond Counties, the *New York State 2000 Recreational Boating Report*, and observations by NPS personnel at the Jamaica Bay Unit. Although PWC use tends to be concentrated in a number of areas, personal watercraft are used throughout the unit's waters, including ocean waters off Breezy Point (D. Riepe, NPS, pers. comm., June 26, 2002). PWC use is assumed to be evenly distributed by available surface area of jurisdictional waters. Other watercraft also use all areas of the Jamaica Bay Unit (D. Riepe, NPS, pers. comm., June 26, 2002), so it is assumed they are evenly distributed throughout the jurisdictional waters. Future use trends for motorized watercraft (personal watercraft and motorboats) were estimated for the next 10 years for the Jamaica Bay Unit, based on registration data for the past four years in Kings, Queens, and Richmond Counties. While boating activity is distributed over a full day from 4 A.M. to 6 P.M., it peaks between 10 A.M. and 2 P.M. The current (2002) contaminant loading to water was calculated for one day, assuming a given number of personal watercraft (example: on average, 35 personal watercraft operating per hour in Jamaica Bay, each operating for four hours, for a total of 140 PWC-hours during peak hours, and each discharging 11.34 liters of gasoline per PWC-hour). It was also estimated that outboards operated for four hours per day.
5. Since no models were available to predict concentrations in water of selected pollutants emitted by personal watercraft and motorboats, an approach was developed to provide a rough estimate of whether typical PWC (and outboard motor) use over a particular time (e.g., a typical busy weekend day) would result in exceedances of the identified standards, criteria, or toxicity benchmarks. The approach is described in appendix C. Results of this approach were then taken into account, along with site-specific information about water flow, currents, mixing, wind, turbidity, etc., as well as the specific fate and transport characteristics of the pollutant involved (e.g., volatility), to assess the potential for the occurrence of adverse water quality impacts.
6. In general, the approach provides the information needed to calculate emissions to the receiving waterbody from personal watercraft (and, by estimation, from outboard motors) of MTBE and selected hydrocarbons whose concentrations in the raw gasoline fuel are available in the literature and for which ecotoxicological and/or human health benchmarks were acquired from the literature. The selected chemicals were benzene, MTBE, and three PAHs — benzo(a)pyrene,

naphthalene, and 1-methyl naphthalene. First the emissions of these pollutants to the water per PWC operational hour (based on literature values) was estimated, and then the total loading of the pollutants into the water, based on the estimated hours of use, was estimated. The next step was to estimate the volume of water it would take to dilute the calculated emission loading to the level of the water quality standard or benchmark. The volume of water (referred to as the "threshold volume of water") was then compared to the total available volume of water, and all the mechanisms that result in loss of the pollutant from the water were also qualitatively considered. In this way, an assessment could be made as to the potential for the standards or benchmarks to be exceeded, even on a short-term basis. In May 2000 Governor George Pataki banned the use, sale, or importation of fuels containing MTBE beginning in 2004 in order to protect New York's water supplies against contamination from MTBE (NY State Governor's Office 2000). Consequently, emission calculations excluded MTBE after 2004.

Although there is no clear definition of how MTBE, BTEX, and PAHs from marine engine exhaust affect human and aquatic health, the physical characteristics and natural tendencies of Jamaica Bay establish longer retention times for pollutants and contaminants. As a result, exposure time, concentrations, and risks associated with these pollutants may increase over time.

Hydrocarbons also have the potential to accumulate in the sediment and solids on which marine mammals feed. As a result of bioaccumulation, long-term adverse health effects in mammals and humans who use marine life as a food source are possible. BTEX and MTBE compounds tend to transfer from water to air more rapidly than PAHs. PAHs, however, do not dissolve easily in water and tend to bond to particulate matter and settle to the bottom sediments. Research has found that increased exposure to PAHs can adversely affect immune systems and has the potential to cause cancer in humans (Agency for Toxic Substances and Disease Registry [ATSDR] 1996a).

7. The principal mechanisms that result in loss of pollutants from the water also were qualitatively considered. Many organic pollutants that are initially dissolved in the water volatilize to the atmosphere, especially if they have high vapor pressures, are lighter than water, and mixing occurs at the air/water interface. Other compounds that have low vapor pressure, low solubility, and high octanol/water partition coefficients tend to adhere to organic material and clays and eventually adsorb onto bottom sediments. By considering movements of the organics through the water column, an assessment can be made as to whether there could be an issue with standards or benchmarks being exceeded, even on a short-term basis. Jamaica Bay is a marine environment, and only limited water quality criteria or standards are available for PWC-related contaminants.

   Some states (e.g., New York, Washington) utilize freshwater quality criteria to assess effects on marine organisms for a variety of chemical parameters. In the absence of established marine criteria or standards at the federal or state level, this analysis adopted freshwater ecotoxicological benchmarks for benzo(a)pyrene, naphthalene, and benzene (Suter and Tsao 1996) to determine potential water quality impacts; marine benchmarks were used for 1-methyl naphthalene (USFWS 1987) and MTBE (Mancini et al. 2002). Benchmarks for benzo(a)pyrene (US EPA 1999a) and benzene (NYS DEC 1999) that are based on the consumption of aquatic organisms by humans are also used to assess impacts (see Table 14). [Note: The U.S. Environmental Protection Agency (2002a) recently lowered the human health fish ingestion criterion for benzo(a)pyrene from 0.049 µg/L to 0.018 µg/L. While use of this new, lower criterion would increase the threshold volumes for benzo(a)pyrene, conclusions provided below for the Jamaica Bay Unit would not change. The New York standard for benzene (10 µg/L) is lower than the revised EPA standard (51 µg/L), so the state standard is used instead of the federal standard.]

   Site-specific data on pollution from emissions was calculated for the park. The threshold volume was determined by considering the PWC-hours of operation for each site and the loadings during

operating hours; the ecotoxicological and human health benchmarks were obtained from literature or guidance.

Benzene, when released to the water, is subject to rapid volatilization, with a half-life for evaporation of about five hours (US EPA 2001b). Consequently, this evaporation rate is discussed for benzene in the analysis of the alternatives.

TABLE 14: TOXICOLOGICAL BENCHMARKS USED IN CALCULATIONS — NEW YORK STATE

Chemical	Ecotoxicological Benchmark (μg/L)	Source	Human Health Benchmark (μg/L)	Source
Benzo(a)pyrene	0.014	Suter & Tsao 1996	0.049*	US EPA 1999a
Naphthalene	62	Suter & Tsao 1996	--	--
1-methyl naphthalene	19**	USFWS 1987	--	--
Benzene	130	Suter & Tsao 1996	10***	NYS DEC 1999
MTBE	18,000	Mancini et al. 2002	--	--

* Based on the consumption of aquatic organisms. [Note: The U.S. Environmental Protection Agency (2002a) recently lowered the human health fish ingestion criterion for benzo(a)pyrene from 0.049 μg/L to 0.018 μg/L. Conclusions regarding water quality impacts presented below for the Jamaica Bay Unit based on the 0.049 μg/L criterion (US EPA 1999a) would not change as result of the new criterion. The New York standard for benzene (10 μg/L) is lower than the revised EPA standard (51 μg/L), so the state standard is used instead of the federal standard.]

** Based on LC50 of 1,900 μg/L for dungeness crab.

*** Based on the consumption of aquatic organisms.

8. The threshold volume of water was calculated in acre-feet (1 acre-foot = 1 acre of water 1 foot deep). For example, if results showed that for benzo(a)pyrene, 55 acre-feet of water would be needed to dilute the expected emissions to the benchmark level, and the receiving body of water is a 100-acre reservoir with an average depth of 20 feet (= 2,000 acre-feet) and is well-mixed, then this would indicate little chance of a problem, especially when adding in the effects of any other processes that contribute to the loss of the benzo(a)pyrene from the water column. However, if the impact area is a 5-acre backwater area averaging 2 feet deep (10 acre-feet), then there may be at least a short-term issue, especially if outboard emissions are added and/or if there is little mixing in the area. Water volumes were determined from NOAA chart 12350 (2002d) and include the Jamaica Bay Unit's jurisdictional waters and the entire volume of Jamaica Bay. All results were rounded to two significant figures.
9. To assess cumulative impacts, outboard motorboat emissions were added to PWC emissions to get a more complete estimation of loading to the receiving waterbody. It was assumed that outboards have the same emission rate as personal watercraft. Inboards contribute very little to the loading and were not included in the estimation. The figures used for relative loading from various outboard engines have been obtained from reported data. Other sources of pollutants of concern exist in the area, but were considered to be relatively minor and were not included in the quantitative assessment.
10. To predict the cumulative effects of PWC emissions in the context of all other similar types of emissions, projections of existing use were extrapolated into the future as a percentage of overall emissions in order to gage the magnitude of potential water quality changes, with and without continued PWC use at the park, and taking into account the reduction in emissions required by the New York State Department of Environmental Conservation over the next 10 years (see Table 15 for the dates that these reductions are scheduled to occur).
11. According to regulations adopted by California, hydrocarbon emissions in all new outboard and PWC engines must be reduced by 90% by 2008. In accordance with data presented in the California Air Resources Board staff report (CARB 1998b), this analysis assumes that the overall reduction of hydrocarbon emissions would be 60% by 2012 compared to 2002 emissions. No emission reductions were assumed for 2002.

TABLE 15: ESTIMATED REDUCTIONS IN WATERCRAFT EMISSIONS IN NEW YORK STATE

Date	Action
1999	EPA requires production line testing for 75% HC reduction in new outboards and begins to see reductions as newer models are introduced (US EPA 1997).
2000	EPA requires production line testing for 75% HC reduction in new personal watercraft and begins to see reductions as newer models are introduced (US EPA 1997).
2000	**New York State adopts California emission regulations for all new personal watercraft (New York State Assembly 2000).**
2001	**CA EPA fully implements 75% HC reduction in new outboards and PWC (CARB 1999).**
2005	Estimate 25% reduction in HC emissions overall as a result of newer models being gradually used (US EPA 1996b; date modified in US EPA 1997).
2006	EPA fully implements 75% HC reduction in new outboards and personal watercraft (US EPA 1996).
2008	**CA EPA and NYS DEC fully implement 90% HC reduction in new outboards and PWC (CARB 1999).**
2012	**Estimate 60% reduction in HC emissions overall (CARB 1998a)**

12. Existing information on PWC effects on water quality was reviewed and extrapolated to address unit-specific issues. Threshold values were compared to estimated volumes of water within the unit's jurisdiction.

IMPACT ANALYSIS AREA

PWC use is assumed to be evenly distributed throughout the NPS jurisdictional waters in the Jamaica Bay Unit. The impact analysis area was subdivided into Jamaica Bay, Rockaway Inlet, and Breezy Point. Other motorized watercraft also use all areas of the Jamaica Bay Unit, and they are also assumed to be evenly distributed.

IMPACT TO WATER QUALITY FROM PWC USE

Given the above methodology and assumptions, the following impact thresholds were established in order to describe the relative changes in water quality (overall, localized, short and long-term, cumulatively, adverse and beneficial), under the various PWC management alternatives, when compared to baseline conditions (alternative A).

Negligible: Impacts are chemical, physical, or biological effects that would not be detectable, would be well below water quality standards or criteria, and would be within historical or desired water quality conditions.

Minor: Impacts (chemical, physical, or biological effects) would be detectable but would be well below water quality standards or criteria and within historical or desired water quality conditions.

Moderate: Impacts (chemical, physical, or biological effects) would be detectable but would be at or below water quality standards or criteria; however, historical baseline or desired water quality conditions would be altered on a short-term basis.

Major: Impacts (chemical, physical, or biological effects) would be detectable and would be frequently altered from the historical baseline or desired water quality conditions; and/or chemical, physical, or biological water quality standards or criteria would be locally, slightly and singularly, exceeded on a short-term and temporary basis.

Impairment: Impacts are chemical, physical, or biological effects that would be detectable and would be substantially and frequently altered from the historical baseline or desired water quality conditions and/or water quality standards, or criteria would be exceeded several times on a short-term and temporary basis. In addition, these adverse, major impacts to park resources and values would

contribute to deterioration of the park's water quality and aquatic resources to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use in the waters of the Jamaica Bay Unit would result in chemical and physical impacts. Chemical impacts would result from the emission of hydrocarbons directly into the water. Physical impacts would be associated with the resuspension of sediments and a resulting increase in turbidity during PWC operation in shallow waters.

The impacts to water quality vary according to where personal watercraft are used (e.g., flushing in the inlet and channels reduces the potential impact to water quality). Under alternative A all unit waters would remain open to PWC use, and the New York State boating regulations would continue to be enforced. As mentioned previously, the 50 personal watercraft operating at peak hours in 2002 (four hours per day) in the Jamaica Bay Unit were assumed to be distributed as follows: 35 in Jamaica Bay, 10 in Rockaway Inlet, and 5 in Breezy Point (see Table 13). Assuming a 0.3% per year average increase, PWC numbers would increase to 52 by 2012, with the 2 additional units allocated to Jamaica Bay, for a total of 37; PWC use in Rockaway Inlet and at Breezy Point is not projected to increase. A change in the national socioeconomic conditions (as well as industry's marketing strategies) may cause this trend to vary one way or the other.

In addition, a reduction in impacts to water quality associated with the emission of pollutants is expected in the long term due to the fact that PWC hydrocarbon emissions are projected to decrease by 60% by 2012 (NYS DEC 1998b). This reduction is a result of newer models gradually coming into use (US EPA 1996b; date modified in US EPA 1997), and New York State adopted the California emission reduction schedule. The summary of threshold volumes (acre-feet) for this alternative is presented below. They were developed utilizing the PWC user trends and the forecast reductions in emissions by 2012 (see "PWC and Visitor Use Trends"). Threshold volumes of water needed to dilute PWC emissions are shown in Table 16.

TABLE 16: THRESHOLD WATER VOLUMES NEEDED TO DILUTE PWC POLLUTANTS, ALTERNATIVE A — JAMAICA BAY UNIT

	Jamaica Bay		Rockaway Inlet		Breezy Point	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)*	155,020		55,800		16,420	
Ecotoxicological Benchmarks**						
Benzo(a)pyrene (fuel and exhaust)	190	82	55	22	28	11
Naphthalene	77	32	22	9	11	4
1-methyl naphthalene	390	160	110	45	56	22
Benzene	180	78	52	21	26	10
MTBE	8	banned	2	banned	1	banned
Human Health Benchmarks***						
Benzo(a)pyrene (fuel and exhaust)	57	23	16	6	8	3
Benzene	2,400	1,000	680	270	340	140

* Total water volume of Jamaica Bay = 203,088 ac-ft.
** Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
*** Threshold volumes (ac-ft) below which human health might be impacted.

The results of the water quality analysis for PWC activity show that for all discharged pollutants evaluated, the ecotoxicological threshold volumes estimated for 2002 and 2012 would be well below volumes of water available in the three study areas. Threshold volumes would range from 1 to 390 acre-feet, while available jurisdictional water volumes range from 16,420 to 155,020 acre-feet. Impacts to aquatic organisms are expected to be negligible for all pollutants evaluated.

Although the waters of the Jamaica Bay Unit are not used for drinking purposes, visitors to the park could be affected by an increase in pollutant loadings through ingestion of fish that have accumulated pollutants. Threshold volumes for human health benchmarks of benzo(a)pyrene and benzene are also well below volumes of water available at the three study areas in 2002 and 2012. Threshold volumes would range from 3 to 2,400 acre-feet, while available jurisdictional water volumes range from 16,420 to 155,020 acre-feet. Impacts to human health are expected to be negligible for all pollutants evaluated. Mixing, flushing, and the resulting dilution of the unit's waters by adjacent waters would further reduce pollutant concentrations. During flood tides soluble pollutants are transported into Jamaica Bay, significantly increasing the available acre-feet. During outgoing tides the water exchange is high. As previously mentioned, tidal currents in the channels of Jamaica Bay can exceed four feet per second. Rockaway Inlet and Breezy Point are also characterized by strong tides. Overall, water quality impacts due to PWC emissions of organic pollutants in 2002 would be negligible. In 2012, water quality impacts from PWC emission are expected to remain negligible due to reduced emission rates and the banning of MTBE in gasoline.

Cumulative Impacts. Cumulative impacts would result from other motorized watercraft that use nearby waters, as well as point and non-point sources of urban pollutants. These watercraft include recreational boats, commercial boats (fishing and cruises), and official units (police, U.S. Coast Guard, etc.), as well as personal watercraft. Marine traffic (other than PWC use) in the Lower Bay constitutes a major source of pollutants to the aquatic environment. Although some of these boats could be using four-stroke engines, data were not available; therefore, it was assumed that current use of four-stroke engines would be small and it was not accounted for in the calculation. As shown in Table 13, all motorized watercraft are projected to increase from 335 in 2002 (236 in Jamaica Bay, 67 in Rockaway Inlet, and 32 at Breezy Point) to 346 by 2012 (245 in Jamaica Bay, 68 in Rockaway Inlet, and 33 at Breezy Point). Municipal discharges from nearby areas, as well as from local marinas, are also sources of hydrocarbons to surface waters, but were not included in the calculations. Threshold volumes calculated for all motorized watercraft are shown in Table 17.

TABLE 17: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE A — JAMAICA BAY UNIT

	Jamaica Bay		Rockaway Inlet		Breezy Point	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)*	155,020		55,800		16,420	
Ecotoxicological Benchmarks**						
Benzo(a)pyrene (fuel and exhaust)	1,300	540	370	150	180	73
Naphthalene	520	220	150	60	70	29
1-methyl naphthalene	2,600	1,100	750	300	360	150
Benzene	1,200	510	350	140	170	69
MTBE	53	banned	15	banned	7	banned
Human Health Benchmarks***						
Benzo(a)pyrene (fuel and exhaust)	370	160	110	43	51	21
Benzene	16,000	6,700	4,600	1,900	2,200	900

* Total water volume of Jamaica Bay = 203,088 ac-ft.
** Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
*** Threshold volumes (ac-ft) below which human health might be impacted.

For all discharged pollutants evaluated, the ecotoxicological threshold volumes estimated for 2002 and 2012 would be well below volumes of water available in NPS jurisdictional waters in the three study areas. Threshold volumes would range from 7 to 2,600 acre-feet, while available jurisdictional water volumes range from 16,420 to 155,020 acre-feet. Impacts to aquatic organisms are expected to be negligible for all pollutants evaluated.

Threshold volumes for risks to human health from benzo(a)pyrene and benzene would also be well below the jurisdictional volumes of water in all three areas in 2002 and 2012. Threshold volumes would range from 21 to 16,000 acre-feet, while available jurisdictional water volumes range from 16,420 to 155,020 acre-feet. Risks to human health from benzo(a)pyrene and benzene, largely attributable to non-PWC use, are expected to be minor for Breezy Point and negligible for the other areas in 2002; impacts would be negligible for all areas in 2012.

Conclusion. Under alternative A water quality impacts from PWC use based on ecotoxicological and human health benchmarks would be negligible for all pollutants in all areas in 2002. By 2012, all water quality impacts from PWC use are expected to remain negligible due to reduced emission rates and the banning of MTBE in gasoline in 2004.

Cumulative water quality impacts from all motorized watercraft under alternative A based on ecotoxicological benchmarks would be negligible for all pollutants in all areas in 2002 and 2012. Cumulative impacts to human health from all motorized watercraft would be minor in 2002 and negligible in 2012. In 2012, cumulative water quality impacts from all watercraft are expected to be lower than in 2002 due to reduced emission rates mandated by New York State and the banning of MTBE.

This alternative would not impair water quality.

Impacts of Alternative B — Special Regulation to Continue PWC Use with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Alternative B would restrict PWC use in Jamaica Bay to the North Channel (Island Channel), Broad Channel (the Raunt), Beach Channel (South Channel), and Grass Hassock Channel. PWC use would also be restricted to the Rockaway Inlet navigational channel and would be prohibited from Breezy Point waters. For the purpose of evaluating impacts to water quality under alternative B, it is assumed that the same number of personal watercraft would be operating in Jamaica Bay and Rockaway Inlet, but would be confined to smaller areas under this alternative. Further, it is assumed that PWC users that formerly used the Breezy Point area would move out of the unit's waters. Other watercraft access to unit waters would not be affected under alternative B. Threshold volumes needed to dilute PWC pollutants in surface water under alternative B are shown in Table 18.

Banning PWC use in Breezy Point waters would reduce impacts to water quality in this area. Restricting PWC use to the main navigational channels in Jamaica Bay and Rockaway Inlet would contribute to improved water quality by reducing resuspension of sediments in shallow areas; however, this management measure would increase initial effects on water quality in the navigational channels where PWC use would be concentrated.

As in alternative A, for all PWC pollutants evaluated, the ecotoxicological threshold volumes estimated for 2002 and 2012 would be well below volumes of water available in Jamaica Bay and Rockaway Inlet. Threshold volumes would range from 2 to 390 acre-feet, while available jurisdictional water volumes are 6,992 acre-feet for Rockaway Inlet and 68,650 acre-feet for Jamaica Bay. Impacts to aquatic organisms are expected to be negligible for all pollutants evaluated. Because MTBE will be banned in 2004, there would be no PWC emissions of MTBE in 2012.

TABLE 18: THRESHOLD WATER VOLUMES NEEDED TO DILUTE PWC POLLUTANTS, ALTERNATIVE B — JAMAICA BAY UNIT

	Jamaica Bay		Rockaway Inlet		Breezy Point	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)*	155,020		55,800		16,420	
Volume of water in PWC permitted area	68,650		6,992		0	
Ecotoxicological Benchmarks**						
Benzo(a)pyrene (fuel and exhaust)	190	82	55	22	0	0
Naphthalene	77	32	22	9	0	0
1-methyl naphthalene	390	160	110	45	0	0
Benzene	180	78	52	21	0	0
MTBE	8	banned	2	banned	0	banned
Human Health Benchmarks***						
Benzo(a)pyrene (fuel and exhaust)	57	23	16	6	0	0
Benzene	2,400	1,000	680	270	0	0

NOTE: This alternative would close jurisdictional waters at Breezy Point and would restrict PWC use in Jamaica Bay and Rockaway Inlet to navigational channels. PWC use and emissions in Jamaica Bay and Rockaway Inlet would remain the same as in alternative A, but pollutants would be concentrated in smaller areas.
* Total water volume of Jamaica Bay = 203,088 ac-ft.
** Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
*** Threshold volumes (ac-ft) below which human health might be impacted.

Threshold volumes for human health impacts from benzo(a)pyrene and benzene emitted by personal watercraft under alternative B would be well below available water volumes. Threshold volumes would range from 6 to 2,400 acre-feet, while available jurisdictional water volumes are 6,992 and 68,650 acre-feet. Impacts to human health would be negligible in all areas in 2002 and 2012. However, due to the PWC use restrictions, local effects on biota and human health could be somewhat increased compared to alternative A.

Cumulative Impacts. Under alternative B the PWC use restrictions would not apply to other motorized watercraft, which would continue to be allowed throughout all three areas. Total water volumes of Jamaica Bay and Rockaway Inlet are also considered in the evaluation of water quality impacts. For the comparison of threshold volumes with available water volumes, PWC emissions are compared to the volume of water in the PWC permitted use area, and other watercraft emissions are compared to volumes within the unit's jurisdictional waters in each area. Threshold volumes calculated for all motorized watercraft are shown in Table 19.

TABLE 19: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE B — JAMAICA BAY UNIT

	Jamaica Bay		Rockaway Inlet		Breezy Point	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)*	155,020		55,800		16,420	
Volume of water in PWC permitted area	68,650		6,992		0	
Ecotoxicological Benchmarks**						
Benzo(a)pyrene (fuel and exhaust)	1,300	540	370	150	150	62
Naphthalene	520	220	150	60	59	25
1-methyl naphthalene	2,600	1,100	750	300	300	120
Benzene	1,200	510	350	140	140	59
MTBE	53	banned	15	banned	6	banned
Human Health Benchmarks***						
Benzo(a)pyrene (fuel and exhaust)	370	160	110	43	43	18
Benzene	16,000	6,700	4,600	1,900	1,800	760

NOTE: This alternative would close jurisdictional waters at Breezy Point to PWC use and would restrict PWC use in Jamaica Bay and Rockaway Inlet to navigational channels. PWC use and emissions in Jamaica Bay and Rockaway Inlet would remain the same as in alternative A; however, pollutants would be concentrated in smaller areas.
* Total water volume of Jamaica Bay = 203,088 ac-ft.
**Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
*** Threshold volumes (ac-ft) below which human health might be impacted.

As described in the evaluation of impacts for PWC use, emissions within the permitted areas would result in more localized impacts from PWC-discharged pollutants. Estimated threshold volumes for cumulative impacts from PWC and other motorized watercraft are considerably higher than for PWC alone, as seen in Table 19. The threshold volumes for the five organics evaluated based on ecotoxicological benchmarks would be well below the jurisdictional and permitted volumes of water available to all watercraft, including personal watercraft. Threshold volumes would range from 6 to 2,600 acre-feet, while available jurisdictional water volumes range from 16,420 to 155,020 acre-feet. No MTBE-related impacts are projected for 2012 since this gasoline additive will be banned in New York State. Impacts to aquatic organisms are considered negligible in 2002 and 2012.

Threshold volumes based on human health benchmarks for benzo(a)pyrene and benzene would also be well below available jurisdictional water and permitted water volumes. Threshold volumes would range from 18 to 16,000 acre-feet, while available jurisdictional water volumes range from 16,420 to 155,020 acre-feet. Cumulative impacts to human health from benzo(a)pyrene and benzene, largely attributable to non-PWC, would be minor for Breezy Point and negligible for the other areas in 2002 and negligible for all areas in 2012.

These impact evaluations are based on PWC users staying within the permitted areas and boats operating throughout the entire unit's jurisdictional waters. Also, existing environmental conditions (e.g., flushing, mixing), and characteristics of the chemicals of concern (e.g., half-lives in water) would reduce the potential risks to the aquatic environment and human health.

Conclusion. Under alternative B water quality impacts from PWC emissions based on ecotoxicological and human health benchmarks would be negligible for all pollutants in all areas in 2002 and 2012. Closing Breezy Point to PWC use would have a beneficial effect on water quality. Restricting PWC use to the main navigational channels within Jamaica Bay and Rockaway Inlet would have beneficial impacts on shoreline areas, but would not reduce the number of personal watercraft or emissions and would result in more localized adverse effects of PWC pollutants.

Cumulative water quality impacts from all watercraft under alternative B based on ecotoxicological benchmarks would be negligible for all pollutants in all areas in 2002 and 2012. Cumulative water quality impacts from all motorized use based on human health benchmarks are expected to be minor in 2002 and negligible in 2012.

This alternative would not impair water quality.

Impacts of Alternative C — Special Regulation to Continue PWC Use with Geographic Restrictions

Analysis. Alternative C would be essentially the same as alternative B except that PWC use would also be allowed within the Winhole Channel in Jamaica Bay, in addition to the North Channel (Island Channel), Broad Channel (the Raunt), Beach Channel (South Channel), and Grass Hassock Channel. PWC use would be prohibited from Breezy Point waters, but would be permitted in the Rockaway Inlet navigational channel. It is assumed that the same number of personal watercraft would use unit waters in Jamaica Bay and Rockaway Inlet as in alternative A, and that PWC users that would have operated in Breezy Point would move out of the unit's waters. Also, it is assumed that the same number of watercraft (excluding personal watercraft) would be using all three areas, as in alternatives A and B. Estimated threshold volumes needed to dilute PWC emissions would be similar to those calculated in alternative B (see Table 20).

Impacts to water quality under alternative C would be similar to those under alternative B, except in Jamaica Bay, where impacts would be somewhat lower because the additional volume of Winhole Channel would be available to dilute PWC-related pollutants. Threshold volumes based on ecotoxicological benchmarks would range from 2 to 390 acre-feet, while water volumes accessible to PWC users are 6,992 and 90,889 acre-feet. All impacts to aquatic life from the PWC pollutants evaluated are considered negligible in all areas in 2002 and 2012. Because MTBE will be banned in 2004, there are no PWC-related impacts in 2012 attributable to MTBE.

TABLE 20: THRESHOLD WATER VOLUMES NEEDED TO DILUTE PWC POLLUTANTS, ALTERNATIVE C — JAMAICA BAY UNIT

	Jamaica Bay		Rockaway Inlet		Breezy Point	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)*	155,020		55,800		16,420	
Volume of water in PWC permitted area	90,889		6,992		0	
Ecotoxicological Benchmarks**						
Benzo(a)pyrene (fuel and exhaust)	190	82	55	22	0	0
Naphthalene	77	32	22	9	0	0
1-methyl naphthalene	390	160	110	45	0	0
Benzene	180	78	52	21	0	0
MTBE	8	banned	2	banned	0	banned
Human Health Benchmarks***						
Benzo(a)pyrene (fuel and exhaust)	57	23	16	6	0	0
Benzene	2,400	1,000	680	270	0	0

NOTE: This alternative would close jurisdictional waters at Breezy Point and would restrict PWC use in Jamaica Bay and Rockaway Inlet to navigational channels. PWC emissions in the channels would remain the same as in alternative A, but pollutants would be concentrated in smaller areas.
* Total water volume of Jamaica Bay = 203,088 ac-ft.
** Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
*** Threshold volumes (ac-ft) below which human health might be impacted.

Threshold volumes based on human health benchmarks would range from 6 to 2,400 acre-feet, while water volumes available to PWC users are 6,992 and 90,889 acre-feet. Impacts to human health from benzo(a)pyrene and benzene would be negligible in all areas in 2002 and 2012.

Because the permitted areas of Jamaica Bay under alternative C are surrounded by other extensive areas of water (both waters within the unit's jurisdiction and other waters), the actual mixing/dilution volumes would be substantially greater than in the PWC-permitted areas. In addition to the relative volume comparisons, half-lives of benzene and MTBE (five and four hours, respectively) are considered in evaluation of impacts to human health.

Cumulative Impacts. PWC use restrictions would not apply to other motorized watercraft, which would be allowed throughout all three areas of the Jamaica Bay Unit. For the comparisons of threshold volumes with available water volumes, PWC emissions are compared primarily to the restricted area volumes (see Table 21), and other watercraft emissions are compared to volumes within park jurisdictional waters in each area. As described in the evaluation of impacts for PWC use, emissions within the permitted areas would result in more localized impacts from pollutants discharged by personal watercraft.

As under alternative B, estimated threshold volumes for cumulative impacts from personal watercraft and other watercraft would be considerably higher than for personal watercraft alone. The threshold volumes based on ecotoxicological benchmarks would be well below water volumes available in the NPS jurisdictional and PWC permitted use areas. Threshold volumes would range from 6 to 2,600 acre-feet, while available jurisdictional water volumes range from 16,420 to 155,020 acre-feet. Impacts to aquatic organisms would be negligible for all areas in 2002 and 2012. No MTBE-related impacts are projected for 2012 since New York State will ban this gasoline additive after 2004.

TABLE 21: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE C — JAMAICA BAY UNIT

	Jamaica Bay		Rockaway Inlet		Breezy Point	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)*	155,020		55,800		16,420	
Volume of water in PWC permitted area	90,889		6,992		0	
Ecotoxicological Benchmarks**						
Benzo(a)pyrene (fuel and exhaust)	1,300	540	370	150	150	62
Naphthalene	520	220	150	60	59	25
1-methyl naphthalene	2,600	1,100	750	300	300	120
Benzene	1,200	510	350	140	140	59
MTBE	53	banned	15	banned	6	banned
Human Health Benchmarks***						
Benzo(a)pyrene (fuel and exhaust)	370	160	110	43	43	18
Benzene	16,000	6,700	4,600	1,900	1,800	760

NOTE: This alternative would close jurisdictional waters at Breezy Point to PWC use and would restrict PWC use in Jamaica Bay and Rockaway Inlet to navigational channels. PWC emissions in channels would remain the same as in alternative A; however, pollutants would be concentrated in smaller areas.
* Total water volume of Jamaica Bay = 203,088 ac-ft.
**Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
*** Threshold volumes (ac-ft) below which human health might be impacted.

Threshold volumes based on human health benchmarks for benzo(a)pyrene and benzene would also be well below the threshold water volume available in NPS jurisdictional and PWC permitted use areas. Threshold volumes would range from 18 to 16,000 acre-feet, while available jurisdictional water volumes would range from 16,420 to 155,020 acre-feet. Cumulative impacts to human health from benzo(a)pyrene and benzene, largely attributable to other motorized craft, would be minor in 2002 and negligible in 2012 in all areas. These impact evaluations are based on PWC use occurring only in the permitted areas and boats operating throughout the entire unit's jurisdictional waters. Also, existing environmental conditions (e.g., flushing, mixing), and characteristics of the chemicals of concern (e.g., half-lives in water) would reduce the potential risks to the aquatic environment and human health.

Conclusion. Under alternative C water quality impacts from PWC emissions on ecotoxicological and human health benchmarks for organic pollutants would be negligible for all pollutants in all areas in 2002 and 2012. Closing Breezy Point to PWC use would have a beneficial impact on water quality in that area. Restricting PWC use to the main navigational channels of Rockaway Inlet and Jamaica Bay, including Winhole Channel, would have beneficial impacts on shoreline areas, but would not reduce the number of PWC users or emissions within Jamaica Bay. This alternative would result in more localized adverse effects on PWC-emitted pollutants.

Cumulative water quality impacts from all watercraft under alternative C based on ecotoxicological benchmarks would be negligible for all pollutants in all areas in 2002 and 2012. Cumulative water quality impacts from all motorized activities based on human health benchmarks would be minor in 2002 and negligible in 2012 in all areas.

This alternative would not impair water quality.

Impacts of the No-Action Alternative — No PWC Use

Analysis. PWC use would be banned from all NPS jurisdictional waters in the Jamaica Bay Unit under the no-action alternative. This would have a beneficial effect on the local water quality and associated biota of the Jamaica Bay Unit.

Cumulative Impacts. There would be no contribution from personal watercraft to cumulative impacts in this alternative. Impacts from all other forms of motorized recreation would continue. Threshold volumes required for all motorized watercraft other than personal watercraft are shown in Table 22.

TABLE 22: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT (EXCLUDING PWC), NO-ACTION ALTERNATIVE — JAMAICA BAY UNIT

	Jamaica Bay		Rockaway Inlet		Breezy Point	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	155,020		55,800		16,420	
Ecotoxicological Benchmarks*						
Benzo(a)pyrene (fuel and exhaust)	1,100	460	320	130	150	62
Naphthalene	440	180	120	51	59	25
1-methyl naphthalene	2,200	930	640	260	300	120
Benzene	1,100	440	300	120	140	59
MTBE	45	banned	13	banned	6	banned
Human Health Benchmarks**						
Benzo(a)pyrene (fuel and exhaust)	320	130	90	37	43	18
Benzene	14,000	5,700	3,900	1,600	1,800	760

* Total water volume of Jamaica Bay = 203,088 ac-ft.
**Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
*** Threshold volumes (ac-ft) below which human health might be impacted.

As seen by comparing the values in Table 22 with those in Table 16, motorized watercraft other than personal watercraft account for over 80% of the organic pollutants discharged to water. Under the no-action alternative water quality impacts based on ecotoxicological benchmarks from all motorized watercraft except personal watercraft would be negligible for all pollutants in 2002 and 2012. Because MTBE will be banned in 2004, there would be no motorboat-related impacts in 2012 attributable to MTBE. Water quality impacts based on human health benchmarks from all other motorized boats would be minor in 2002 at Breezy Point and negligible in the other two areas in 2002, and negligible in all areas by 2012.

Conclusion. Banning PWC use within the Jamaica Bay Unit would have a beneficial impact on water quality by reducing sediment resuspension and eliminating PWC pollutants in the unit's waters.

On a cumulative basis, other motorized watercraft would continue to have minor to negligible adverse impacts on water quality of the unit's waters due to their discharge of organic pollutants.

This alternative would not impair water quality.

AIR QUALITY

Personal watercraft emit various compounds that pollute the air. Up to one third of the fuel delivered to current two-stroke engines goes unburned and is discharged as gaseous hydrocarbons; the lubricating oil is used once and is expelled as part of the exhaust; and the combustion process results in emissions of air pollutants such as volatile organic compounds (VOC), nitrogen oxides (NO_x), particulate matter (PM), and carbon monoxide (CO) (US EPA 1996b). Personal watercraft also emit fuel components such as benzene and fuel additives that are known to have adverse health effects. Even though PWC engine exhaust is usually routed below the waterline, portions of the exhaust gases end up in the air. These air pollutants may adversely impact park visitor and employee health, as well as sensitive park resources. For example, VOC and NO_x emissions in the presence of sunlight form ozone, which can cause or contribute to respiratory illness (US EPA 1996c). Ozone is harmful to sensitive species of vegetation. It causes visible foliar injury, decreases plant growth, and increases plant susceptibility to insects and disease. Carbon monoxide can affect humans as well. It interferes with the oxygen carrying capacity of blood,

resulting in lack of oxygen to tissues. Nitrogen oxides and particulate emissions can reduce visibility, and nitrogen oxides contribute to acid deposition. However, nitrogen oxides are produced in relatively small quantities from PWC engines, and effects attributable to PWC use are estimated to be minimal.

GUIDING REGULATIONS AND POLICIES

Clean Air Act. The Clean Air Act establishes national ambient air quality standards to protect the public health and welfare from air pollution. The act also establishes the prevention of significant deterioration (PSD) of air quality program to protect the air in relatively clean areas. One purpose of this program is to preserve, protect, and enhance air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic or historic value (42 USC 7401 et seq.). The program also includes a classification approach for controlling air pollution. In accordance with the act, Jamaica Bay is designated a class II area, and the Clean Air Act allows only moderate air quality deterioration in these areas. In no case, however, may pollution concentrations violate any of the national ambient air quality standards. In contrast, in class I areas very little deterioration of air quality is allowed, and the unit manager has an affirmative responsibility to protect visibility and all other class I area air quality related values from the adverse effects of air pollution.

Conformity Requirements. National park system areas that do not meet the national ambient air quality standards or whose resources are already being adversely affected by current ambient levels require a greater degree of consideration and scrutiny by NPS managers. Areas that do not meet national air quality standards for any pollutant are designated as non-attainment areas. Section 176 of the Clean Air Act states:

> No department, agency, or instrumentality of the Federal Government shall engage in, support in any way or provide financial assistance for, license or permit, or approve, any activity which does not conform to an [state] implementation plan. . . . [T]he assurance of conformity to such a plan shall be an affirmative responsibility of the head of such department, agency or instrumentality

Federal agencies must ensure that any action taken does not interfere with a state's plan to attain and maintain the national ambient air quality standards in designated non-attainment and maintenance areas. In making decisions regarding PWC use within a designated non-attainment or maintenance area, park managers must conduct a conformity review to ensure that any pollutants added will not interfere with plans to attain national standards as documented in the State Implementation Plan. If there is a possibility that the addition of pollutants could interfere with compliance with the State Implementation Plan, then the park managers should discuss plans with the appropriate state air pollution control agency and conduct a more formal conformity determination.

As previously noted, Jamaica Bay is designated by the Environmental Protection Agency as a severe non-attainment area for O_3 and as an attainment area for all other criteria pollutants (NO_x, SO_2, PM_{10}, CO, and Pb). The New York State Implementation Plan for ozone (revised October 2001) establishes control measures to ensure that the national ambient air quality standard for ozone will be met by year 2007. Therefore, the State Implementation Plan applies to the project area, and the proposed action(s) are subject to a federal conformity determination or requirement. The proposed actions will not create or increase other air pollutant levels that are not included in the State Implementation Plan, and therefore the project is presumed to be in conformity with the state plan (40 CFR 93.158).

In addition, the New York metropolitan area was previously designated as moderate non-attainment for CO based on ambient data recorded in Kings County — Brooklyn (56 FR 56694 and 57 FR 56762). Effective May 20, 2002, the Environmental Protection Agency redesignated the entire metropolitan area in attainment for CO with an approved maintenance plan (67 FR 19337, April 19, 2002). The CO

emissions from personal watercraft will not be subject to a conformity determination because they are already accounted for in the State Implementation Plan.

Applicable PWC Emission Standards. The Environmental Protection Agency issued the gasoline marine engine final rule in August 1996. The rule, which took effect in 1999, affects manufacturers of new outboard engines and the type of inboard engines used in personal watercraft. The agency adopted a phased approach to reduce emissions. The current emission standards were set at levels that are achievable by existing personal watercraft. By 2006 PWC manufacturers will be required to meet a corporate average emission standard that is equivalent to a 75% reduction in VOC emissions. (The corporate average standard allows manufacturers to build some engines to emission levels lower than the standard and some engines to emission levels higher than the standard, and to employ a mix of technology types, as long as the overall corporate average is at or below the standard.) Because the actual reduction in emissions depends on the sale of lower-emitting personal watercraft, the Environmental Protection Agency estimates that a 52% emission reduction will be achieved by 2011, and a 75% emission reduction by 2031 (US EPA 1996a, 1997).

On September 8, 2000, the New York State Assembly adopted standards and regulations equivalent to those California has adopted for accelerating the reduction of exhaust emissions of ozone precursor chemicals HC (which relates to VOC) and NO_x from new spark-ignition marine engines (Environmental Conservation Law, sec. 19-0306-A). By 2012 the California Air Resources Board assumes approximately a 60% reduction in VOC emissions, compared to baseline emissions in the California State Implementation Plan (CARB 1998a).

In July 2002 the Environmental Protection Agency proposed new evaporative emissions standards for gasoline-fueled boats and personal watercraft. These proposed standards would require most new boats produced in 2008 or later to be equipped with low-emission fuel tanks or other evaporative emission controls.

NPS Organic Act and Management Policies. The NPS Organic Act of 1916 (16 USC 1 et seq.) and the NPS *Management Policies* guide the protection of park and wilderness areas. The general mandates of the Organic Act state that the National Park Service will

> promote and regulate the use of . . . national parks . . . by such means and measures as conform to the fundamental purpose of the said parks, . . . which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations (16 USC 1).

Under its *Management Policies 2001* the National Park Service will

> seek to perpetuate the best possible air quality in parks to (1) preserve natural resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas (NPS 2000c).

The *Management Policies* further state that the National Park Service will assume an aggressive role in promoting and pursuing measures to protect air quality related values from the adverse impacts of air pollution. In cases of doubt as to the impacts of existing or potential air pollution on park resources, the National Park Service "will err on the side of protecting air quality and related values for future generations."

The Organic Act and the *Management Policies* apply equally to all areas of the national park system, regardless of its designation under the Clean Air Act. Therefore, the National Park Service will protect resources at both class I and class II designated units. Furthermore, the Organic Act and *Management*

Policies provide additional protection from that afforded by the Clean Air Act's national ambient air quality standards alone because the National Park Service has documented that specific park air quality related values can be adversely affected at levels below the national standards or by pollutants for which no standard exists.

METHODOLOGY AND ASSUMPTIONS

To assess the level of PWC air quality impacts resulting from a given management alternative, the following methods and assumptions were used:

1. The national ambient air quality standards and state/local air quality standards (if applicable) were examined for each pollutant.
2. Air quality designations for the surrounding area were determined. If a park, or a portion of a park, was within the boundaries of a non-attainment or maintenance area for a given pollutant, ambient air quality concentrations were assumed to violate the national ambient air quality standards for that pollutant. As previously stated, the Jamaica Bay Unit is in attainment for all criteria pollutants except ozone, and it is in a maintenance area for carbon monoxide.
3. Local ambient air quality data from monitoring sites within the park, if available, and from monitoring sites nearby (within 100 miles) were reviewed. The occurrence of any exceedances (where applicable) and the level and frequency of pollutant concentrations were ascertained. If local ambient air quality data were not available, short-term sampling was conducted to assess current air quality conditions, or current conditions were assessed from regional interpolations. For each pollutant evaluated, the first highest maximum concentration obtained was compared with the national ambient air quality standards.
4. The use of motorized watercraft (both number of visits and hours of operation) at the park was determined from visitation records, launching permits, seasonal observations by park personnel, and state aerial surveys. The annual number of hours of use by each watercraft type was calculated by multiplying the number of personal watercraft used in the park by the hours of operation. Peak hours of use were estimated assuming that on a high-use day all personal watercraft would operate at the same time.
5. The rated horsepower, average engine load, deterioration factors, and other relevant parameters for each watercraft type were taken from the EPA nonroad model. (This model is used to calculate emissions of criteria pollutants from operation of nonroad spark-ignition type engines, including personal watercraft. The model includes built-in variables regarding the mix of engine types that will be phased in as new engine standards come into effect and increasing numbers of personal watercraft will be of the cleaner burning, four-stroke type. Total hydrocarbon emissions comprise approximately 100% of the VOC for two-stroke engines and 93% of the VOC for four-stroke engines [US EPA 1997; US EPA 2000a].)
6. Any reductions in emissions resulting from implementing control strategies were taken into account, as were changes in emissions resulting from increased or decreased usage.
7. Any available studies regarding ozone injury on sensitive plants found in the park were reviewed.

8. A calculation referred to as SUM06[*] (ppm-hr) was used to assess area ozone conditions. The highest three-month, five-year average commonly used for the area was determined by reviewing ambient air quality data (available from the NPS Air Resources Division).
9. Visibility impairment was determined from local monitoring data, emissions of fine particulate matter ($PM_{2.5}$), or from qualitative evidence such as personal observations and photographs.
10. The air quality impacts of the various alternatives were assessed by considering the existing air quality levels and the air quality related values present, and by using the estimated emissions and any applicable, EPA-approved air quality models. Estimated reductions in hydrocarbon emissions assumed a 60% reduction by 2012 from personal watercraft. A further reduction for each year thereafter is assumed. Estimated reductions in hydrocarbon emissions would be the same as those described for water quality.
11. Cumulative impacts were analyzed quantitatively for all recreational watercraft. The National Park Service maintains vehicular access in the Jamaica Bay Unit for cars, trucks, and recreational vehicles; emissions from these vehicles and other local and regional sources of air pollutants were not assessed quantitatively but were considered qualitatively in the cumulative impact assessment.

PWC impact thresholds for air quality depend on the type of pollutants produced, the background air quality, and the resources in the environment that may be affected by airborne pollutants (air quality related values). Air quality related values include "visibility and those scenic, cultural, biological, and recreation resources of an area that are affected by air quality" (43 FR 15016). Impact thresholds may be qualitative (e.g., photos of degraded visibility) or quantitative (e.g., based on impacts to air quality related values or federal air quality standards), depending on what type of information is appropriate or available.

Because the U.S. Environmental Protection Agency has established standards that are regulated by states to protect human health and the environment, two categories of potential airborne pollution impacts from personal watercraft are analyzed: (1) impacts on human health, and (2) impacts on air quality related values in the park area. Thresholds for each impact category (negligible, minor, moderate, and major) are discussed below.

IMPACT ANALYSIS AREA

The geographic area that was analyzed includes the immediate locations of PWC use and the surrounding nearshore environment where air pollutants may accumulate. For purposes of this assessment and because it is assumed that PWC users are dispersed throughout the unit, the impact analysis area is the Jamaica Bay Unit in its entirety — including Jamaica Bay, Rockaway Inlet, and Breezy Point.

IMPACT TO HUMAN HEALTH FROM AIRBORNE POLLUTANTS RELATED TO PWC USE

The Jamaica Bay Unit is in severe non-attainment for ozone and is in attainment for all other criteria pollutants (CO, PM, and NO_x), although there is a maintenance plan for CO.

Attainment Pollutants: The following impact thresholds have been defined for attainment pollutants:

[*] The SUM06 exposure index cumulates over a given time period and diurnal window all hourly O_3 concentrations greater than or equal to 0.06 ppm.

	Activity Analyzed		Current Air Quality
Negligible:	Emission levels would be less than 50 tons/year for each pollutant.	**and**	The first highest three-year maximum for each pollutant is less than NAAQS.
Minor:	Emission levels would be less than 100 tons/year for each pollutant.	**and**	The first highest three-year maximum for each pollutant is less than NAAQS.
Moderate:	Emission levels would be greater than or equal to 100 tons/year for any pollutant.	**or**	The first highest three-year maximum for each pollutant is greater than NAAQS.
Major:	Emission levels would be greater than or equal to 250 tons/year for any pollutant.	**and**	The first highest three-year maximum for each pollutant is greater than NAAQS.

Non-attainment and Maintenance Pollutants (O_3 and CO): The following impact thresholds have been defined for the non-attainment and maintenance pollutants and their precursors:

Negligible: There would be a net decrease in emissions from current levels.

Minor: Emissions would be 0–5 tons/year.

Moderate: Emissions would be greater than 5 tons/year and less than conformity *de minimis* levels* (25 tons/year for ozone and 100 tons/year for CO).

Major: Emissions would be equal to or greater than conformity *de minimis* levels (25 tons/year for ozone and 100 tons/year for CO).

Impairment (for both attainment and non-attainment/maintenance areas): Impacts would have a major adverse effect on park resources and values; and

contribute to deterioration of the park's air quality to the extent the park's purpose could not be fulfilled as established in its enabling legislation; or

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Both VOC and NO_x are ozone precursors in the presence of sunlight and are evaluated separately in lieu of ozone, which is formed as a secondary pollutant. (Note that in attainment areas the Clean Air Act does not require that NO_x be counted as an ozone precursor).

* Conformity *de minimis* levels are levels of emissions below which a federal action in a non-attainment or maintenance area is presumed to conform to a state's implementation plan and would not require further review. Actions in attainment areas are presumed to conform and do not require analysis with respect to *de minimis* levels. Emission values representing the Clean Air Act conformity *de minimis* levels for all pollutants are shown in the glossary.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Under alternative A peak-season PWC use would be 50 craft per hour in 2002, increasing to 52 in 2012 (see "PWC and Visitor Use Trends," page 74). Ambient air quality levels would continue to meet the national ambient air quality standards for all pollutants except ozone. The air quality impact levels would be major adverse for CO because PWC emission levels would be greater than 100 tons/year for a maintenance area. PM impact levels would be negligible in 2002 and 2012 (less than 25 tons/year for an attainment pollutant). For the ozone precursors in a non-attainment area, impacts would be minor adverse for NO_x in 2002 and 2012 (less than 5 tons/year), but they would be major adverse for VOC in 2002 (more than 25 tons/year), decreasing to moderate adverse in 2012 (less than 25 tons/year; see Table 23).

TABLE 23: PWC EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE A — JAMAICA BAY UNIT

	CO		PM		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	141.28	116.92	2.81	0.40	0.65	2.14	64.64	12.25
Impact Level (adverse)	Major	Major	Negligible	Negligible	Minor	Minor	Major	Moderate

Cumulative Impacts. A variety of commercial and recreational marine vessels use the waters in and around the unit. According to the NPS informal survey, the number of other boats present within unit waters may total 285 boats during peak hours, while the current hourly use of personal watercraft is 50 per hour. The size of boats present on the waters can vary from small 16-foot watercraft to 50-foot or longer fishing and performance boats to ferryboats. Most of the smaller boats typically operate two-stroke gasoline outboard engines with power ratings from 15 to 130 horsepower (hp), or between 11 and 96 kW (OC Bayside Rentals staff, pers. comm., Sept. 13, 2001). Larger performance boats often operate on inboard diesel engines, with a power rating between 340 to 660 hp, or on a 90 hp four-stroke outboard diesel engine.

Considering the average national trend of marine vehicle use and current and projected emission levels within the unit, the cumulative emissions and impacts of all boating activities under alternative A are shown in Table 24.

TABLE 24: PWC AND MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE A — JAMAICA BAY UNIT

	CO		PM		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	901.08	839.67	16.15	10.72	24.25	30.98	300.05	113.29
Impact Level (adverse)	Major	Major	Negligible	Negligible	Moderate	Major	Major	Major

The cumulative CO emission levels would have a major adverse impact from 2002 through 2012 (more than 100 tons/year for a CO maintenance area), while PM levels would be negligible (less than 25 tons/year for an attainment pollutant). For ozone precursors in a non-attainment area, the cumulative NO_x emissions would result in moderate adverse impacts in 2002 (less than 25 tons/year), increasing to major adverse impacts in 2012 (more than 25 tons/year); VOC emissions would result in major adverse impacts in both 2002 and 2012 because emission levels would exceed 25 tons/year.

Conclusion. PWC use would continue at existing levels within the unit boundary. Alternative A would result in major adverse impacts for CO in 2002 and 2012 because Jamaica Bay is in a CO maintenance area, and negligible adverse impacts for PM pollutants. Located in a severe non-attainment area for ozone, the unit would experience major adverse impacts to air quality from VOC emissions in 2002 (as

defined by the federal conformity rule), decreasing to moderate by 2012; impacts from NO_x would be minor.

Cumulatively, emissions from all boating activities under this alternative would result in major adverse impacts from CO emissions (as defined by the federal conformity rule for a nonattainment area) in 2002 and 2012 and negligible adverse impacts from PM. For ozone precursors, impacts from VOC would be major adverse in 2002 and 2012, and impacts from NO_x would be moderate in 2002, increasing to major by 2012.

This alternative would not impair air quality.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

PWC use would be banned at Breezy Point and restricted to the navigational channels within Rockaway Inlet and Jamaica Bay. Estimated peak-hour PWC use in both areas would be 45 watercraft per hour in 2002 and 47 in 2012. Table 25 presents the annual PWC emission loads and their impact levels.

TABLE 25: PWC EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE B — JAMAICA BAY UNIT

	CO		PM		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	127.15	105.67	2.53	0.41	0.59	1.94	58.17	11.07
Impact Level (adverse)	Major	Major	Negligible	Negligible	Minor	Minor	Major	Moderate

In 2002 and 2012 air quality impact levels would be major adverse for CO since PWC emission levels would be greater than 100 tons/year for a CO maintenance area and negligible adverse for PM (less than 50 tons/year). For ozone precursors in a non-attainment area, impacts would be minor adverse for NO_x (less than 5 tons/year) and major adverse for VOC in 2002 (more than 25 tons/ year), decreasing to moderate adverse in 2012 (less than 25 tons/year for an ozone non-attainment area).

Cumulative Impacts. Cumulative impacts would be similar to those described under alternative A, except that PWC users would be relegated to the navigational channels within Rockaway Inlet and Jamaica Bay.

TABLE 26: PWC AND MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE B — JAMAICA BAY UNIT

	CO		PM		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	886.95	828.42	15.87	10.67	24.19	30.78	293.58	112.11
Impact Level (adverse)	Major	Major	Negligible	Negligible	Moderate	Major	Major	Major

Under alternative B the cumulative emission levels for CO would be major adverse (see Table 26); while levels for PM emissions would be negligible. For an ozone non-attainment area, cumulative VOC emissions would be major adverse for both 2002 and 2012 (more than 25 tons/year), and NO_x emissions would be moderate adverse (less than 25 tons/year), becoming major adverse by 2012 (more than 25 tons/year).

Conclusion. PWC annual emissions under alternative B in 2002 and 2012 would result in major adverse impacts from CO emissions and negligible adverse impacts from PM emissions. For ozone precursors,

impacts from VOC would be major adverse in 2002, decreasing to moderate adverse in 2012, and impacts from NO_x would be minor adverse in 2002 and 2012.

The cumulative impacts from all boating activities under this alternative would be major adverse for CO (as defined by the federal conformity rule) and negligible for PM. For ozone precursors, impacts from VOC would be major adverse throughout the assessment period; impacts from NO_x would be moderate adverse in 2002, increasing to major adverse in 2012.

This alternative would not impair air quality.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. PWC use under alternative C would be similar to alternative B, with the same geographic restrictions, except Winhole Channel would be open to use. Estimated PWC use would remain 45 per hour during peak season in 2002, increasing to 47 per hour in 2012 (see Table 25). Table 26 under alternative B shows the annual PWC emission loads and their impact levels for the years 2002 and 2012.

Air quality impact levels would be very similar to those under alternative B. Impacts would be major adverse for CO (greater than 100 tons/year) and negligible adverse for PM (less than 5 tons/year). For ozone precursors, emission levels would be minor adverse for NO_x (less than 5 tons/year) in 2002 and 2012; impacts for VOC would be major in 2002 (more than 25 tons/year), decreasing to moderate by 2012 (less than 25 tons/year).

Cumulative Impacts. The cumulative emissions and impacts under alternative C would be the same as under alternative B (see Table 26). In 2002 and 2012 cumulative CO emission levels would be major adverse as defined by the federal conformity rule, while levels for PM emissions would be negligible. For ozone precursors in a non-attainment area, the cumulative VOC emissions would be major adverse for both 2002 and 2012 (more than 25 tons/year); NO_x emissions would be moderate adverse in 2002 (less than 25 tons/year), increasing to major adverse (more than 25 tons/year) in 2012.

Conclusion. PWC annual emissions in 2002 and 2012 would result in major adverse impacts from CO and negligible adverse impacts from PM. For ozone precursors, impacts from VOC would be major in 2002, decreasing to moderate by 2012; impacts from NO_x would be minor in 2002 and 2012.

Cumulative impacts from all boating activities would result in major adverse impacts from CO (as defined by the federal conformity rule) and negligible adverse impacts from PM emissions. For ozone precursors, impacts from VOC would be major adverse throughout the assessment period, and impacts from NO_x would be moderate adverse in 2002, increasing to major adverse by 2012.

This alternative would not impair air quality.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Under the no-action alternative there would be no further emissions from PWC use within the unit boundary as it would be banned, resulting in beneficial impacts.

TABLE 27: MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, NO-ACTION ALTERNATIVE — JAMAICA BAY UNIT

	CO		PM		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	759.80	722.75	13.34	10.26	23.60	28.84	235.41	101.04
Impact Level (adverse)	Major	Major	Negligible	Negligible	Moderate	Major	Major	Major

Cumulative Impacts. The cumulative air quality impacts of all motorized boating activities under the no-action alternative are shown in Table 27; there would be no contribution to annual emissions from PWC use within the Jamaica Bay Unit.

Overall, the 2002 cumulative emission levels for CO would be major adverse (more than 100 tons/year) as defined by the federal conformity rule, and PM emission levels would be negligible adverse (less than 25 tons/year). For ozone precursors, VOC levels would be major adverse (more than 25 tons/year) for a non-attainment area. NO_x levels would be moderate adverse in 2002 (less than 25 tons/year), increasing to major adverse (more than 25 tons/year) in 2012.

Conclusion. The no-action alternative would have beneficial impacts on air quality with the ban of PWC use within the Jamaica Bay Unit.

Cumulative impacts would be similar to alternative A, with major adverse impacts from CO and negligible adverse impacts from PM. For ozone precursors, impacts from VOC would be major in 2002 and 2012, and impacts from NO_x would be moderate in 2002, increasing to major by 2012. There would be no contribution from PWC use.

This alternative would not impair air quality.

IMPACT TO AIR QUALITY RELATED VALUES FROM PWC POLLUTANTS

Impacts on air quality related values include visibility and biological resources (specifically, ozone effects on plants) that may be affected by airborne pollutants emitted from personal watercraft and other sources. These pollutants include ozone, nitrogen oxides, and particulate matter.

$PM_{2.5}$ as a fraction of particulate matter is evaluated for visibility impairment. To assess the impact of ozone on plants, the five-year ozone index value is used. This value is represented as SUM06 ozone measured in ppm-hours. The SUM06 values are interpreted and mapped by the NPS Air Resources Division based on data from rural and urban monitoring sites; they represent the overall condition of the area due to regional emissions of ozone precursor chemicals, and consequent formation of ozone. Based on the five-year average data provided by the National Park Service, the SUM06 for the impact analysis area is within a range of 19–25 ppm-hrs (based on urban site data). The following PWC impact levels for air quality related values are assumed:

	Activity Analyzed		Current Air Quality
Negligible:	Emissions would be less than 50 tons/year for each pollutant.	**and**	There are no perceptible visibility impacts (photos or anecdotal evidence). **and** There is no observed ozone injury on plants. **and** SUM06 ozone is less than 12 ppm-hours.

Minor:	Emissions would be less than 100 tons/year for each pollutant.	**and**	SUM06 ozone is less than 15 ppm-hours.
Moderate:	Emissions would be greater than 100 tons/year for any pollutant. **or** Visibility impacts from cumulative PWC emissions would be likely (based on past visual observations).	**or**	Ozone injury symptoms are identifiable on plants. **and** SUM06 ozone is less than 25 ppm-hours.
Major:	Emissions would be equal to or greater than 250 tons/year for any pollutant. **or** Visibility impacts from cumulative PWC emissions would be likely (based on modeling or monitoring).	**and**	Ozone injury symptoms are identifiable on plants. **or** SUM06 ozone is greater than 25 ppm-hours.

Impairment: Impacts would have a major adverse effect on park resources and values; and

contribute to deterioration of the park's air quality to the extent that the park's purpose could not be fulfilled as established in its enabling legislation; or

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Annual PWC emission loads and their impact levels for 2002 and 2012 under this alternative are shown in Table 28.

TABLE 28: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS, ALTERNATIVE A — JAMAICA BAY UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	2.59	0.42	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

The adverse air quality impact levels under this alternative would be moderate since the SUM06 ozone values would be between 19 and 25 ppm-hrs. For visibility, $PM_{2.5}$ emissions would be less than 50 tons/year and there would be no perceptible visibility impacts, resulting in a negligible adverse impact.

Cumulative Impacts. The cumulative impact analysis includes all other marine vehicle use, taking into consideration national use trends as well as current and future emission levels. The effects on visibility

and plants due to airborne pollutants were considered. Cumulative emissions and impacts of all PWC and other boating activities under alternative A are shown in Table 29.

The cumulative ozone levels from all activities under this alternative would be moderate adverse. Visibility impact levels would be negligible in 2002 and 2012. Future emission levels would decrease due to EPA and New York State requirements.

TABLE 29: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, ALTERNATIVE A — JAMAICA BAY UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	14.86	9.86	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

Conclusion. PWC annual emissions under alternative A would result in moderate adverse impacts for ozone in 2002 and 2012. Currently, there are no perceptible qualitative visibility impacts or observed ozone injury to plants. The PWC impact levels on visibility under this alternative would not be perceptible.

The cumulative impacts from all boating activities would be moderate adverse for ozone and negligible for visibility.

This alternative would not impair air quality related values.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Under this alternative the ambient air quality levels in the unit would meet the national ambient air quality standards, and there are no perceptible qualitative visibility impacts or observed ozone injury on plants. Table 30 presents the annual PWC emission loads and their impact levels for 2002 and 2012.

TABLE 30: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS, ALTERNATIVE B — JAMAICA BAY UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	2.33	0.38	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

The adverse ozone impact levels would be moderate for all pollutants since the SUM06 ozone value would be 19–25 ppm-hrs. Visibility impacts would be negligible, with emission levels below 50 tons/year.

Cumulative Impacts. Cumulative emissions and impacts of all motorized watercraft under alternative B are summarized in Table 31. The impact levels from air emissions of ozone would be moderate adverse, and visibility impact levels would be negligible.

TABLE 31: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, ALTERNATIVE B — JAMAICA BAY UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	14.60	9.82	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

Conclusion. PWC annual emissions under alternative B would result in moderate adverse impacts for ozone in 2002 and 2012. Currently, there are no perceptible qualitative visibility impacts or observed ozone injury on plants. Impacts on visibility from airborne pollutants related to PWC use would be negligible.

Cumulative impacts from all PWC and other marine boating activities would result in moderate adverse ozone impacts and negligible visibility impacts in 2002 and 2012.

This alternative would not impair air quality related values.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. Under alternative C emission levels would be similar to those under alternative B, as the same number of personal watercraft are assumed, except they could also operate in the Winhole Channel (see Table 30). The adverse air quality ozone impact levels would be moderate. Visibility impact levels would be negligible.

Cumulative Impacts. Cumulative emissions and impacts of all PWC and other boating activities would be the same as alternative B (see Table 31). Cumulative ozone impact levels would be moderate, and visibility impacts negligible.

Conclusion. PWC annual emissions under alternative C would result in moderate adverse impacts for all pollutants in 2002 and 2012. Currently, there are no perceptible qualitative visibility impacts or observed ozone injury on plants. Impacts on visibility would be negligible.

Future cumulative ozone impacts from all motorized marine boating activities would be moderate and adverse; visibility impacts would be negligible.

This alternative would not impair air quality related values.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Under the no-action alternative PWC use within the unit would be banned. As a result reduced air emissions from personal watercraft would have beneficial impacts. Currently, there are no perceptible qualitative visibility impacts or observed ozone injury on plants.

Cumulative Impacts. While PWC use would no longer be allowed within the unit, other motorized watercraft would continue at the same use levels. The total cumulative emission loads and impact levels are presented in Table 32.

TABLE 32: AIR QUALITY RELATED IMPACTS FROM MOTORIZED BOATS, NO-ACTION ALTERNATIVE — JAMAICA BAY UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	12.27	9.44	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

Cumulative ozone impact levels from all motorized watercraft air emissions would be moderate, and visibility impacts would be negligible. Future emission levels would decrease due to the cleaner engine regulations.

Conclusion. The no-action alternative would have beneficial impacts on the air quality of the Jamaica Bay Unit because PWC use would no longer be allowed.

Ozone impacts from airborne pollutants related to all other boating activities would be moderate and visibility impacts negligible.

This alternative would not impair air quality related values.

SOUNDSCAPES

All motorized watercraft, including personal watercraft, produce noise that may impact unit soundscapes and visitor experiences. Any watercraft that does not meet the NPS watercraft noise regulation of 82 dB at 82 feet at full acceleration is subject to fine and removal from the unit. Therefore, it is assumed for this analysis that 82 dB at 82 feet is the maximum that would be emitted for any legal watercraft at full acceleration (normally the “loudest” portion of its operation).

In addition, the noise from personal watercraft may be more noticeable and therefore more annoying to people than other motorized watercraft due to frequent changes in acceleration and direction, and jumping into the air, causing rapid increases in the noise level and changes in sound frequency distribution.

GUIDING REGULATIONS AND POLICIES

The national park system includes some of the quietest places on earth, as well as a rich variety of sounds intrinsic to park environments. These intrinsic sounds are recognized and valued as a park resource in

keeping with the NPS mission (*NPS Management Policies 2001,* sec. 1.4.6), and they are referred to as the natural soundscape. The natural soundscape, sometimes called natural quiet, is the aggregate of all the natural sounds that occur in parks, absent human-caused sound, together with the physical capacity for transmitting the natural sounds (*Management Policies 2001,* sec. 4.9). It includes all of the sounds of nature, including such "non-quiet" sounds as birds calling, thunder, and waves breaking against the shore. Some natural sounds are also part of the biological or other physical resource components of parks (e.g., animal communication, sounds produced by physical processes).

NPS policy requires the restoration of degraded soundscapes to the natural condition whenever possible, and the protection of natural soundscapes from degradation due to noise (undesirable human-caused sound) (*Management Policies 2001,* sec. 4.9). The National Park Service is specifically directed to "take action to prevent or minimize all noise that, through frequency, magnitude, or duration, adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified as being acceptable to, or appropriate for, visitor uses at the sites being monitored" (*Management Policies 2001,* sec. 4.9). Overriding all of this is the fundamental purpose of the national park system, established in law (e.g., 16 USC 1 et seq.), which is to conserve park resources and values (*Management Policies 2001,* sec. 1.4.3). NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values (*Management Policies 2001,* sec 1.4.3).

Noise can adversely affect park resources, including but not limited to natural soundscapes. It can directly impact them, for example, by modifying or intruding on the natural soundscape. It can also indirectly impact resources, for example, by interfering with sounds important for animal communication, navigation, mating, nurturing, predation, and foraging functions.

Noise can also adversely impact park visitor experiences. The term visitor experience can be defined as the opportunity for visitors to experience a park's resources and values in a manner appropriate to its purpose and significance, and appropriate to the resource protection goals for a specific area or management zone within that park. In other words, visitor experience is primarily a resource-based opportunity appropriate to a given park or area within a park, rather than a visitor-based desire. Noise impacts to visitor experience can be especially adverse when management objectives for visitor experience include solitude, serenity, tranquility, contemplation, or a completely natural or historical environment. Management objectives (or desired conditions) for resource protection and visitor experience are derived through well-established public planning processes from law, policy, regulations, and management direction applicable to the entire national park system and to each specific park unit.

Visitor uses of parks will only be allowed if they are appropriate to the purpose for which a park was established, and if they can be sustained without causing unacceptable impacts to park resources or values (*Management Policies 2001,* sec. 8.1 and 8.2). While the fundamental purpose of all parks also includes providing for the "enjoyment" of park resources and values by the people of the United States, enjoyment can only be provided in ways that leave the resources and values unimpaired for the enjoyment of future generations (*Management Policies 2001,* sec. 1.4.3). Unless mandated by statute, the National Park Service will not allow visitors to conduct activities that, among other things, unreasonably interfere with "the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park" (*Management Policies 2001,* sec. 8.2). While many visitor activities are allowed or even encouraged in parks consistent with the above policies, virtually <u>all</u> visitor activities are limited or restricted in some way (e.g., through carrying capacity determinations, implementation plans, or visitor use management plans), and on a park- or area-specific basis, some visitor activities are not allowed at all.

The degree to which a given activity (e.g., PWC use) is consistent with, or moves the condition of a resource or a visitor experience toward or away from a desired condition, is one measure of the impact of the activity.

The federal regulation pertaining to noise abatement for boating and water use activities (36 CFR 3.7) prohibits operating a vessel on inland waters "so as to exceed a noise level of 82 decibels measured at a distance of 82 feet (25 meters) from the vessel" and specifies that testing procedures to determine such noise levels should be in accordance with or exceed those established by the Society of Automotive Engineers (SAE) in "Exterior Sound Level Measurement Procedure for Pleasure Motorboats" (J34). This SAE procedure specifies that sound level measurements be taken 25 meters perpendicular to the line of travel of the vessel at full throttle (SAE 2001). It is important to note that this NPS regulation and the SAE procedure were developed for enforcement purposes, not impact assessment purposes. The level in the regulation does not imply that there are no impacts to park resources or visitor experiences at levels below 82 dB; it just indicates that noise levels from vessels legally operating on NPS waters will be no "louder" than 82 dB. As explained elsewhere in this document, a single decibel value does not provide much information for impact assessment purposes.

Human-generated noise sources at the Jamaica Bay Unit of Gateway National Recreation Area include personal watercraft and other types of watercraft, vehicular traffic, aircraft, and noise from private communities.

METHODOLOGY AND ASSUMPTIONS

The methodology used to assess noise impacts from PWC use in this document is consistent with the NPS *Management Policies 2001*, and *Director's Order #47: Soundscape Preservation and Noise Management,* and the reference manual for DO #47 (NPS 2000b). Park-specific factors related to context, time, and intensity are discussed below, and then integrated into a discussion of the impact thresholds used in this analysis.

Potential impacts to the soundscape at the Jamaica Bay Unit were evaluated based on the existing sound levels in comparison to potential sound levels associated with each of the alternatives. This evaluation is a qualitative assessment. The qualitative assessment is based on the general trends of existing and future PWC use in the park and best professional judgment. While specific background noise studies are not available for the Jamaica Bay Unit, certain conditions have been taken into account given the number of PWC users in the identified study areas and land use patterns surrounding those areas. For example, it is assumed that the soundscape throughout the majority of the unit is affected by adjacent land uses, such as the JFK International Airport and transportation networks surrounding the park. Impacts to wildlife from noise are addressed separately under "Wildlife and Wildlife Habitat."

Context: The Jamaica Bay Unit includes areas characterized by intense urban land uses. Resources at the seashore that are most likely to be affected by PWC noise include the park's natural environment and noise-sensitive wildlife, such as breeding waterfowl, within the Jamaica Bay Wildlife Refuge.

Time Factor: PWC use is assumed to occur from May through September (a period of approximately 160 days), with peak use from Memorial Day to Labor Day. PWC use occurs during daylight hours as mandated under New York State boating regulations. Use generally discontinues during periods of inclement weather (e.g., cold, thunderstorms).

In areas of concentrated PWC use, such as the Rockaway Inlet, noise from personal watercraft and other boats can be virtually constant from sunrise to sunset. In areas of low use, noise from

all types of motorized watercraft can be intermittent, usually lasting at least a few minutes when present.

Intensity: Noise limits established by the National Park Service are 82 dB at 82 feet. PWC noise travels in relationship to the speed of the craft, the distance from shoreline, and other influences. Outdoor noise levels usually decrease with increasing distance from the source because of geometrical spreading of the noise over a bigger surface and absorption of the noise by the atmosphere and the ground (Bruer and Kjaer 2002). According to Komanoff and Shaw (2000), PWC noise dissipates by 5 dBA across water for each doubling of distance from a 20-foot circle around the source and by 6 dBA across land. A PWC engine in the water produces 80 dB of sound within a 20-foot radius, and 73 dB within a 50-foot radius (Komanoff and Shaw 2000). This is close to estimates provided by the Personal Watercraft Industry Association (PWIA 2002b), which state that one PWC operating 50 feet from an on-shore observer is heard at 71 dBA, and two would be heard at 74 dBA.

The National Park Service contracted for noise measurements of personal watercraft and other motorized vessels in 2001 at Glen Canyon National Recreation Area (Harris Miller Miller & Hanson, Inc. 2002). The results show that maximum PWC noise levels at 82 feet ranged from 68 to 76 dBA. Noise levels for other motorboat types measured during that study ranged from 65 to 86 dBA at 82 feet. However, PWC-generated noise may be more disturbing due to rapid changes in acceleration and direction of noise than noise from a constant source at 90 dB (US EPA 1974, cited in Izaak Walton League 1999).

Vegetation can also decrease noise. According to the U.S. Department of Transportation (FHWA 2000), vegetation must be so high, wide, and dense that it cannot be seen through, and must be at least 61 meters (186 feet) wide to reduce noise by 10 dB.

In response to public complaints, the PWC industry has employed new technologies to reduce sound by about 50% to 70% on 1999 and newer models (Sea-Doo 2000; Hayes 2002). Additionally, the EPA emission standards will reduce PWC noise, in association with improvements to engine technology (US EPA 1996b).

The level of sound generated by watercraft using the Jamaica Bay Unit is expected to affect recreational users differently. For example, visitors participating in less sound-intrusive activities such as bird-watching would likely be more adversely affected by PWC noise than another PWC or motorboat users. Therefore, impacts to soundscapes must take into account the effect of noise levels on different types of recreational users within the impact analysis area. The following is a list of other considerations for evaluating sound impacts:

The maximum number of personal watercraft operating per hour would increase from 50 in 2002 to 52 by 2012 throughout the unit. This is considered to be the maximum number of personal watercraft operating in the unit midday during the peak season, when use is highest.

Ambient noise levels include natural sounds, airplanes, traffic, other visitors, and other boats.

Context, time, and intensity together determine the level of impact for an activity. For example, noise for a certain period and intensity would be a greater impact in a highly sensitive context, and a given intensity would be a greater impact if it occurred more often, or for longer duration. It is usually necessary to evaluate all three factors together to determine the level of noise impact. In some cases an analysis of one or more factors may indicate one impact level, while an analysis of another factor may indicate a different impact level, according to the criteria below. In such cases, best professional judgment based on a documented rationale must be used to determine which impact level best applies to the situation being evaluated.

In order to estimate the relative impacts of PWC use at the unit, the following methodology was used:

1. PWC use was estimated as explained in "PWC and Visitor Use Trends" (page 74). National literature was used to estimate the average PWC decibel levels. Literature sources included federal and state agencies, PWC industry specifications, and measurements conducted by various nongovernmental organizations.
2. Areas of shoreline use by other visitors were identified in relation to where PWC launch and operate offshore. Personal observations from park staff were used to identify these areas, as well as PWC user trend information (see "PWC and Visitor Use Trends").
3. Other considerations, such as topography and prevailing winds, were then used to identify areas where PWC noise levels may be exacerbated or reduced.
4. In this assessment the noise of two or more personal watercraft operating at the same time (when one unit produces 82 dB), and at a distance of 82 feet from the source, was shown to be 85 dB.* Consequently, the noise levels at 100 feet, and based on PWC average numbers per hour estimated in the user trend section of this report, would be as follows:

Breezy Point	5 PWC / hour = 87 dB
Rockaway Inlet	10 PWC / hour = 90 dB
Jamaica Bay	35 PWC / hour = 95 dB

At 500 feet from PWC users (the distance from bathing beaches that PWC users must maintain under New York State boating regulations) the following noise levels were calculated:**

Breezy Point	5 PWC / hour = 73 dB
Rockaway Inlet	10 PWC / hour = 76 dB
Jamaica Bay	35 PWC / hour = 81 dB

IMPACT ANALYSIS AREA

The impact analysis area for soundscapes is related to the location that personal watercraft operate and the distance that PWC noise travels. PWC use is allowed throughout the Jamaica Bay Unit; however, the majority of use is within Jamaica Bay (see "PWC and Visitor Use Trends," page 74). PWC noise can travel inland and is expected to dissipate within 0.75 mile of the source. Thus, the impact analysis area for soundscapes is all of the Jamaica Bay Unit and is analyzed by defined areas of use (Jamaica Bay, Rockaway Inlet, and Breezy Point).

IMPACT TO VISITORS FROM PWC NOISE

Given this methodology and the accompanying assumptions, the following criteria have been developed to assess the noise impacts for each alternative:

Negligible: Natural sounds would prevail; motorized noise would be very infrequent or absent, mostly immeasurable.

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* The equation used was $10 \times \log((10^{82/10}) + (10^{82/10})) = 85$ dB

** The equation used was $20 \times \log(D1/D2)$

where D1 = the location to be calculated

D2 = the distance of the known noise source

Minor: Natural sounds would be predominant in areas where management objectives call for natural processes to predominate, with motorized noise infrequent at low levels. In areas where motorized noise is consistent with park purpose and objectives, motorized noise could be heard frequently throughout the day at moderate levels, or infrequently at higher levels, and natural sounds could be heard occasionally.

Moderate: In areas where management objectives call for natural processes to predominate, natural sounds would predominate, but motorized noise could occasionally be present at low to moderate levels. In areas where motorized noise is consistent with park purpose and objectives, motorized noise would predominate during daylight hours and would not be overly disruptive to noise-sensitive visitor activities in the area; in such areas, natural sounds could still be heard occasionally.

Major: In areas where management objectives call for natural processes to predominate, natural sounds would be impacted by human noise sources frequently or for extended periods of time at moderate intensity levels (but no more than occasionally at high levels), and in a minority of the area. In areas where motorized noise is consistent with park purpose and zoning, the natural soundscape would be impacted most of the day by motorized noise at low to moderate intensity levels, or more than occasionally at high levels; motorized noise would disrupt conversation for long periods of time and/or make enjoyment of other activities in the area difficult; natural sounds would rarely be heard during the day.

Impairment: The level of noise associated with PWC use would be heard consistently and would be readily perceived by other visitors throughout the day, especially in areas where such noise would potentially conflict with the intended use of that area. In addition, these adverse, major impacts (described above) to park resources and values would

contribute to deterioration of the park's soundscape to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. As stated above, on a typical summer day during peak operating hours, approximately 35 personal watercraft are present in Jamaica Bay, 10 in Rockaway Inlet, and 5 at Breezy Point, for a total of 50 craft. Other motorized watercraft are also present. PWC users and boaters are required to maintain a distance of 500 feet from any marked bathing beaches, but there are no other restrictions that inhibit their access to the shore.

Noise limits established by the National Park Service are 82 dB at 82 feet. Two personal watercraft, each of which emits 82 dB, would together produce a noise level of 85 dB at 82 feet. Noise levels generated by five personal watercraft at 85 dB traveling more than 200 feet from shore would be 77 dB on the shoreline. Visitors canoeing, kayaking, or fishing within the unit boundary would be directly exposed to PWC-generated noise.

Within the unit boundary, the noise levels recede as the noise travels over the shoreline and vegetation. As sound travels inland, the attenuating properties of the terrain and natural vegetation further reduce noise levels. The ambient noise levels vary between each PWC use area. Ambient levels in Jamaica Bay

and Rockaway Inlet are higher than those at Breezy Point. Due to the level of human activity and various other uses in Jamaica Bay and Rockaway Inlet, PWC use would result in negligible adverse impacts to other visitors and the natural soundscapes. In these areas PWC noise would be heard throughout the day.

Ambient noise levels may be assumed to be lower at Breezy Point. PWC noise would have minor adverse impacts to visitors on shore in this area; however, PWC and watercraft noise would be consistent throughout the day.

Overall, PWC noise levels are expected to have negligible to minor adverse impacts at certain locations within the Jamaica Bay Unit. Due to current levels of boat and PWC traffic in the area, airplane traffic, and automobile traffic form nearby parkways and causeways, PWC noise generated within the unit during the summer months would be consistent with ambient noise levels. Overall, this alternative would result in negligible to minor adverse impacts over the short and long term. Potential reduction in noise emissions (Sea-Doo 2001b; Yamaha Motor 2001) could also contribute to a reduction of adverse impacts to park visitors.

Cumulative Impacts. Other noise sources within the Jamaica Bay Unit include air traffic, automobile traffic, waves (Breezy Point), ocean breezes, private communities, and other watercraft. Motorized boating activities within the bay generate noise levels similar to those from personal watercraft, but personal watercraft comprise only 15% of all the watercraft using these waters. The cumulative impacts of boating noise, ambient noise levels, and PWC noise would range from negligible to moderate over the short and long term, depending on the location within the unit and the time of year. Noise levels are elevated in the northern section of the unit due to the airport and in the western section due to the presence of the parkway and private communities; the southern portion of the unit also has private communities and a high level of boat traffic. Noise impacts would be minor to other visitors and minor to moderate compared to the natural soundscape.

Conclusion. PWC use would continue to have negligible to minor adverse impacts on visitors throughout the unit over the short and long term.

Noise from all motorized watercraft, as well as ambient noise levels occurring outside the unit, would have negligible to moderate adverse impacts on other recreational users within the unit. Noise impacts would be minor to other visitors and minor to moderate compared to the natural soundscape.

This alternative would not impair any soundscape-related values.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. This alternative would prohibit PWC use throughout the unit except in designated navigational channels; PWC use would be prohibited at Breezy Point. As a result, it is assumed that 35 personal watercraft would use the channels in Jamaica Bay on a peak summer day, and 10 would use Rockaway Inlet. PWC noise impacts in these two areas would be similar to those described under alternative A, although more localized in the navigational channels and probably less noticeable to park visitors on the shoreline since PWC traffic would be farther away within the central channels. Impacts would range from negligible to minor. Breezy Point would experience beneficial impacts with the removal of PWC use from this area.

Cumulative Impacts. Motorized craft would continue to have access to all areas of the unit, and noise generated by them would still impact visitors. Noise from all motorized watercraft, as well as ambient

noise levels occurring outside the unit, would have negligible to moderate adverse impacts on other recreational users over the short and long term. Noise impacts would be minor to other visitors and minor to moderate compared to the natural soundscape.

Conclusion. PWC-related noise impacts would range from negligible to minor adverse over the short and long term in and near navigational channels open to PWC use. Visitors at Breezy Point would experience beneficial impacts with the removal of PWC use.

Noise from all motorized watercraft, as well as ambient noise levels occurring outside the unit, would have negligible to moderate adverse impacts on other recreational users within the unit, similar to alternative A. Noise impacts would be minor to other visitors and minor to moderate compared to the natural soundscape.

This alternative would not impair any soundscape-related values.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. Similar to alternative B, this alternative would prohibit PWC use throughout the unit except in designated navigational channels, including the Winhole Channel. As a result, it is assumed that PWC activity would remain at 35 craft in Jamaica Bay and 10 at Rockaway Inlet. PWC use would be prohibited at Breezy Point. Impacts within Jamaica Bay and Rockaway Inlet would be similar to those described under alternative A, although they would be more localized in the navigational channels and less on the shorelines. Compared to alternative B, PWC noise impacts would increase in the area bordering the Winhole Channel. Impacts would range from negligible to minor over the short and long term. Visitors at Breezy Point would experience beneficial impacts with the removal of PWC use in this area.

Cumulative Impacts. All areas would continue to experience negligible to minor adverse impacts due to noise generated by personal watercraft and other motorboats, as well as ambient noise levels. Boats would continue to have access to all areas of the unit, and noise generated by them would still impact visitors. Noise from personal watercraft and other boats, as well as ambient noise levels, occurring outside the unit boundary would have negligible to moderate adverse impacts on other recreational users over the short and long term. Noise impacts would be minor to other visitors and minor to moderate compared to the natural soundscape.

Conclusion. Noise impacts would range from negligible to minor over the short and long term due to continued PWC use in navigational channels (including Winhole Channel). Visitors at Breezy Point would experience beneficial impacts with the removal of PWC use.

Noise from all motorized watercraft, as well as ambient noise levels occurring outside the unit, would have negligible to moderate adverse impacts on other recreational users within the unit, similar to alternative A. Noise impacts would be minor to other visitors and minor to moderate compared to the natural soundscape.

This alternative would not impair any soundscape-related values.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Banning personal watercraft within the unit would have a beneficial impact by reducing this source of noise.

Cumulative Impacts. Other boating activities and ambient noise levels within the unit would continue to generate noise levels equal to those described under alternative A. Even though PWC-generated noise would be eliminated within the park, other boating activity and air and automobile traffic would continue to result in negligible to moderate adverse impacts within the unit over the short and long term.

Conclusion. Banning PWC use within the Jamaica Bay Unit would have a beneficial impact by eliminating this noise source within the unit boundary.

Noise from all motorized watercraft, as well as ambient noise levels occurring outside the unit, would have negligible to moderate adverse impacts on other recreational users within the unit, similar to alternative A. Noise impacts would be minor to other visitors and minor to moderate compared to the natural soundscape.

This alternative would not impair any soundscape-related values.

WILDLIFE AND WILDLIFE HABITAT

Some research suggests that PWC use impacts wildlife by interrupting normal activities, causing alarm or flight, causing animals to avoid habitat, displacing habitat, and affecting reproductive success. This is thought to be caused by a combination of PWC speed, noise, and ability to access sensitive areas, especially in shallow water. PWC use may have a greater impact on waterfowl and nesting birds because of their noise, speed, and ability to access shallow-water areas more readily than other types of watercraft. This may force nesting birds to abandon eggs during crucial embryo development stages and flush other waterfowl from habitat, causing stress and associated behavior changes. Collisions with waterfowl and other wildlife species may also be of concern.

GUIDING REGULATIONS AND POLICIES

The National Park Service *Management Policies 2001* states that the National Park Service will maintain as parts of the natural ecosystems of parks all native plants and animals (sec. 4.4.1). The National Park Service will achieve this by

> preserving and restoring the natural abundance, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and communities and ecosystems in which they occur
>
> restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions
>
> minimizing human impacts on native plants, animal populations, communities, and ecosystems, and the processes that sustain them

Gateway National Recreation Area encompasses the largest collection of natural systems, wildlife habitats, historic resources, and recreational opportunities in the New York City / New Jersey metropolitan area. The mission of Gateway National Recreation Area is to "maintain, improve, and make these resources and opportunities available to the public for inspiration, education, and recreation." To achieve

this, long-term goals in Gateway's *Strategic Plan* include the protection, restoration, or maintenance of ecosystems, including rare or endangered plant and animal populations. Additional federal, state, and local regulations and/or policies for wildlife and wildlife habitat are shown in Table 33.

TABLE 33: NPS LAWS AND POLICIES

Law or Policy	Management Direction
GENERAL — NATIONAL PARK SERVICE	
National Park Service Organic Act National Park Service *Management Policies 2001*	The National Park Service will "conserve the scenery and the natural and historic objects and the wild life therein and . . . provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." "Congress, recognizing that the enjoyment by future generations of the national parks can be assured only if the superb quality of park resources and values is left unimpaired, has provided that when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant" (sec. 1.4.3.). The NPS *Management Policies* acknowledge that providing opportunities for public enjoyment is fundamental to the NPS mission. But they emphasize that recreational and other activities, including management activities, may be allowed only when they will not cause impairment or derogation of a park's resources, values, or purposes. The sole exception is when an activity that would cause impairment or derogation is mandated by Congress (sec. 1.4.4.).
16 USC 460(c)	On October 22, 1972, Congress established Gateway National Recreation Area to preserve and protect for the use and enjoyment of present and future generations an area possessing outstanding natural and recreational features.
Public Law 95-625; NPS *Management Policies 2001*; 16 USC 1a-7(b)(4)	NPS management plans must include measures for protecting the parks' resources.
NATURAL RESOURCES	
National Environmental Policy Act *Director's Order #12: Conservation Planning, Environmental Impact Analysis, and Decision-making*	The purpose of the National Environmental Policy Act is to establish a national policy "which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man and to enrich the understanding of the ecological systems and natural resources important to the Nation." The act is implemented by regulations of the Council on Environmental Quality. Within the National Park Service, the provisions of the act and the CEQ regulations are implemented through DO #12.
NPS *Management Policies 2001* NPS *Natural Resources Management Guideline* (DO #77) Endangered Species Act of 1973 Migratory Bird Conservation Act of 1958 Marine Mammal Protection Act of 1972	Policies and guidelines for natural resources direct that the park must (1) identify and complete the inventories of natural resources for baseline information; (2) minimize impacts of human activities, developments, and uses on marine and terrestrial resources; (3) continue to close areas of the seashore to protect nests; and (4) manage endangered, threatened, and candidate species.
Title 36 *Code of Federal Regulations* 1.5, 1.6, 1.10, 2.1, 2.2, 2.3, 2.4, 2.5	Title 36 CFR provides authorization for closing areas and limiting public use to protect resources; providing public notice of closures or use limits; prohibiting the destruction, defacing, or disturbing of resources; and protecting fish and wildlife and permit research.
Executive Order 13158, "Marine Protected Areas"	Signed May 2000, this order helps fulfill the purposes of the NPS Organic Act and other pertinent statutes. The purpose of the order, consistent with domestic and international law, is to (a) strengthen the management, protection, and conservation of existing marine protected areas (MPAs) and establish new or expanded MPAs; (b) develop a scientifically based, comprehensive national system of MPAs representing diverse U.S. marine ecosystems, and the Nation's natural and cultural resources; and (c) avoid causing harm to MPAs through federally conducted, approved, or funded activities."
Executive Order 11990, "Protection of Wetlands"	This order requires federal agencies to avoid, to the extent possible, the long- and short-term adverse impacts associated with the destruction of modification of wetlands.
Public Law 94-265	The Magnuson-Stevens Fishery Conservation and Management Act calls for direct action to stop or reverse the continued loss of fish habitats. Congress mandated the identification of habitats essential to managed species and measures to conserve and enhance this habitat. The act requires cooperation among National Marine Fisheries Service, fishing participants, and federal and state agencies to protect, conserve, and enhance essential fish habitat. Areas designated as essential fish habitat are outlined in "The Affected Environment."

SOURCE: Adapted from NPS *Management Policies 2001.*

METHODOLOGY AND ASSUMPTIONS

Information on wildlife species likely to occur in, or in proximity to, areas accessible by personal watercraft was considered in the analysis. The analysis of possible impacts to wildlife species was based on their potential to utilize habitats likely to be affected by the implementation of each of the alternatives.

A similar methodology was used to determine the relative magnitude of impacts from PWC-generated noise to avian species given the various management alternatives. Studies indicate that flushing distances for avian species vary based on whether the bird is incubating, the site location, and the individual birds. Impacts to state or federally listed threatened or endangered species, or species of concern, are addressed separately beginning on page 121.

IMPACT ANALYSIS AREA

The impact analysis area includes the immediate locations of PWC use and the surrounding nearshore environment where wildlife and wildlife habitat may occur. For purposes of this review, the impact analysis area is the Jamaica Bay Unit, including Jamaica Bay, Rockaway Inlet, and Breezy Point.

IMPACT OF PWC USE ON WILDLIFE AND WILDLIFE HABITAT

The following thresholds were used to determine the magnitude of effects on wildlife and wildlife habitat.

Negligible: There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them. Impacts would be of short duration and well within natural fluctuations.

Minor: Impacts would be detectable, but they are not expected to be outside the natural range of variability or to have any long-term effects on native species, their habitats, or the natural processes sustaining them. Population numbers, population structure, genetic variability, and other demographic factors for species might have small, short-term changes, but long-term characteristics would remain stable and viable. Occasional responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, or other factors affecting population levels. Key ecosystem processes might have short-term disruptions that would be within natural variation. Sufficient habitat would remain functional to maintain viability of all species. Impacts would be outside critical reproduction periods for sensitive native species.

Moderate: Breeding animals of concern are present; animals are present during particularly vulnerable life-stages, such as migration or juvenile stages; mortality or interference with activities necessary for survival can be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the unit. Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they could be outside the natural range of variability for short periods of time. Population numbers, population structure, genetic variability, and other demographic factors for species might have short-term changes, but would be expected to rebound to pre-impact numbers and to remain stable and viable in the long term. Frequent responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors affecting short-term population levels. Key ecosystem processes might have short-term disruptions that would be outside natural variation (but would soon return to natural conditions). Sufficient habitat would remain functional to maintain viability of all native species. Some impacts might occur during critical periods of reproduction or in key habitat for sensitive native species.

Major: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be outside the natural range of variability for long periods of time or be permanent. Population numbers, population structure, genetic variability, and other demographic factors for species might have large, short-term declines, with long-term population numbers significantly depressed. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a long-term decrease in population levels. Breeding colonies of native species might relocate to other sections of the park. Key ecosystem processes might be disrupted in the long term or permanently. Loss of habitat might affect the viability of at least some native species.

Impairment: Some of the major impacts described above might be an impairment of park resources if their severity, duration, and timing resulted in the elimination of a native species or significant population declines in a native species. In addition, these adverse, major impacts to park resources and values would

contribute to deterioration of the park's wildlife resources and values to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Within the Jamaica Bay Unit PWC users primarily stay in the navigational channels around Jamaica Bay and access Breezy Point and open waters on the oceanside. Intense wave action prohibits most users from traveling farther into open water. PWC recreationists often race along shore, explore coves, circle around the marsh islands, and occasionally venture into the small channels connecting the marshes. As a result, human activity and noise levels associated with PWC use near these areas are typically high, especially during the summer months and particularly on weekends. Noise levels and the ability of PWC users to rapidly approach landing areas could adversely affect terrestrial wildlife, such as shorebirds and waterfowl, by causing alarm or flight. Effects are expected to be minor because species sensitive to a high level of noise and human activity are not expected to use these areas. If PWC users operate under 5 mph within 100 feet of the shoreline, as required by state regulations, adverse effects associated with rapid approach and noise to wildlife utilizing shoreline habitats would be minimized. In addition, shorebird-nesting areas would remain closed to landing or launching of any vessels, including personal watercraft, as stipulated in the 1999 "Superintendent's Compendium" for the Jamaica Bay Unit.

Noise generated by personal watercraft has the potential to affect birds and wildlife in certain areas, particularly within the marsh islands in Jamaica Bay. Although background noise associated with the surrounding urban environment tends to be greater than that from personal watercraft, noise from motorized watercraft can be a problem in certain areas. When PWC users move toward or between the center islands, the sudden fluctuating noise they cause can disturb the bird and wildlife populations inhabiting these marshes. PWC use in these areas could adversely affect waterfowl or shorebirds by disrupting normal nesting, foraging, or resting activities, causing alarm and flight, and over time potentially resulting in habitat avoidance and displacement. Reactions of various nesting bird species to nearby PWC use indicates alarm or flight responses and in some cases the abandonment of nests. PWC movement between and around central islands and marsh areas can also increase the potential for collisions with wildlife, such as waterfowl and diamondback terrapins. Adherence to state boating laws that restrict PWC and other watercraft speeds to 5 mph within 100 feet of shore would reduce potential adverse effects to wild-

life associated with rapid shoreline approach and noise. Additional restriction of PWC landing or launching in designated shorebird nesting areas would further reduce potential adverse effects to these species.

Bird species must maximize their foraging when certain invertebrate prey species are available. For birds raising offspring or building up fat reserves for migration, being chased from feeding areas can affect their potential for survival, especially when these disturbances continue for several days. For terns, which rest on beaches when not feeding, repeated disturbance could lead to exhaustion, potentially affecting the bird's ability to survive. Burger (1998) examined the behavior of common terns in relation to PWC use and other boats and noted that because PWC users traveled faster and came closer to banks, there was a greater flight response in terns, contributing to lower reproductive success. Studies indicate that shorebird disturbance by PWC use depends on the species. Some species may be disturbed and displaced when PWC users come within 200 to 300 feet of shore. Due to the high level of background noise in the vicinity of the Jamaica Bay Unit, the effects of PWC use at extended distances from shorebird or waterfowl activity are expected to be negligible to minor.

Diamondback terrapins use habitats throughout Jamaica Bay for feeding and nesting and for foraging in shallow tidal creeks and tidal flats. Terrapin activity is predominantly associated with salt marshes and mudflats. Specific sites in the bay where terrapins are regularly observed include Jo Co and Silver Hole Marshes, East High Meadow, and the complex of marsh and tidal flats west of Ruler's Bar Hassock and east of Canarsie Pol-Ruffle Bar in western Jamaica Bay. Ruler's Bar Hassock is used extensively for nesting. Other known terrapin nesting areas include Dubos Point, Floyd Bennett Field, and the community of Broad Channel. High-speed PWC use in areas used by terrapins could directly affect the species as a result of collisions. Foraging, spawning, and nesting activities could also be adversely affected by nearby PWC use. Adverse effects in shallow water areas are expected to be minor due to the potential for damage to PWC engines from operating in waters that are too shallow. Requirements for PWC users to operate under 5 mph within 100 feet of the shoreline would also reduce the potential for adverse effects to the extent that the regulations were observed. Onshore activities associated with PWC use could also adversely affect terrapin nesting activities as a result of disturbance or trampling of nests.

Porpoises and seals can be directly affected by collisions with personal watercraft; however, porpoises are seldom present in Jamaica Bay, and seals are present during the winter, which limits potential for them to be adversely affected. (Indirect impacts caused by noise generated underwater are discussed separately beginning on page 116.)

Essential fish habitat established under the Magnuson-Stevens Fishery Conservation and Management Act is designated for several species in Jamaica Bay. Shallow water species, such as Atlantic herring and several species of flounder, could be disrupted from normal feeding behavior as a result of PWC use in nearshore areas. Continuous PWC use in these areas could adversely affect habitat suitability to meet life-cycle requirements for these fish species, resulting in short- and long-term, moderate, direct and indirect adverse effects.

Short- and long-term, minor to moderate, adverse direct and indirect impacts to wildlife and habitat are expected under alternative A.

Cumulative Impacts. The Jamaica Bay Unit experiences high levels of PWC and other watercraft use between June and August, particularly on weekends. Based on park staff observations, PWC use in the unit has increased steadily over the past decade. Future expected increases in PWC use, combined with probable increases in the use of other types of watercraft, could increase the potential for adverse effects to wildlife and habitat. However, considering existing background conditions, these effects are expected to be minor. Also, species sensitive to noise and human activity are not expected to regularly occur in the high use areas or immediately adjacent habitats during peak periods. Cumulative impacts to wildlife and

habitat are expected to be similar to those discussed above for PWC use alone and would be minor to moderate.

Conclusion. Short- and long-term, minor to moderate, adverse direct and indirect impacts to wildlife and habitat are expected under alternative A. Effects are expected to be minor because species sensitive to a high level of noise and human activity are not expected to regularly use areas frequented by PWC users during peak periods. To the extent that PWC users operate at 5 mph within 100 feet of the shoreline, as required by state regulations, adverse effects associated with rapid approach, noise disturbance to wildlife utilizing shoreline habitats, and the potential for collisions would be minimized. Moderate adverse impacts could be caused by continuous PWC use in nearshore areas, potentially affecting habitat suitability for shallow water fish species. Onshore activities associated with PWC use could also adversely affect wildlife and habitat due to species disturbance or trampling of nests and habitat.

Although background noise associated with the surrounding urban environment tends to be greater than that from personal watercraft, noise from all motorized watercraft could be a problem in certain areas. The intensity of adverse impacts would be minor to moderate. Shorebird nesting areas would remain closed to landing or launching of any vessels, including personal watercraft.

This alternative would not impair wildlife or wildlife habitat.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use restrictions applicable to alternative A would apply under alternative B. In addition, PWC use would be restricted to the navigational channels in Jamaica Bay and Rockaway Inlet; use at Breezy Point and in all other areas would be prohibited. A 150-foot buffer would be established around all protected areas.

In areas remaining open to PWC use, impacts on wildlife and wildlife habitat would be short and long term, minor, and adverse, similar to those discussed under alternative A. Effects are expected to be minor because species sensitive to a high level of noise and human activity would probably not regularly use these areas during summer peak periods. Requirements for PWC users to stay within navigational channels, not to access shoreline habitats, and to operate at less than 5 mph within 100 feet of the shoreline would minimize adverse effects associated with rapid approach, collision, and noise to wildlife utilizing the shoreline and nearshore habitats in the Jamaica Bay Unit.

In areas where PWC use would be banned, including the areas around the islands bordering Winhole Channel, impacts to shorebirds, waterfowl, and other fish and wildlife species using shallow water habitats and the shorelines would be beneficial. Restricting PWC access to large areas of shallow-water habitat in the unit would also enhance the quality of essential fish habitat in these areas, a beneficial impact.

Cumulative Impacts. Cumulative impacts to wildlife and wildlife habitat would be minor to moderate and adverse over the short and long term, similar to those discussed under alternative A, except that PWC-related impacts would be limited to certain navigational channels and adjacent areas. Future increases in PWC use, combined with probable increases in other motorized watercraft uses (which would not be restricted to navigational channels), could increase the potential for adverse effects to wildlife and habitat as a result of noise and possible water quality impacts. However, considering existing background conditions, these effects are expected to be minor; also, species sensitive to noise and human activity are not expected to regularly occur in the high use areas or immediately adjacent habitats during peak

periods. Cumulative impacts to wildlife and habitat would be similar to those discussed under alternative A and would be minor to moderate.

Conclusion. Impacts to wildlife in areas remaining open to PWC use would be minor, adverse, and short and long term because species sensitive to noise and human activity are not expected to regularly occur in these areas during peak periods. Restricting PWC use to existing navigational channels and requiring 150-foot buffers around all protected areas would result in beneficial impacts to wildlife and habitat.

On a cumulative basis impacts to wildlife species would be adverse and minor to moderate over the short and long term, similar to those discussed under alternative A. In areas closed to PWC use (all areas outside of existing navigational channels) impacts would be beneficial; however, impacts associated with use by other motorized watercraft would continue to impact areas throughout the unit. Wildlife in areas closed to PWC use could be adversely affected by uses in the navigational channels as a result of noise and possible water quality impacts; however, considering existing background conditions, these effects are expected to be negligible.

This alternative would not impair wildlife or wildlife habitat.

Impacts of Alternative C — Continue PWC under a Special Regulation Use with Geographic Restrictions

Analysis. PWC use restrictions applicable to alternatives A and B would apply under alternative C. Similar to alternative B, PWC use would be prohibited in all areas of the unit except in the navigational channels of Rockaway Inlet and Jamaica Bay; however, under alternative C use would also be allowed in Winhole Channel.

In areas remaining open to PWC use, impacts on wildlife and wildlife habitat would be minor, short and long term, and adverse, similar to alternatives A and B. Effects would be minor because species sensitive to a high level of noise and human activity are not expected to regularly use these areas during high use periods. Restricting PWC use to navigational channels, prohibiting access to most shoreline habitats, and requiring PWC users to operate at less than 5 mph within 100 feet of the shoreline would minimize adverse effects associated with rapid approach, collision, and noise to wildlife using shoreline and nearshore habitats in the Jamaica Bay Unit.

In areas where PWC use would be banned, impacts to shorebirds, waterfowl, and other fish and wildlife species using shallow water habitats and shorelines would be beneficial. Restricting PWC access to large areas of shallow water habitat in the unit would also enhance the quality of potential essential fish habitat that occurs in these areas, a beneficial impact.

Cumulative Impacts. Cumulative impacts to wildlife and wildlife habitat would be adverse and minor to moderate, similar to those discussed under alternative B, except that PWC-related impacts would include the Winhole Channel and immediately adjacent areas. Future increases in PWC use, combined with probable increases in other motorized watercraft uses throughout the unit, would increase the potential for adverse effects to wildlife and habitat in the unit. However, species sensitive to noise and human activity are not expected to regularly occur in high use areas or immediately adjacent habitats during peak periods. Cumulative impacts to wildlife and habitat would be minor to moderate, similar to those discussed under alternative B.

Conclusion. Impacts to wildlife in areas remaining open to PWC use would be minor and adverse over the short and long term because species sensitive to noise and human activity are not expected to

regularly occur in these areas during high use periods. Restricting PWC use to existing navigational channels and requiring 150-foot buffers around all protected areas would result in beneficial impacts to wildlife and habitat.

On a cumulative basis impacts to wildlife species would be adverse and minor to moderate over the short and long term, similar to those discussed under alternative B, but with possibly more impacts in the eastern end of the bay since Winhole Channel would remain open to PWC use. In areas closed to PWC use, impacts would be beneficial; however, impacts on wildlife as a result of noise and possible water quality impacts associated with other motorized watercraft uses would continue throughout the unit. Considering existing background conditions, these effects are expected to be minor.

This alternative would not impair wildlife or wildlife habitat.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Banning PWC use within the Jamaica Bay Unit would result in beneficial impacts on wildlife and wildlife habitat within the unit. No PWC use within the unit would also be more protective of wildlife in nearshore habitats, because a buffer would be created from PWC use occurring outside NPS boundaries. Restricting PWC access to the unit would also enhance the quality of potential essential fish habitat that may occur in the unit, a beneficial impact.

Cumulative Impacts. Cumulative impacts would be short and long term and minor to moderate, similar to those described under alternative A except there would be no contribution to those impacts from PWC use within the Jamaica Bay Unit. Noise levels and activity associated with all motorized watercraft uses throughout the unit could adversely affect shorebirds and waterfowl by causing alarm or flight responses. Adverse cumulative effects associated with increased future motorized uses are expected to be short and long term and minor to moderate because species sensitive to noise and human activity are not expected to regularly occur in high use areas or immediately adjacent habitats during peak periods.

Conclusion. Eliminating PWC use within the Jamaica Bay Unit would have beneficial impacts on wildlife species and habitat.

Cumulative impacts are expected to be adverse, short and long term, and minor to moderate, similar to alternative A, because other motorized uses would continue.

This alternative would not impair wildlife or wildlife habitat.

AQUATIC FAUNA

BACKGROUND

While the full impact that noise has on marine mammals is not completely understood, the increase in human-made underwater noises could be a serious problem to their survival to the extent that it interferes with their methods of communication and hunting strategy (Coastal Carolina University [CCU] 1998). Noise generated by motorized watercraft can be greater than 100 dB over a range of frequencies (12 Hz – 30 kHz) (CCU 1998), and the hearing range of marine mammals can vary between 20 Hz and 150 kHz (humans have a hearing range between 20 Hz and 20 kHz). The average vocalizations in whales range between 145 and 186 dB.

Aquatic wildlife react to high levels of underwater noise in various ways, depending on the species, exposure period, intensities, and frequencies. PWC motors produce noise levels in the range of 70–102 dB per unit. Because of the way the craft are used, noise is usually produced at various intensities, and this continual change in loudness during normal use makes PWC-caused noise much more disturbing than the constant sounds of conventional motorboats (Bluewater Network 2001; Komanoff and Shaw 2000).

Increases in human-made noise have the potential to cause adverse effects on the survival, communication, and hunting methods of marine mammals. The reactionary response of marine mammals to low-frequency, high-decibel noises varies from species to species. As a general rule, whales will avoid sounds between 110 and 120 dB. At higher frequencies, all species become frantic, their heart rate increases, and in some cases, vocalization ceases (CCU 1998).

Recent studies have found that some mammals have stopped feeding and resting and became overly alert when human noise sources increased. Temporary noise disturbances may alter the swimming path, heart rate, or breathing of marine mammals, while long-term noise disturbances may inhibit mammals from accessing critical feeding, nesting, and mating habitat (Acoustical Society of America 2000).

It is widely known that intense sounds can damage the sensory cells of the ears of mammalian species; for example, 160 dB in air can cause tissue damage to the ears of mammals. The concern is that similar sounds can impair hearing in other wildlife species. One of the few direct studies on the impact of sound on fishes conducted under laboratory conditions (Hastings et al. 1996) found that when fish were subjected to high decibel levels for four hours, some sensory cells of the ears were damaged. This damage does not show up until a few days after exposure, and it is a long-term effect (regeneration did occur after a few days).

Although marine mammals show a diverse behavioral range that can obscure any correlation between a specific behavior and the impact from noise, it is well documented that these species rely on sound for communication, navigation, or detection of predators and prey. Disruption of any of these important functions could interfere with normal activities and behavior (Cornell University n.d.). The impact of intense sound on marine mammals can range from minimal changes in behavior to physiological damage (permanent hearing loss) that may impair their ability to survive.

METHODOLOGY AND ASSUMPTIONS

Data on PWC-related noise effects on various species of marine mammals, reptiles, and fish are limited, and no specific monitoring has been done at the unit to quantify impacts. Therefore, personal observations of park staff were used to determine concerns. These concerns were identified and assessed relative to the number of personal watercraft being used, their proximity during critical seasons of use, and the type of species present in those sensitive areas.

Sound produced in air behaves differently than when produced underwater. The measurement scales for sound in water and in air have a difference of 63 dB between them (Cornell University n.d.). That is, a PWC engine producing 100 dB in air would produce 163 dB underwater.

Sound travels 4.5 times faster in water than it does in air, and low frequency sounds travel farther underwater than high frequency sounds. Noise from recreational watersports range from about 12 Hz to about 30 kHz, and noise from commercial fishing fleets can generate levels from 5 to 500 Hz when sonar equipment is used.

In this assessment the surface noise of two or more personal watercraft operating at the same time (when one unit produces 82 dB), and at a distance of 82 feet from the source, was calculated to be 85 dB (see page 103). Underwater noise from the same source at a distance of 82 feet would be approximately 148 dB. The air and underwater noise calculated for the three study areas, based on PWC average numbers per hour estimated in the "PWC and Visitor Use Trends" section of this report, would be:

Breezy Point	5 PWC / hour = 87 dB in the air and 150 dB underwater
Rockaway Inlet	10 PWC / hour = 90 dB in the air and 153 dB underwater
Jamaica Bay	35 PWC / hour = 95 dB in the air and 158 dB underwater

At 500 feet from PWC users the following noise levels were calculated:**

Breezy Point	5 PWC / hour = 73 dB in the air and 136 dB underwater
Rockaway Inlet	10 PWC / hour = 76 dB in the air and 139 dB underwater
Jamaica Bay	35 PWC / hour = 81 dB in the air and 144 dB underwater

This means that 25 or more personal watercraft operating 500 feet from shore would still produce noise levels that could have harmful effects on aquatic fauna.

IMPACT ANALYSIS AREA

The impact analysis area includes the immediate locations of PWC use and the surrounding nearshore environment where wildlife and wildlife habitat may occur. For purposes of this review, the impact analysis area is the Jamaica Bay Unit, including Jamaica Bay, Rockaway Inlet, and Breezy Point.

IMPACT OF PWC NOISE ON AQUATIC FAUNA

The same impact thresholds as defined for wildlife and wildlife habitat (see page 111) were used for aquatic fauna.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Marine mammals that can be affected by increased noise levels around the Jamaica Bay Unit include dolphins and seals. Kemp's ridley and loggerhead sea turtles have potential to occur in waters around the Jamaica Bay Unit, and diamondback terrapins are abundant in areas of the unit. Most sea turtles occurring in the area are juveniles that populate the area to feed. In addition, more than 80 species of fish can be found in unit waters.

Under alternative A impacts to aquatic fauna are expected to be short and long term, indirect, and minor to moderate. PWC-generated noise could affect the activities of marine reptiles, mammals, and fish in the Jamaica Bay Unit. While these impacts might not cause mortality, they could adversely affect how marine organisms are distributed. There would be a minor to possibly moderate impact from PWC activity in the shallow waters of the unit. Potential future reduction in noise emissions (Sea-Doo 2001b; Yamaha Motor 2001)) could reduce adverse impacts. Long-term effects under this alternative include a potential reduc-

** The equation used was 20 × log (D1/D2), where D1 = the location to be calculated, and D2 = the distance of the known noise source.

tion in species diversity in shallow water habitats and possible limitation of access of fauna through Rockaway Inlet into or out of Jamaica Bay.

Cumulative Impacts. There is a high level of PWC and conventional watercraft use in and around the Jamaica Bay Unit. As a result, human activity and noise levels in the vicinity of the unit are typically high, especially between June and August and particularly on weekends. Future increases in PWC use, combined with probable increases in the use of other types of watercraft, are expected to increase the potential for adverse effects to aquatic fauna in the area. New technologies would contribute to reduced noise emissions from new personal watercraft and other conventional watercraft in the future (Sea-Doo 2001b; Yamaha Motor 2001). However, an overall increase in watercraft using new technology and existing watercraft would minimize the beneficial effects of quieter new craft. Cumulative impacts to aquatic fauna are expected to be similar to those discussed above for PWC use; however, the intensity of adverse impacts is expected to be moderate.

Conclusion. Alternative A would have short- and long-term, indirect, minor to moderate adverse effects on aquatic fauna in the Jamaica Bay Unit.

Cumulative impacts to aquatic fauna would be moderate over the short and long term because of the degree of use.

This alternative would not impair aquatic fauna.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use under alternative B would be restricted to the navigational channels in Jamaica Bay and near Rockaway Inlet and would be banned within NPS waters on the oceanside of Breezy Point. In areas remaining open to PWC use, impacts to aquatic fauna would be short and long term, indirect, and minor, similar to those discussed under alternative A. Restricting PWC access to navigational channels would increase noise impacts within the channels but would not affect as many species in nearshore environments. However, as discussed above, sound travels in water faster and with higher intensities than in air; consequently, personal watercraft operating as much as 500 feet from restricted access boundaries could still have impacts on aquatic fauna within unit boundaries. Long-term reductions in noise emissions as a result of eliminating PWC operation within most of the unit, and as a result of quieter new machines (as forecast by the industry), could reduce adverse impacts to aquatic fauna in nearshore areas.

Cumulative Impacts. Cumulative impacts to aquatic fauna would be similar to those discussed under alternative A. There is a high level of PWC and conventional watercraft use in and around the Jamaica Bay Unit. Future increases in PWC use, combined with probable increases in the use of other types of watercraft, are expected to increase the potential for adverse effects to aquatic fauna in the area. New technologies would contribute to reduced noise emissions from new personal watercraft and other conventional watercraft in the future (Sea-Doo 2001b; Yamaha Motor 2001). However, an overall increase in use of watercraft using new technology and existing watercraft would minimize the beneficial effects of quieter new craft. Cumulative impacts to aquatic fauna are expected to be moderate.

Conclusion. In areas remaining open to PWC use, impacts on aquatic fauna would be short and long term, indirect, and minor, similar to alternative A. Restricting PWC access to navigational channels within unit boundaries and not allowing access in oceanside waters along Breezy Point would have beneficial impacts compared to alternative A.

Cumulative impacts to aquatic fauna would be moderate over the short and long term, similar to alternative A.

This alternative would not impair aquatic fauna.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. PWC use areas under alternative C would also be allowed in Winhole Channel, in addition to the navigational channels that would be open under alternative B. In areas remaining open to PWC use, impacts on aquatic fauna would be short and long term, indirect, minor, and adverse, similar to those discussed for alternative A. Restricting PWC access to navigational channels within unit boundaries and prohibiting access to oceanside waters along Breezy Point would reduce the potential for adverse effects to aquatic fauna in park waters; however, impacts would increase in the Winhole Channel / Broad Channel area compared to alternative B. As discussed above, sound travels in water faster and with higher intensities than in air; consequently, personal watercraft operating as much as 500 feet from restricted access boundaries could still have impacts on aquatic fauna in NPS waters. Long-term noise reductions as a result of eliminating PWC use within most of the unit, and as a result of quieter new machines (Sea-Doo 2001b; Yamaha Motor 2001), could help reduce adverse impacts to aquatic fauna in nearshore areas.

Cumulative Impacts. Cumulative impacts to aquatic fauna would be similar to those discussed under alternative A. There is a high level of PWC and conventional watercraft use in and around the Jamaica Bay Unit. Future increases in PWC use, combined with probable increases in the use of other types of watercraft, are expected to increase the potential for adverse effects to aquatic fauna in the area. New technologies would contribute to reduced noise emissions from new personal watercraft and other conventional watercraft in the future (Sea-Doo 2001b; Yamaha Motor 2001). However, an overall increase in watercraft using new technology and existing watercraft would minimize the beneficial effects of quieter new craft. Cumulative impacts to aquatic fauna are expected to be moderate.

Conclusion. In areas remaining open to PWC use, impacts to aquatic fauna would be short and long term, indirect, and minor. Restricting PWC access within unit boundaries to navigational channels (including Winhole Channel) and prohibiting access to oceanside waters along Breezy Point would reduce the potential for adverse effects to aquatic fauna in park waters compared to alternative A.

Cumulative impacts to aquatic fauna would be moderate over the short and long term, similar to those discussed under alternative A.

This alternative would not impair aquatic fauna.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Beneficial impacts are expected under the no-action alternative as a result of banning PWC use within the Jamaica Bay Unit. PWC use would not contribute to adverse effects on aquatic fauna from motorized watercraft uses.

Cumulative Impacts. Cumulative impacts to aquatic fauna would be similar to those discussed under alternative A. There is a high level of PWC and conventional watercraft use in and around the Jamaica Bay Unit. Future increases in PWC use, combined with probable increases in the use of other types of watercraft, are expected to increase the potential for adverse effects to aquatic fauna in the area. New

technologies would contribute to reduced noise emissions from new personal watercraft and other conventional watercraft in the future (Sea-Doo 2001b; Yamaha Motor 2001). However, an overall increase in use of watercraft using new technology and existing watercraft would minimize the beneficial effects of quieter new craft. Cumulative impacts to aquatic fauna are expected to be moderate.

Conclusion. Banning PWC use within the Jamaica Bay Unit would result in beneficial impacts to aquatic fauna.

Cumulative impacts to aquatic fauna would be minor and adverse over the short and long term, similar to those discussed under alternative A, because of future increases in PWC use in the areas outside the unit, along with increases in other motorized watercraft throughout the unit. However, PWC use within NPS jurisdictional waters would not contribute to those impacts.

This alternative would not impair aquatic fauna.

THREATENED, ENDANGERED, OR SPECIAL CONCERN SPECIES

GUIDING REGULATIONS AND POLICIES

The Endangered Species Act (16 USC 1531 et seq.) mandates that all federal agencies consider the potential effects of their actions on species listed as threatened, endangered, or of special concern. If the National Park Service determines that an action may adversely affect a federally listed species, consultation with the U.S. Fish and Wildlife Service is required to ensure that the action will not jeopardize the species' continued existence or result in the destruction of adverse modification of critical habitat.

Informal consultation was initiated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service during the internal scoping period for this project. A list of species that are known to occur or may occur within or adjacent to PWC use areas within the boundaries of the Jamaica Bay Unit was requested. Responses from the National Marine Fisheries Service are included in appendix B. A response from the U.S. Fish and Wildlife Service had not been received at the time of publication.

Potential impacts to each listed species within the Jamaica Bay Unit is included in this section. The environmental assessment will be submitted to the U.S. Fish and Wildlife Service and National Marine Fisheries Service for review. If no impact on listed species is expected, and the other federal agencies concur, no further consultation would be required.

Formal consultation would be initiated if the National Park Service determined that actions associated with the preferred alternative are likely to adversely affect one or more of the federally listed threatened or endangered species identified at the Jamaica Bay Unit. At that point a biological assessment would be prepared to document the potential effects. From the date that formal consultation was initiated, the U.S. Fish and Wildlife Service or National Marine Fisheries Service would be allowed 90 days to consult with the agency and 45 days to prepare a biological opinion based on the biological assessment and other scientific sources. The U.S. Fish and Wildlife Service or National Marine Fisheries Service would state its opinion as to whether the proposed PWC activities would be likely to jeopardize the continued existence of the listed species or result in the destruction or adverse modification of critical habitat. Such an opinion would be the same as a determination of impairment. To ensure that a species would not be jeopardized by PWC activities, the National Park Service would confer with the U.S. Fish and Wildlife Service or National Marine Fisheries Service to identify recommendations for reducing adverse effects and would integrate those into the preferred alternative.

The NPS *Management Policies 2001* state that the potential effects of agency actions will also be considered on state or locally listed species. The National Park Service is required to control access to critical habitat of such species, and to perpetuate the natural distribution and abundance of these species and the ecosystems upon which they depend.

Species at the Jamaica Bay Unit that could be affected by proposed PWC management alternatives would most likely include transients or migrants. Studies conducted on piping plovers indicate that flushing distances vary widely (USFWS 2000b). No specific monitoring data are available at the park to quantify impacts; therefore, personal observations of NPS staff were used to determine areas of concern (nesting areas, critical habitat, etc.). These areas were identified, and impacts were assessed relative to the number and proximity of PWC users potentially traveling during critical seasons and by the type of species present in those sensitive areas (state, federally listed, species of concern, etc.).

METHODOLOGIES AND ASSUMPTIONS

State and federally listed species were identified through discussions with park staff and informal consultation with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the New York Natural Heritage Program (see appendix B).

Primary steps in assessing impacts to listed species were to determine (1) which species are found in areas likely to be affected by PWC management actions described in the alternatives, (2) current and future PWC use and distribution, (3) habitat loss or alteration caused by the alternatives, and (4) displacement and disturbance potential of the actions and the species' potential to be affected by PWC activities. The information contained in this analysis was obtained through best professional judgment of park staff and experts in the field (as cited in the text), and by conducting literature review.

Documentation of the occurrence and locations of federal and state rare, threatened, and endangered species at the Jamaica Bay Unit was provided by the National Park Service through several park studies and surveys. The potential for adverse effects was based on the locations of sensitive species with respect to PWC use and the potential for such use to affect the species. All known federally listed species that occur at the Jamaica Bay Unit are discussed in the analysis. Only state listed species that are documented to occur in the vicinity of the PWC use areas, or that have potential to be affected by PWC use, are discussed in the analysis.

Federally endangered wildlife species documented in the Jamaica Bay Unit include the roseate tern and Kemp's ridley sea turtle. The federally threatened piping plover and loggerhead sea turtle also occur in or near PWC use areas. In addition, the endangered leatherback sea turtle occurs in the waters of New York and New Jersey. State-listed threatened or endangered wildlife species include the state endangered roseate tern and piping plover and the state threatened common tern, least tern, and northern harrier. The state endangered peregrine falcon nests on the Marine Park Bridge, which is outside of the Jamaica Bay Unit, but peregrine falcons utilize the area (D. Riepe, NPS, pers. comm., June 27, 2002). Two state species of special concern — the black skimmer and the osprey — also occur within the unit.

Federally protected whales that occur seasonally off the coast of New York and New Jersey include the endangered northern right whale, humpback whale, and fin whale (see appendix B).

IMPACT ANALYSIS AREA

The impact analysis area includes the immediate locations of PWC use and the surrounding nearshore environment where wildlife and wildlife habitat may occur. For purposes of this review, the impact analysis area is the Jamaica Bay Unit, including Jamaica Bay, Rockaway Inlet, and Breezy Point.

IMPACT OF PWC USE ON SUCH SPECIES

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

> *No effect:* A proposed action would not affect a listed species or designated critical habitat.
>
> *May affect / not likely to adversely affect:* Effects on special status species would be discountable (i.e., extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated) or completely beneficial.
>
> *May affect / likely to adversely affect:* When an adverse effect to a listed species might occur as a direct or indirect result of proposed actions and the effect would either not be discountable or completely beneficial.
>
> *Is likely to jeopardize proposed species / adversely modify proposed critical habitat (impairment):* The appropriate conclusion when the National Park Service, U.S. Fish and Wildlife Service, or the National Marine Fisheries Service identifies situations where PWC use could jeopardize the continued existence of a proposed species or adversely modify critical habitat to a species within and/or outside park boundaries.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Under alternative A all areas of the Jamaica Bay Unit would remain open to PWC use, which is expected to increase slightly over the future (see "PWC and Visitor Use Trends," page 74).

Observations indicate that shorebirds, including piping plovers and various terns, can show disturbance behavior and may be displaced when PWC users come within 200 to 300 feet. Noise associated with PWC use near Breezy Point and Riis Park can affect sensitive shorebird species by causing alarm or flight, in some cases causing them to abandon nests. PWC use in nearshore areas can also disturb species foraging for bait fish and other food in nearshore habitats. Birds must maximize their foraging when certain invertebrate or other prey species are available. For birds raising offspring or building up fat reserves for migration, being chased from feeding areas can affect their potential for survival, especially when these disturbances continue over several days. Background noise related to human activity, vehicular traffic, other watercraft, and aircraft in the Jamaica Bay Unit is high. Beach and watercraft activity is particularly high between June and August, especially on weekends. Because background noise is already relatively high, there would be less potential for PWC use to cause specific noise-related impacts to sensitive shorebirds. In addition, state regulations that require personal watercraft to operate at 5 mph within 100 feet of the shoreline would help minimize the potential for adverse effects to shorebirds. Despite speed restrictions, some PWC users do operate at rapid speeds within 100 feet of the shoreline. Shore landings within restricted areas also occur to change operators or make repairs, or for other purposes. Access to shorelines during nesting periods has the potential to disturb nesting birds and can potentially result in nest abandonment.

Piping plovers and roseate terns occur at Breezy Point and Jacob Riis Park within the Jamaica Bay Unit. Areas where shorebird nesting occurs are closed to the landing or launching of motorized watercraft

(including personal watercraft). However, PWC users do access nearshore areas in the Breezy Point area adjacent to where piping plovers and other sensitive species nest, forage, and rest.

Common terns, least terns, and black skimmers nest at Breezy Point and forage in the ocean and backbay areas of the unit and use beach areas for resting. Impacts similar to those discussed for piping plovers and roseate terns are expected to affect these species in the Jamaica Bay Unit.

Alternative A may affect but is not likely to adversely affect the piping plover, the roseate tern, and other sensitive avian species that utilize the Jamaica Bay Unit because these species have likely habituated to persistent background noise, because access to shorelines by PWC users is limited, and because low speed limits are required within 100 feet of the shoreline (not always observed).

The state endangered peregrine falcon and the state threatened northern harrier nest in areas that are not likely to be adversely affected by PWC use in the Jamaica Bay Unit. Both species utilize the unit for foraging. PWC use could adversely affect nearby foraging activities. These species may be affected but are not likely to be adversely affected because the birds would still likely forage around wetland and island habitats where PWC use would be limited.

In 2002 ospreys, a state species of special concern, nested at seven locations within the unit. PWC use in Jamaica Bay could affect ospreys by causing alarm and flight, especially in areas close to nest sites. PWC use could also disturb ospreys in areas where the birds forage for fish. Ospreys show a wide range in their tolerance of human disturbance. Predictable disturbance, or disturbance that is ongoing when nesting is initiated, is better tolerated than sporadic disturbance or new disturbance which occurs after nesting has begun (USFWS 2000a). The Jamaica Bay Unit, in areas accessed by personal watercraft, is an area where background noise related to human activity, vehicular traffic, other watercraft, and aircraft has been and continues to be high. Ospreys that utilize these areas for nesting and foraging have likely habituated to the high background noise levels. While this species may be affected, it is not likely to be adversely affected.

PWC use could affect federally listed sea turtles documented to occur in the area as a result of collisions. However, direct impacts are unlikely because turtles would likely avoid areas where high PWC use occurs due to related underwater noise and disturbance. However, Kemp's ridley sea turtles are reported to occasionally access Jamaica Bay for foraging and could potentially be adversely affected as a result of rapid PWC movements in lower use areas. The species is not expected to be adversely affected.

Federally protected whales, including the endangered northern right whale, humpback whale, and fin whale, are not expected to be affected by PWC use in the Jamaica Bay Unit.

The sea beach amaranth occurs at Breezy Point (D. Riepe, NPS, pers. comm., June 27, 2002). Because of the relative minor degree of disturbance caused by foot traffic and the minor extent of ground covered, it is unlikely, except for infrequent cases, that overland traffic associated with PWC landing areas would impact the seabeach amaranth. Foot traffic on lower sections of the beach, where most PWC-associated overland traffic would occur, is not likely to affect the plant. However, where users went to higher beach and dune areas, the plant could be stepped on and destroyed. PWC-related foot traffic is not expected to be detrimental to the persistence of the seabeach amaranth. The state threatened dune sandspur and hop sedge, which occur in coastal sands, sand dunes, and dune swales, could also be affected by foot traffic if they occur in areas where PWC access the shore, but these species are not expected to be adversely affected.

The state threatened red pigweed and the state endangered globose flatsedge, narrow-leaf sea blite, and Roland's sea blite occur in association with salt marsh habitats and could occur in the Jamaica Bay Unit. PWC use is not likely to adversely affect these species because salt marshes are closed to PWC access.

In summary, alternative A may affect but is not likely to adversely affect federally or state listed threatened or endangered species in the Jamaica Bay Unit.

Cumulative Impacts. The unit experiences high levels of PWC and other watercraft use between June and August, particularly on summer weekends, and motorized uses, including PWC use, are expected to increase. Cumulative impacts to threatened or endangered species listed by the federal or state government would be similar to those discussed above for PWC use; however, the potential for adverse impacts would be higher because of increased motorized watercraft use. Species could be affected but are not likely to be adversely affected.

Conclusion. Alternative A may affect but is not likely to adversely affect the piping plover, roseate tern, or other state listed avian species that use the Jamaica Bay Unit. Access by PWC users to nesting and foraging areas could disturb sensitive species using these areas. Background noise associated with the unit is expected to reduce the potential for PWC noise-related impacts to sensitive shorebirds. In addition, state regulations requiring speed limits of 5 mph within 100 feet of the shoreline would help minimize the potential for adverse effects caused by rapid approaches to the shore. Sea turtles are not likely to be adversely affected because they would likely avoid high use areas due to noise and activity; however, where PWC users rapidly access areas where sea turtles do occur, collisions could result.

Cumulative impacts to federal and state listed threatened or endangered species would be similar to those discussed for PWC use alone; however, the potential for adverse impacts would be higher because motorized uses would continue throughout the bay. Threatened or endangered species may be affected but are not likely to be adversely affected.

This alternative would not impair any threatened, endangered, or sensitive species.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Under alternative B, PWC use would be restricted to the navigational channels within Rockaway Inlet and Jamaica Bay.

Alternative B may affect but is not likely to adversely affect federal or state threatened or endangered species in the Jamaica Bay Unit. Closing waters adjacent to Breezy Point would eliminate the potential for PWC-related adverse effects to species foraging in nearshore ocean habitats or resting or foraging along the shoreline. Similar to alternative A, PWC use in the navigational channels remaining open to such use may affect federal or state listed species in these areas, but the species are not likely to be adversely affected. Effects would be minor because species sensitive to a high level of noise and human activity would likely not use these areas during high use periods. Requiring PWC users to operate only in navigational channels, and establishing a 150-foot buffer around all protected areas in Jamaica Bay (thereby restricting access to most shoreline habitats), would minimize adverse effects to sensitive species associated with rapid approaches, collisions, and noise.

Cumulative Impacts. Cumulative impacts to federal and state listed threatened or endangered species would be similar to those discussed under alternative A, except that PWC-related impacts would be limited to navigational channels open to PWC users and immediately adjacent areas. Future increases in motorized watercraft use throughout the unit, as well as PWC use outside NPS jurisdictional waters, would raise the potential for adverse effects to threatened or endangered species. Sensitive species may be affected but are not likely to be adversely affected.

Conclusion. PWC use under alternative B may affect but is not likely to adversely affect federal or state threatened or endangered species in the Jamaica Bay Unit. Impacts could occur where species access or forage in channel areas remaining open to PWC use and would be similar to those discussed under alternative A. Closing waters adjacent to Breezy Point would eliminate the potential for PWC-related adverse effects to species foraging in nearshore ocean habitats or resting or foraging along the shoreline.

On a cumulative basis, threatened or endangered species may be affected but are not likely to be adversely affected under this alternative, similar to alternative A. The potential for adverse effects would be slightly less than under alternative A because of restricting PWC use to navigational channels within the bay, but other motorized watercraft uses would continue throughout the bay.

This alternative would not impair any threatened, endangered, or sensitive species.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. PWC use restrictions under alternative C would be similar to those under alternative B, except personal watercraft would be allowed in Winhole Channel. Effects would be similar to those discussed under alternative B. Impacts to federal or state listed species could occur, similar to those discussed under alternative A, where species access or forage in channel areas remaining open to PWC use. Allowing use in Winhole Channel under alternative C could increase the potential for impacts in comparison to alternative B. Alternative C may affect but is not likely to adversely affect federal or state threatened or endangered species in the Jamaica Bay Unit.

Cumulative Impacts. Cumulative impacts to federal or state threatened or endangered species would be similar to those discussed under alternative A, except that PWC-related impacts would be limited to the navigational channels and immediately adjacent areas. Future increases in motorized watercraft uses throughout the unit, along with PWC use outside NPS jurisdictional waters, could increase the potential for adverse effects to sensitive species. Cumulative impacts to threatened or endangered species would be similar to alternative B, except Winhole Channel would remain open to PWC use, in addition to other motorized watercraft.

Conclusion. PWC use may affect but is not likely to adversely affect federal or state threatened or endangered species in the Jamaica Bay Unit. Impacts would be similar to those discussed under alternative A, where species access or forage in channel areas remaining open to PWC use.

Cumulative impacts to threatened or endangered species would be similar to those discussed under alternative A; however, the potential for adverse effects would be higher than under alternative B because Winhole Channel would remain open to PWC use.

This alternative would not impair any threatened, endangered, or sensitive species.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Banning PWC use within the Jamaica Bay Unit would have no adverse effect on threatened or endangered species. Eliminating PWC use in the unit would also buffer terrestrial and nearshore wildlife and habitats from the adverse effects of PWC use occurring beyond NPS boundaries. Prohibiting PWC access in marine habitats in the Jamaica Bay Unit would enhance habitat quality for sea turtles that may occur in the area.

Cumulative Impacts. Cumulative impacts may affect but are not likely to adversely affect threatened or endangered species, similar to alternative A, except there would be no contribution to impacts from PWC use within NPS jurisdictional waters in Jamaica Bay.

Conclusion. Eliminating PWC use within the Jamaica Bay Unit would have no adverse effect on threatened or endangered species. Restricting PWC access from marine habitats in the unit would also enhance habitat quality for sea turtles that may occur in the unit.

Cumulative impacts would be similar to those discussed under alternative A, because other motorized watercraft use would continue; however, there would be no contribution to impacts from PWC use.

This alternative would not impair any threatened, endangered, or sensitive species.

SHORELINE VEGETATION AND WETLAND HABITATS

METHODOLOGY AND ASSUMPTIONS

Personal watercraft have the potential to impact shoreline vegetation and wetland habitats as a result of operating in shallow waters or adjacent to wetland or marsh habitats. Direct impacts resulting from collision or mechanical removal can occur. Potential indirect impacts include the deposition of suspended sediments on aquatic or submerged aquatic vegetation or modification of substrates. Impacts to shoreline vegetation associated with foot traffic adjacent to landing areas could also occur.

Primary steps in assessing impacts to shoreline vegetation were to determine

- the occurrence and location of vegetation in areas likely to be affected by the alternatives
- current and future PWC use and distribution
- habitat impact or alteration caused by PWC use under each alternative
- potential for PWC activities to affect shoreline vegetation

The information contained in this analysis was obtained through best professional judgment of park staff and experts in the field, and by conducting literature reviews.

IMPACT ANALYSIS AREA

The impact analysis area includes the immediate locations of PWC use and the surrounding nearshore environment where shoreline vegetation may occur. For purposes of this review, the impact analysis area is the Jamaica Bay Unit, including Jamaica Bay, Rockaway Inlet, and Breezy Point.

IMPACTS ON SHORELINE VEGETATION AND WETLAND HABITATS FROM PWC USE

The following thresholds were used to determine the magnitude of effects on shoreline vegetation and wetland habitats:

> *Negligible:* No shoreline vegetation or wetland habitats are present in areas likely to be accessed by personal watercraft; no impacts or impacts with only temporary effects are expected.

Minor: Shoreline vegetation or wetland habitats are present, but only in low extent. Occasional impacts to species or communities are expected, but with no impacts or limited impacts on the continued existence of the species or viable, functioning communities within the unit.

Moderate: Shoreline vegetation or wetland habitats are present in areas accessible by personal watercraft. Direct loss of vegetation or other effects are expected on an occasional basis, but are not expected to threaten the continued existence of the species or the viable, functioning of communities in the unit.

Major: Shoreline vegetation or wetland habitats are present in relatively high extent in areas accessible by personal watercraft. Direct loss of vegetation or other effects are expected on a regular basis and could threaten the continued survival of species or communities of species in the park.

Impairment: PWC use would contribute substantially to the deterioration of the shoreline or wetland habitats to the extent that the park's shoreline would no longer function as a natural system. In addition, these adverse major impacts to park resources and values would

contribute to deterioration of these resources to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use under alternative A would continue in all waters within the Jamaica Bay Unit in the short and long term, and all state and NPS regulatory requirements would apply. Direct impacts from PWC use to shoreline vegetation could occur around landing areas as a result of trampling by foot traffic. Also, direct impacts to wetland vegetation and habitat could occur in areas where PWC users access shallow water marsh habitats. Minor, direct impacts to wetland vegetation and habitats could occur as a result of collision or mechanical removal. Indirect impacts resulting from the modification of substrates (i.e., scouring) associated with PWC operation in shallow water habitats could also occur. However, PWC access to wetland habitats is restricted, and PWC users tend to avoid shallow water areas to prevent damage to their craft. Adverse effects are expected to be minor over the short and long term due to limited use of PWC in shallow wetland habitats.

Cumulative Impacts. Adverse direct and indirect cumulative effects associated with future increased use by motorized watercraft, including personal watercraft, would be minor to moderate around landing areas and in wetland habitats over the short and long term. No other actions or programs have been identified that would affect shoreline vegetation.

Conclusion. Minor, direct and indirect, adverse impacts could occur over the short and long term to shoreline vegetation from PWC-related foot traffic in accessible shoreline areas. Impacts to wetland habitats would be short and long term and minor to moderate because of low levels of PWC use and limited access to shallow water areas.

Minor to moderate, direct and indirect, adverse cumulative effects to shoreline vegetation and wetland habitats are expected over the short and long term. Impacts would result from continued foot traffic around landing areas and from limited access by boaters to shallow water habitats.

This alternative would not impair shoreline vegetation or wetland habitats.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Impacts to shoreline vegetation and wetland habitats from PWC use under alternative B would be negligible because operators would be restricted to navigational channels, and wave energy from PWC use would dissipate before the waves reached the shore. Potential impacts would be further reduced as a result of prohibiting landing and launching along shorelines and establishing 150-foot buffers around protected areas. Not allowing PWC use in the Winhole Channel would result in beneficial impacts because the possibility of disturbing adjacent shorelines and wetland vegetation would be eliminated.

Cumulative Impacts. Minor adverse direct and indirect cumulative effects associated with increased future use by both PWC and other watercraft are expected, similar to alternative A. Although PWC use would be restricted to navigational channels, other watercraft could access shallow water areas outside the channels, potentially resulting in impacts to wetland and shoreline vegetation and habitats.

Conclusion. Impacts to shoreline vegetation and wetland habitats from PWC use would be negligible over the short and long term under alternative B as a result of restricting use to navigational channels, prohibiting shoreline access, and establishing buffers around protected areas.

Minor, adverse, direct and indirect, cumulative effects are expected, similar to those discussed under alternative A. Even though PWC use would be restricted to navigational channels, other watercraft could access shallow water areas outside of the channels, potentially resulting in short- and long-term impacts to shoreline vegetation and wetland habitats.

This alternative would not impair shoreline vegetation or wetland habitats.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. Impacts to shoreline vegetation and wetland habitats under alternative C would be negligible as a result of restricting PWC use to navigational channels, although allowing PWC use in the Winhole Channel would slightly increase the potential for impacts in adjacent areas. As described under alternative B, wave energy from PWC use should dissipate before the waves reached the shore. Potential impacts would be further reduced as a result of prohibiting landing and launching along shorelines, and establishing 150-foot buffers around protected areas.

Cumulative Impacts. Minor, adverse, direct and indirect, cumulative effects associated with increased future use by both personal watercraft and other motorized watercraft are expected, similar to alternative A. Although PWC use would be restricted to navigational channels, other watercraft could access shallow water areas outside of the channels, potentially resulting in impacts to wetland and shoreline vegetation and habitats.

Conclusion. Impacts to shoreline vegetation and wetland habitats would be negligible over the short and long term under alternative C as a result of restricting PWC use to navigational channels (including Winhole Channel), restricting shoreline access, and establishing buffers around protected areas.

Minor adverse direct and indirect cumulative effects similar to those discussed under alternative A are expected. Although PWC use would be restricted to navigational channels, other motorized watercraft could access shallow water areas outside the channels, potentially resulting in short- and long-term impacts to shoreline vegetation and wetland habitats.

This alternative would not impair shoreline vegetation or wetland habitats.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Discontinuing all PWC use in the Jamaica Bay Unit under the no-action alternative would have beneficial impacts on shoreline vegetation and wetland habitats. Precluding PWC use would eliminate the potential for PWC users to access shallow water habitats in the unit and would eliminate the potential for PWC-generated waves to affect shoreline vegetation.

Cumulative Impacts. Closing the Jamaica Bay Unit to PWC use would eliminate any resultant impacts to shoreline vegetation and wetlands. However, the continued use of all other motorized watercraft use throughout the unit would likely increase, resulting in short- and long-term, minor, adverse impacts. These impacts would reduce the beneficial effects of prohibiting PWC use.

Conclusion. Effects to shoreline vegetation and wetland habitats as a result of closing the Jamaica Bay Unit to PWC use would be beneficial.

On a cumulative basis, impacts would be minor and adverse over the short and long term because other motorized watercraft users would continue to have access to shallow water areas and to shoreline habitats. PWC use would no longer contribute to any shoreline impacts within the unit.

This alternative would not impair shoreline vegetation or wetland habitats.

VISITOR USE AND EXPERIENCE

GUIDING REGULATIONS AND POLICIES

The NPS *Management Policies 2001* state that the enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks and that the National Park Service is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks. Because many forms of recreation do not require a national park setting, the National Park Service will therefore seek to

- provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in particular units
- defer to local, state, and other federal agencies, private industry, and nongovernmental organizations to meet the broader spectrum of recreational needs and demands that are not dependent on a national park setting

Unless mandated by statute, the National Park Service will not allow visitors to conduct activities that would

- impair park resources or values
- create an unsafe or unhealthful environment for other visitors or employees

- be contrary to the purposes for which the park was established
- unreasonably interfere with the atmosphere of peace and tranquility, or the natural soundscape maintained in wilderness and natural, historic, or commemorative locations within the park; NPS interpretive, visitor service, administrative, or other activities; NPS concessioner or contractor operations or services; or other existing, appropriate park uses

Part of the purpose of the Jamaica Bay Unit is to offer opportunities for public access, use, and enjoyment. Jamaica Bay is a diverse barrier island ecosystem and is comprised of relatively unspoiled and undeveloped beaches, dunes, and other natural features. One of the park's mission goals is to ensure "visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities." To achieve this, the following long-term visitor goal is identified in the park's *Strategic Plan:*

> *Visitor Satisfaction* — By September 30, 2005, 88% of visitors to Gateway National Recreation Area are satisfied with appropriate park facilities, services, and recreational opportunities.

METHODOLOGIES AND ASSUMPTIONS

The purpose of this impact analysis is to determine if the use of personal watercraft at the Jamaica Bay Unit is compatible or in conflict with the purposes of the park, its visitor experience goals, and the direction provided by the NPS *Management Policies*. Thus, these policies and goals were integrated into the impact thresholds.

To determine impacts, the current level of PWC use was calculated at locations throughout the unit where PWC use is known to occur. Other recreational activities and the type of visitor experiences that are proposed in these locations were also identified. Visitor surveys (if available) and staff observations were also evaluated to determine visitor attitudes and satisfaction in areas where personal watercraft are encountered.

Data suggest that the vast majority of visitors are satisfied with their current experiences. The potential for change in visitor experiences was evaluated by identifying projected increases or decreases in both PWC and other visitor uses, and by determining whether these projected changes would affect the desired visitor experience and result in greater safety concerns or additional user conflicts.

IMPACT ANALYSIS AREA

The impact analysis area for visitor experience impacts includes the locations related to PWC operation and the distance that PWC-related noise travels, so the area of analysis extends 0.75 mile onshore. Personal watercraft are allowed to operate in all waters of Jamaica Bay Unit.

IMPACT OF PWC USE ON VISITOR EXPERIENCE GOALS

The following thresholds were defined:

> *Negligible:* Visitors would not likely be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources.
>
> *Minor:* Visitors would likely be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources; however the changes in visitor uses and experience would

be slight and likely short term. Other areas in the park would remain available for similar visitor experiences and uses without derogation of park resources and values.

Moderate: Visitors would be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources. Changes in visitor uses and experiences would be readily apparent and likely long term. Other areas in the park would remain available for similar visitor experiences and uses without derogation of park resources and values, but visitor satisfaction could be measurably affected (either beneficially or adversely). Some visitors who desire to continue their use and enjoyment of the activity/visitor experience would be required to pursue their choices in other available local or regional areas.

Major: Visitors would be highly aware of the effects associated with changes proposed for visitor use and enjoyment of park resources. Changes in visitor uses and experiences would be readily apparent and long term. The proposed change in visitor use and experience would preclude future generations of some visitors to enjoy park resources and values. Some visitors who desire to continue their use and enjoyment of the activity/visitor experience would be required to pursue their choice in other available local or regional areas.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. *Impacts on PWC Users* — PWC users under alternative A would notice little or no change in their experiences or satisfaction since access to the park and PWC activity inside the unit boundary would remain unchanged. PWC users would experience negligible adverse impacts.

Impacts on Other Boaters — Other boaters in the Jamaica Bay Unit would continue to interact with PWC operators in the same manner as they do now. Alternative A would have little effect on the visitor experience of other boaters, compared to existing conditions.

Impacts on Other Visitors — Visitors are dispersed throughout the Jamaica Bay Unit. The number of PWC users in this unit is expected to increase from 50 in 2002 to 52 in 2012, distributed as follows: 35 in Jamaica Bay, increasing to 37 by 2012; 10 in Rockaway Inlet (no projected increase), and 5 at Breezy Point (no projected increase). Increased PWC activity would not be noticeable when compared to existing conditions. PWC use would continue to cause conflicts with anglers. Based on this analysis, PWC activity under alternative A would have a negligible to minor adverse impact on the experiences of swimmers, hikers, anglers, and other unit visitors, depending on seasonal variations in use. Effects to park visitors during the off-season or non-peak hours (weekdays) would be negligible because of minimal PWC use.

Cumulative Impacts. The location and number of other motorized watercraft users in the unit and their proximity to other visitors could affect visitor experiences; however, no changes to other park visitor activities are expected under this alternative. The proposed expansion of the visitor contact station in the Jamaica Bay Wildlife Refuge would enhance the visitor experience at that location, but no other actions are known that would affect visitor experiences within the park. Cumulative impacts to the experiences of PWC users, other boaters, and visitors would be negligible, since there would be little noticeable change from existing conditions. Most visitors would continue to be satisfied with their experiences in the Jamaica Bay Unit.

Conclusion. Continued PWC use in the Jamaica Bay Unit would result in negligible to moderate adverse impacts on visitor experiences, depending on the location and seasonal variations in visitor activities. There would be a moderate adverse impact on the experiences of birdwatchers and anglers during the peak summer months. Alternative A would partially meet the park's strategic goal for improved visitor satisfaction by continuing to allow for unrestricted PWC use.

Cumulative impacts related to all other motorized watercraft users and other visitors would result in negligible impacts, since there would be little noticeable change. Most visitors would continue to be satisfied with their experiences in the Jamaica Bay Unit.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. *Impacts on PWC Users* — Although PWC users would be restricted to the navigational channels within Jamaica Bay and Rockaway Inlet, they would continue to have access to other areas outside NPS jurisdictional waters. Closing Winhole Channel to use would prevent PWC users from traveling in a circle around the bay and could frustrate some individuals. There would be a negligible adverse impact to PWC users as a consequence of the 150-foot buffer zone around protected areas. Closing ocean waters off Breezy Point and interior areas of Jamaica Bay to use would have negligible to moderate adverse impacts on PWC users.

Impacts on Other Boaters — Other boaters in the Jamaica Bay Unit would continue to interact with PWC users within the navigational channels of Jamaica Bay and Rockaway Inlet. It is assumed that the same number of PWC users would be present but they would be concentrated in smaller areas, and congestion among PWC users is expected to increase, along with the potential for adverse effects on other boaters. Alternative B would have minor to moderate adverse effects on the visitor experiences of other boaters now and in the future.

Impacts on Other Visitors — Other visitors to the Jamaica Bay Unit would continue to interact with PWC operators, but on a limited basis. Potential interactions with other visitors, specifically birdwatchers and swimmers, would only occur when PWC users accessed the channels and basins around Jamaica Bay, with negligible adverse effects. Effects on park visitors during the off-season or non-peak hours (weekdays) would continue to be negligible. Visitors to the Jamaica Bay Unit for land-based activities would experience beneficial impacts with the removal of personal watercraft from nearshore habitats.

Cumulative Impacts. Cumulative impacts to visitor experiences in the Jamaica Bay Unit would be negligible, similar to alternative A. The proximity of other boaters to non-boating visitors would continue to affect visitor experiences; interactions between boaters and PWC users would largely be restricted to navigational channels. Cumulative impacts to overall visitor experiences would be beneficial as a result restricting PWC use areas. Most visitors would continue to be satisfied with their experiences in the Jamaica Bay Unit.

Conclusion. Restricting PWC use to navigational channels within the bay (except for Winhole Channel), and closing ocean waters off Breezy Point to PWC use would have negligible to moderate adverse impacts on PWC recreationists. There would be a minor to moderate impact on other boaters to the unit as congestion would increase in the navigational channels. For other visitors PWC use restrictions would result in beneficial impacts to their experiences, depending on the location and seasonal variations in activities, as described for alternative A. Alternative B would partially meet the park's strategic goal for improved visitor satisfaction for boaters and other visitors by restricting PWC use to certain navigational channels.

Cumulative effects would be negligible, similar to alternative A. Most visitors would continue to be satisfied with their experiences at the unit.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. *Impacts on PWC Users* — Although PWC use would be restricted to the navigational channels within Jamaica Bay and Rockaway Inlet, access to other areas outside NPS jurisdictional waters would continue, similar to alternative B. Keeping Winhole Channel open to PWC use would allow recreationists to travel around the bay without having to stop and backtrack; this would potentially enhance their experiences. There would be a negligible adverse impact to PWC users as a consequence of the 150-foot buffer zone around protected areas. Under this alternative PWC users would experience negligible to moderate adverse impacts with the closure of Breezy Point to personal watercraft and the lack of access to interior areas of Jamaica Bay other than the navigational channels.

Impacts on Other Boaters — Other boaters in the Jamaica Bay Unit would continue to interact with PWC users within the navigational channels (including Winhole Channel) and Rockaway Inlet. PWC use within park boundaries would be concentrated within the navigational channels; when that use was added to other motorized boating uses, congestion could increase, although not as much as in alternative B because Winhole Channel would remain open to PWC use. This would increase the potential for adverse effects on other boaters, with minor to moderate adverse effects on their experiences.

Impacts on Other Visitors — Other visitors to the Jamaica Bay Unit would continue to interact with PWC operators, but on a limited basis. Potential interactions would only occur between PWC users obtaining access to the channels and basins around the bay. Visitors to the Jamaica Bay Unit for land-based activities would experience beneficial impacts with the removal of personal watercraft from nearshore habitats. The effects to park visitors would continue to be negligible during the off-season or non-peak hours (weekdays).

Cumulative Impacts. Cumulative impacts would be negligible, similar to those described for alternative A. The location and number of other boaters and their proximity to other visitors would affect visitor experiences. Motorized boats would continue to be present throughout the unit. The potential for PWC use to affect visitors participating in land-based activities would be removed from the areas described above, a beneficial impact. There would be minor to moderate impacts on other boaters as congestion would increase in the navigational channels. Most visitors would continue to be satisfied with their experience in the Jamaica Bay Unit.

Conclusion. Restricting PWC use to navigational channels within the bay and closing ocean waters off Breezy Point to PWC use would have negligible to moderate adverse impacts on PWC users. Keeping Winhole Channel open to PWC use would allow recreationists to travel around the bay, potentially enhancing their experiences. Restricting PWC use to certain areas would result in beneficial impacts for visitors enjoying land-based activities, depending on the location and seasonal variations in visitor use. There would be minor to moderate impacts on other boaters in the unit as congestion would increase in the navigational channels. Alternative C would partially meet the park's strategic goal for improved visitor satisfaction (in the case of non-boating visitors) by restricting PWC use to specific areas of the unit away from nearshore environments.

Cumulative impacts would be negligible, similar to alternative A. Most visitors would continue to be satisfied with their experiences at the unit.

Impacts of the No-Action Alternative — No PWC Use

Analysis. *Impacts on PWC Users* — PWC users would no longer have access to any areas within NPS jurisdictional waters. Under this alternative PWC users living around Jamaica Bay would have to trailer their watercraft to other private/public boat launches. PWC users would experience moderate to major adverse impacts.

Impacts on Other Boaters — Other boaters in the Jamaica Bay Unit would experience beneficial impacts with the removal of personal watercraft from the unit. Congestion within the navigational channels would be reduced and the potential for conflict reduced.

Impacts on Other Visitors — Other visitors to the unit would experience beneficial impacts as a result of banning PWC use within the unit.

Cumulative Impacts. Adverse cumulative impacts within the park boundary are expected for PWC users under this alternative. For other visitors, banning PWC use could have a beneficial effect on visitor experiences within the Jamaica Bay Unit. Banning PWC use within NPS jurisdictional waters would likely force those recreationists to use other areas in the region, potentially creating a minor adverse cumulative impact in those areas as a result of more use.

Conclusion. The no-action alternative would have moderate to major adverse impacts on PWC users, who could no longer ride their craft within the Jamaica Bay Unit. Impacts on other visitors would be beneficial.

Except for PWC users, cumulative impacts of banning PWC use would be beneficial for most visitors. Banning PWC use within NPS jurisdictional waters could force users to other areas within the region that are used by others (e.g., other boaters), creating a minor adverse cumulative impact in those areas.

VISITOR SAFETY

GUIDING REGULATIONS AND POLICIES

In addition to the guiding regulations and policies discussed in the "Visitor Experience" section, the NPS *Management Policies 2001* state that the agency is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks. The policies also state, "While recognizing that there are limitations on its capability to totally eliminate all hazards, the Service and its concessioners, contractors, and cooperators will seek to provide a safe and healthful environment for visitors and employees" (sec. 8.2.5.1). Further, the National Park Service will strive to protect human life and provide for injury-free visits (sec. 8.2.5).

Director's Order #9: Law Enforcement Program, in conjunction with *Reference Manual #9: Law Enforcement,* establishes and defines standards and procedures for NPS law enforcement. Along with education and resource management, law enforcement is an important tool for achieving this mission. Commissioned rangers perform resource stewardship, education, and visitor use management activities, including law enforcement.

In New York, PWC users are required to comply with all federal boating laws and regulations. In addition, the owner/operator is required to comply with additional regulations and/or laws specific to the state (see "State Boating Requirements," page 67).

One of the park's mission goals is to ensure "visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities." To achieve this, the following long-term visitor goal is identified in the park's *Strategic Plan:*

> *Visitor Safety* — By September 30, 2005, the visitor accident/incident rate at Gateway National Recreation Area will be at or below 4.0 per 100,000 visitor days (a 28% decrease from the FY92–FY96 baseline of 5.53 per 100,000 visitor days).

The National Park Service, within the boundaries of the Jamaica Bay Unit, has jurisdiction over state waters. Based on concurrent jurisdictional agreements, the U.S. Park Police enforce boating regulations within the unit boundary.

METHODOLOGY AND ASSUMPTIONS

The methodology for assessing impacts on visitor safety is similar to that described under "Visitor Experience." The potential visitor-related impacts attributable to personal watercraft — a higher rate of accidents than other watercraft and conflicts with other park users — could potentially affect the mandate to provide for injury-free visits.

As described in the "Affected Environment," New York State PWC regulations are enforced within the unit. These regulations govern PWC activities near the shore, the timing of PWC use, and the age and educational requirements of operators.

IMPACT ANALYSIS AREA

In terms of PWC use, the appropriate boundary for analyzing visitor experience impacts includes the locations related to PWC operation. Personal watercraft are allowed in all waters of the Jamaica Bay Unit.

IMPACT TO VISITOR SAFETY FROM PWC USE

The impact intensities for visitor safety follow. Where impacts to visitor safety became moderate, it is assumed that current visitor satisfaction and safety levels would begin to decline and that some of the unit's long-term visitor goals would not be achieved.

> *Negligible:* The impact to visitor safety would not be measurable or perceptible.
>
> *Minor:* The impact to visitor safety would be measurable or perceptible, but it would be limited to a relatively small number of visitors at localized areas. Impacts to visitor safety might be realized through a minor increase in the potential for visitor conflicts in current accident areas.
>
> *Moderate:* The impact to visitor safety would be sufficient to cause a change in accident rates at existing low accident locations or to create the potential for additional visitor conflicts in areas that currently do not exhibit noticeable accident trends.
>
> *Major:* The impact to visitor safety would be substantial. Accident rates in areas usually limited to low accident potential are expected to substantially increase in the short and long term.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Under alternative A all park waters would continue to be open to PWC use. Personal watercraft, due to their ability to reach speeds in the 60 mph range, and their ability to access shallow-draft areas, can create wakes that pose a conflict and safety hazard to other users. Impacts to visitor conflicts and safety are expected to be moderate because the numbers of both visitors and PWC users are projected to increase in the future. The capability of U.S. Park Police to enforce boating laws is directly dependent on the presence of patrols in use areas.

Conflicts between PWC Users and Swimmers — Potential accidents involving personal watercraft and swimmers could occur in nearshore waters of the unit, specifically at Breezy Point. However, most swimmers do not venture farther than 200 feet from shore, and PWC users are restricted from operating within 500 feet of swimming areas (unless the area is smaller than 500 feet), and they are required to operate at 5 mph within 100 feet of the shore. With projected future increases in both visitors and PWC users at the unit, the potential adverse impacts to swimmers would be minor.

Conflicts between PWC Users and Other Boaters — The high-speed capabilities of personal watercraft pose threats not only to the safety of the PWC operator but also to boaters in vessels that are slower to turn, such as sailboats, canoes, and kayaks. The increased number of boaters operating in these waters in recent years has increased the possibility of accidents with personal watercraft. Because of the level of activity in the waters around Jamaica Bay, the potential for accidents with boaters is considered moderate.

Cumulative Impacts. Cumulative impacts under alternative A would continue at minor to potentially moderate levels over the next 10 years as a result of increased congestion. As the number of motorized watercraft in the water continues to increase, the potential for accidents would escalate as well.

Conclusion. The potential for conflicts between PWC users and swimmers would result in minor, adverse impacts because PWC users are restricted from operating near swimming areas and must travel at no-wake speeds within 100 feet of the shore. The potential for conflicts between PWC users and other boaters would be moderate adverse because of the level of activity in the waters around Jamaica Bay.

Cumulative impacts under alternative A would continue at minor to potentially moderate levels over the next 10 years as a result of increased use by all types of watercraft.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Alternative B would result in similar impacts to those discussed for alternative A, but the potential for safety impacts resulting from PWC use would be eliminated outside navigational channels.

Conflicts between PWC Users and Swimmers — Potential accidents involving personal watercraft and swimmers would be eliminated as a result of restricting PWC use to navigational channels, a beneficial impact.

Conflicts between PWC Users and Other Boaters — An increased number of boaters operating in adjacent waters would increase the possibility of accidents with personal watercraft. PWC users and other boaters would experience minor to moderate adverse impacts in the North Channel when turning around within the navigational channel at the trestle bridge, beyond which point access would be prohibited.

Cumulative Impacts. Cumulative impacts would be reduced compared to alternative A as a result of restricting PWC use. Depending on the type of activity and its location, potential impacts to visitor safety would range from negligible to minor. Cumulative minor adverse impacts to areas outside unit waters would likely increase as PWC users concentrated their activities in those areas because most areas in Jamaica Bay would be closed to personal watercraft.

Conclusion. Alternative B would eliminate the potential for PWC-related accidents within those areas of the unit closed to PWC use, a beneficial impact. PWC users and other boaters would experience minor to moderate adverse impacts in the North Channel when turning around within the navigational channel at the trestle bridge.

Cumulative impacts would be reduced compared to alternative A as a result of restricting PWC use, with negligible to minor impacts depending on the type of activity and its location. Cumulative minor adverse impacts to areas outside unit waters could increase if PWC use in other areas increased.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. Similar to alternative B, alternative C would allow PWC use only within the specified navigational channels of Rockaway Inlet and Jamaica Bay, but under this alternative use would be allowed in Winhole Channel. Swimmers would see their safety increased under this alternative, compared to alternative A, also a beneficial impact.

Conflicts between PWC Users and Swimmers — Potential accidents involving personal watercraft and swimmers could occur in nearshore waters of the unit, specifically at Breezy Point. However, most swimmers do not venture farther than 200 feet from shore, and PWC users are restricted from operating within 500 feet of swimming areas (unless the area is smaller than 500 feet), and they are required to operate at 5 mph within 100 feet of the shore. With projected future increases in both visitors and PWC users at the unit, the potential adverse impacts to swimmers would be minor.

Conflicts between PWC Users and Other Boaters — More boaters operating in adjacent waters would increase the possibility of accidents with PWC users. Maintaining an access route around the entire bay by keeping Winhole Channel open to use would reduce the potential for collisions at the trestle bridge, as described under alternative B. The potential for impacts to visitor safety resulting from PWC use would be eliminated in the restricted PWC use areas, a beneficial impact. Because of the level of activity in the waters around Jamaica Bay, the potential for accidents with boaters is considered minor.

Cumulative Impacts. Cumulative impacts would be reduced compared to alternative A as a result of restricting PWC use, with negligible to minor impacts depending on the type of activity and its location. Cumulative minor adverse impacts to areas outside unit waters could increase if PWC use in other areas increased.

Conclusion. Alternative C would eliminate the potential for PWC-related accidents outside the navigational channels, a beneficial impact. Experiences for other boaters in the North Channel would be safer compared to alternative B because PWC users would not have to turn around. Minor adverse impacts would continue over the short and long term in navigational channels.

Cumulative impacts would be reduced compared to alternative A as a result of restricting PWC use, with negligible to minor impacts depending on the type of activity and its location.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Impacts associated with visitor safety and PWC use within the park would be eliminated.

Conflicts between PWC Users and Swimmers — Those visitors who use the park for swimming would no longer be subject to conflicts from PWC use, a beneficial impact.

Conflicts between PWC Users and Other Boaters — Prohibiting PWC use within the unit would also eliminate the potential for conflict with other park visitors. Those visitors who use the park for swimming, fishing, and surfing would experience beneficial impacts from eliminating PWC use in the area.

Cumulative Impacts. Other recreational activities in the park have the potential to affect visitor safety. Depending on the type of activities and their location, potential impacts to visitor safety could range from negligible to minor. Closing the Jamaica Bay Unit to PWC use could create a condition where PWC users would utilize non-park waters for recreation, creating a higher potential for accidents in those areas.

Conclusion. Banning PWC use in the Jamaica Bay Unit would result in beneficial impacts, with an overall reduction in accident potential.

On a cumulative basis this alternative would result in negligible to minor impacts because other recreational activities in the park have the potential to affect visitor safety. Increased PWC use in non-NPS waters could increase potential safety hazards in these areas.

SOCIOECONOMIC EFFECTS

The socioeconomic effects of implementing PWC regulations at Gateway National Recreation Area were determined for all three units — Jamaica Bay, Staten Island, and Sandy Hook (Law Engineering et al. 2002). The following briefly summarizes those effects specific to Jamaica Bay.

BENEFIT-COST ANALYSIS

The purpose of benefit-cost analysis is to determine whether a proposed action (in this case, the regulation of PWC use in Gateway National Recreation Area) would promote an efficient allocation of resources. That is, whether the proposed action would generate more benefits than costs. These costs and benefits accrue directly to households that use personal watercraft, and indirectly to those who are affected by PWC use (e.g., those who would benefit from reduced noise). The resulting changes in PWC use could also impose costs on those who own or work for PWC-related businesses (Law et al. 2002).

Under alternative A there would be no change for any park users relative to current conditions. PWC users would continue to be allowed in the same areas as they are under current regulations.

Alternative B and alternative C would have beneficial impacts on all users except PWC operators and those businesses involved with PWC sales and service. Under these alternatives PWC use would be restricted to navigational channels within Rockaway Inlet and Jamaica Bay and would not be allowed at Breezy Point or in shoreline areas. The impact on boaters is likely to be beneficial but is ambiguous because of the potential for congestion outside park waters (Law et al. 2002). Adverse impacts on swimmers, anglers, canoeists, and other boaters who use the park would be reduced under alternatives B and C due to greater spatial restrictions.

The no-action alternative would have beneficial impacts on all users except PWC users and PWC-related businesses, although the magnitude of the change would be larger under this alternative than under either alternative B or C. Under this alternative some PWC owners who moor their watercraft along canals near the national recreation area would no longer have access through the unit or to adjacent waters outside NPS jurisdiction. Although they could continue to use personal watercraft outside the unit by trailering them to other locations, this would be a major adverse impact. Similar to alternatives B and C, the impact on boaters would most likely be beneficial, but this could be offset by the potential for increased congestion in waters outside the unit, as well as in navigational channels within the unit. Adverse effects to swimmers, anglers, canoeists, and other boaters who use the park would be greatly reduced under the no-action alternative as a result of prohibiting PWC use within unit boundaries.

COSTS TO PWC USERS

PWC dealerships indicated that most PWC users live in the local area and own their machines. Other local areas and private marinas/boat ramps offer an alternative to riders who might be displaced from Gateway National Recreation Area as a result of any proposed regulations.

Two groups of PWC riders could be affected by proposed regulations: those who currently use the Jamaica Bay Unit and those who use waters outside NPS jurisdiction where riders displaced from the park could decide to ride if PWC use in Jamaica Bay was restricted.

For PWC users who currently ride in the Jamaica Bay Unit or who want to ride in the park in the future, prohibiting or restricting PWC use in the park could result in an adverse effect. To the extent that individuals used other nearby areas for PWC recreation, the adverse effect would be reduced.

PWC users who currently ride in nearby areas and were displaced by riders from the national recreation area would be adversely affected if these areas subsequently became more crowded. Although no studies are available that examine the impact of congestion on the value of a PWC trip, other recreation demand studies find that congestion lowers the value of a recreational experience.

Under alternative A no changes in PWC use are anticipated, with no impact on PWC users.

Under alternatives B and C only PWC users who ride in the Jamaica Bay Unit would be affected because they would be restricted to using navigational channels in the bay. There could be an increase in congestion in these channels, adversely affecting PWC users who currently ride in the area. Overall, adverse impacts would be minimal under either alternative B or C.

Banning PWC use under the no-action alternative would have a major adverse effect on PWC users in the national recreation area. It would be more difficult for PWC owners who moor their watercraft along the canals leading to Jamaica Bay to access other recreational uses outside Jamaica Bay. Although they could trailer their watercraft to other use areas, it would be far more inconvenient and expensive.

COSTS TO LOCAL AREA BUSINESSES

Based on current information, it is not possible to quantify the magnitude of the impacts that PWC use restrictions would have on area businesses. If PWC use decreased as a result of use restrictions, then the suppliers of PWC sales and rental services could be adversely affected. Lodging establishments, restaurants, gas stations, and other businesses that serve PWC riders would be unlikely to experience a substantial reduction in business from any proposed restriction because PWC users in the Jamaica Bay

Unit are believed to be primarily local residents on day trips and because PWC users account for a very small share of total visitation to the area.

MANAGEMENT AND OPERATIONS

CONFLICT WITH STATE AND LOCAL ORDINANCES AND POLICIES REGARDING PWC USE

Some states and local governments have taken action, or are considering taking action, to limit, ban, and otherwise manage PWC use. While a national park system unit may be exempt from these local actions, consistency with state and local plans must be evaluated in accordance with the National Environmental Policy Act.

Impacts related to conflicts with state and local ordinances have been analyzed qualitatively using professional judgment to define thresholds or impact magnitude.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use would continue to be managed under New York State boating regulations. Personal watercraft regulations within the unit boundary would not conflict with state regulations or local ordinances and policies regarding PWC use.

Cumulative Impacts. Management of PWC and other boating use would be consistent with existing New York State boating regulations.

Conclusion. PWC and boating regulations within the unit boundaries would continue to be the same as New York State boating regulations. There would be no conflict with state regulations or local ordinances.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Like alternative A, PWC use would continue to be managed under New York State boating regulations within the unit boundary except there would be a 150-foot buffer around all protected areas in Jamaica Bay, and PWC users would be limited to navigational channels in the bay. PWC regulations within the unit would not conflict with state regulations or local ordinances and policies.

Cumulative Impacts. As described for alternative A, management of PWC and other boating use would be consistent with New York State boating regulations, except in those areas where PWC use was prohibited.

Conclusion. As described for alternative A, PWC and boating regulations would be the same as New York State boating regulations. There would be no conflict with state regulations or local ordinances.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. Like alternative B, management of PWC use would continue to be consistent with New York State boating regulations where PWC use was allowed within the unit. PWC use would be limited to

navigational channels within the unit, including Winhole Channel. PWC regulations would not conflict with state regulations or local ordinances and policies.

Cumulative Impacts. Management of PWC and other boating use would continue to be consistent with New York State boating regulations.

Conclusion. As described for alternative A, PWC and boating regulations would be the same as New York State boating regulations. There would be no conflict with state regulations or local ordinances.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Banning PWC use within the Jamaica Bay Unit would not affect the enforcement of other New York State boating regulations.

Cumulative Impacts. Management of other motorized watercraft would continue to be consistent with New York State boating regulations.

Conclusion. Similar to alternative A, boating regulations would be the same as those for New York State. There would be no conflict with state regulations or local ordinances.

IMPACT TO PARK OPERATIONS FROM INCREASED ENFORCEMENT NEEDS

As previously described, *Director's Order #9: Law Enforcement Program,* in conjunction with *Reference Manual #9: Law Enforcement,* establishes and defines standards and procedures for NPS law enforcement. The objectives of the law enforcement program are to (1) prevent criminal activities through resource education, public safety efforts, and deterrence, (2) detect and investigate criminal activity, and (3) apprehend and successfully prosecute criminal violators.

U.S. Park Police are responsible for ensuring the safety of visitors and for protecting natural resources in the Jamaica Bay Unit. These duties include enforcing PWC use regulations within the unit; however, the size of the unit makes it difficult to effectively patrol. Due to the increased accident rates and visitor safety conflicts with personal watercraft, additional staff may be needed to enforce standards, limits, and closures. The National Park Service, the U.S. Park Police, the New York State Department of Environmental Conservation, and the U.S. Coast Guard all have jurisdiction within unit waters. New York State has strict boating regulations applicable to PWC use, including boater education courses.

Impacts to park operations from increased enforcement needs have been analyzed qualitatively using best professional judgment.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Under this alternative unit waters would remain open to PWC use, with a continuing need for enforcement to deal with increased accident rates and visitor safety conflicts. The U.S. Park Police would continue to enforce New York State boating regulations. With current staffing levels, the National Park Service would have difficulty ensuring compliance with all regulations. Impacts under alternative A would be long term and minor to moderate due to needs for additional law enforcement capability within the unit to enforce federal and state boating regulations.

Cumulative Impacts. The National Park Service, the U.S. Park Police, the New York State Department of Environmental Conservation, and the U.S. Coast Guard would continue to have jurisdiction for all boating activities in unit waters. The U.S. Park Police would continue to provide assistance to the various user groups in the park, both to resolve conflicts and ensure safety. Seasonal staff would be required to meet existing and future (2012) needs.

Conclusion. Impacts under alternative A would be long term and minor to moderate due to needs for additional law enforcement capability within the unit to enforce federal and state boating regulations.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Under this alternative PWC use would be restricted to navigational channels within the Jamaica Bay Unit and Rockaway Point. This restriction would require education and enforcement by NPS staff to prevent PWC users from entering restricted areas. This could be completed using existing boat patrols, with the anticipation that PWC users would sometimes operate illegally within restricted areas. To provide more control on PWC operations, daily boat patrols would be required. This could be accomplished by adding seasonal staff positions, which would require more park operating funds. Impacts would be similar to alternative A and would be long term and minor to moderate due to needs for additional law enforcement capability.

Cumulative Impacts. As described for alternative A, various state and federal agencies would continue to have jurisdiction over boating uses within unit waters. However, existing park operations would not be sufficient to adequately monitor and assist current seashore users. The U.S. Park Police would continue to provide assistance to the various user groups to the park, both to resolve conflicts and ensure safety. Park operations and enforcement needs would be similar to alternative A, since the number of people and boats would not change under this alternative, but the entire unit would require patrols to ensure that regulations were enforced throughout the area. Seasonal staff would be required to meet existing and future (2012) needs.

Conclusion. Impacts would be similar to alternative A and would be long term and minor to moderate due to needs for additional law enforcement capability within the unit.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. Similar to alternative B, PWC use would be restricted to navigational channels, except Winhole Channel would remain open to use. As described for alternative A, the proposed restrictions would require education and enforcement by NPS staff to prevent PWC users from entering restricted areas. This could be completed using the existing boat patrols, with the anticipation that personal watercraft would sometimes operate illegally within the unit. To provide more control of PWC operations, daily boat patrols would be required. This could be accomplished by adding seasonal staff positions, requiring additional park operations funds. Impacts would be similar to alternative A and would be long term and minor to moderate due to needs for additional law enforcement capability.

Cumulative Impacts. As described for alternative B, existing park operations are inadequate to monitor and assist with the enforcement of PWC use restrictions in the unit. The U.S. Park Police would continue to provide assistance to various user groups. Park operations and enforcement needs for these user groups would be similar to alternatives A and B, since the number of people and boats would not change under

this alternative, but the entire unit would require patrols to ensure that regulations were enforced throughout the area. Additional seasonal staff positions would be required to meet existing and future (2012) needs related to park operations.

Conclusion. Impacts would be similar to alternative A and would be long term and minor to moderate due to existing needs for additional law enforcement capability within the unit.

Impacts of the No-Action Alternative — No PWC Use

Analysis. The no-action alternative would require additional enforcement to ensure that PWC use restrictions within the unit boundary were observed. Restricting PWC use, however, would reduce the number of complaints related to user conflicts. Park staff would continue to make reasonable efforts to provide for the protection, safety, and security of all park visitors, employees, concessioners, and public and private property, as well as to protect the unit's natural and cultural resources. Eliminating PWC use would decrease the potential for accidents in and near the landing areas, but more U.S. Park Police and boats would be required to enforce the regulation.

Cumulative Impacts. Other visitor activities in the unit besides PWC use require the presence of enforcement personnel. If visitation numbers increased over time, the need for additional commissioned U.S. Park Police would also increase. Depending on park visitation and the ability of the park to hire additional personnel, potential impacts to enforcement needs in the unit would be long term and could range from negligible to moderate.

Conclusion. The no-action alternative would result in short-term, minor to moderate impacts as a result of enforcing the PWC ban; once the ban was understood, impacts would be minor.

UNAVOIDABLE ADVERSE IMPACTS

Unavoidable adverse impacts are impacts that cannot be avoided and cannot be mitigated, and therefore would remain throughout the duration of the action. Under any alternative there would be adverse cumulative impacts if PWC emissions reduced water and/or air quality.

Continuing PWC use throughout the park under alternative A would adversely impact soundscapes, affecting wildlife and visitor experiences. Visitor experiences would also continue to be compromised, with the potential for conflict between anglers and PWC users remaining high.

Under alternatives B and C similar impacts on soundscapes and visitor experiences would continue; however, the intensity of the impacts would be greatly reduced. The potential for visitor conflict would be reduced between shoreside visitors and PWC users; however, it would be increased among PWC users and other water recreationists due to increased congestion in the navigational channels remaining open to PWC use. Alternatives B and C, as well as the no-action alternative, would adversely impact the experiences of PWC users and owners who reside along the canals and basins surrounding Jamaica Bay.

LOSS IN LONG-TERM AVAILABILITY OR PRODUCTIVITY TO ACHIEVE SHORT TERM GAIN

As noted above, some resources could be degraded through implementation of alternative A, B, or C. None of these resources would be impacted to the degree of "impairment" or long-term permanent loss. Enforcement of existing federal and state laws, and park regulations by unit staff, would likely result in a long-term protection of these resources. These conditions could only be achieved by an increase in the U.S. Park Police and resources (boats) made available to the unit.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irretrievable commitments of resources are those that can be reversed, that is, the commitment of a renewable resource or the short-term commitment of any resource. These include the commitment of water quality and air quality by allowing all mobile sources desiring to do so, including personal watercraft, to continue using the unit under alternatives A, B, and C. The use of fossil fuels to power personal watercraft would be an irretrievable commitment of this resource; however, this use is minor.

Staten Island Unit

ALTERNATIVES

Four alternatives are described for the Staten Island Unit of Gateway National Recreation Area (see the Staten Island Location map). The action alternatives address continued PWC use under a special regulation, with various management strategies and mitigation measures; the no-action alternative assumes the National Park Service would not take action to promulgate a special regulation to keep Staten Island Unit waters open to PWC use. The alternatives are summarized in Table 34 and the environmental consequences in Table 35. No other alternatives were considered for the Staten Island Unit.

ALTERNATIVE A — CONTINUE PWC USE UNDER A SPECIAL REGULATION

A special regulation would be promulgated to continue the management and regulation of personal watercraft, as provided for in the "Superintendent's Compendium" for Staten Island (see appendix A). PWC use would be allowed in all waters within the unit except for those areas where salt marshes occur (see Alternative A map). The launching or recovering of personal watercraft would be prohibited in all areas except at the Great Kills Park boat launch. This is considered the baseline alternative to compare against the other management alternatives.

All local, state, and federal regulations regarding PWC use would remain in effect and be enforced by the National Park Service. These include the following:

- no operation from sunset to sunrise
- no operating a vessel that exceeds 90 dB or 82 dB at 82 feet
- no operation within 500 feet of a marked bathing area unless the waterbody is less than 500 feet wide, then cannot operate in excess of 10 mph
- must operate below 5 mph when within 100 feet of the shore, a dock, pier, raft, float, or anchored boat
- no reckless PWC operation or maneuvering in a manner that unnecessarily endangers life, limb, or property
- must be 16 years old and have a boating certificate to operate a personal watercraft or be accompanied by a person with a boating certificate
- no operation while impaired or intoxicated from alcohol or drugs
- must have a visual distress flag and an auditory distress signal (horn or whistle)
- must have a mandatory personal flotation device
- personal watercraft must have at least two ventilators to remove any explosive gases
- an engine cut off lanyard (if equipped) must be attached to the operator
- personal watercraft sold or manufactured in New York must be consistent with the California air emissions reduction and regulations for new spark-ignition PWC marine (New York Environmental Conservation Law, sec. 19-0306-A (New York State Assembly 2000). According to California regulations, hydrocarbon emissions in all new outboard and PWC engines must be reduced by 90% by 2008 (CARB 1998a).

ALTERNATIVE B — CONTINUE PWC USE UNDER A SPECIAL REGULATION WITH ADDITIONAL GEOGRAPHIC RESTRICTIONS (PREFERRED ALTERNATIVE)

Under alternative B the launching or recovering of personal watercraft would be prohibited in all areas of the park except the boat launch at Great Kills Park. Under this alternative additional geographic restrictions on PWC use would be promulgated as follows (see the Alternative B map):

- PWC use would be prohibited from the NPS jurisdictional waters around Hoffman and Swinburne Islands.
- PWC use would be prohibited from waters along the oceanside of the unit.

As described under alternative A, all local, state, and federal laws and regulations relative to PWC use would remain in effect and would be enforced within the unit.

ALTERNATIVE C — CONTINUE PWC USE UNDER A SPECIAL REGULATION, BUT PHASE OUT USE OVER A THREE-YEAR PERIOD

Alternative C would be have the same management measures as alternative B (see Alternative C map). However, under this alternative PWC use would be phased out over a three-year period within the unit. This would be accomplished by eliminating parking permits issued to PWC users at the Great Kills boat launch.

NO-ACTION ALTERNATIVE — NO PWC USE

The no-action alternative assumes a scenario of discontinuing all PWC use at this unit. The National Park Service would take no further action to promulgate a special regulation to allow PWC use, which would result in a ban on PWC use at the unit (see the No-Action Alternative map).

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is the alternative that would promote the National Environmental Policy Act, as expressed in section 101 of the act. The identification of the environmentally preferred alternative is that which best meets the following requirements:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
- Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.

- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

This discussion also summarizes the extent to which each alternative meets section 102(1) of the National Environmental Policy Act, which asks that agencies administer their own plans, regulations, and laws so that they are consistent with the policies outlined above to the fullest extent possible.

Alternative A would not satisfy the majority of the six requirements detailed above. Alternative A would attain a wide range of beneficial park uses to PWC users and would preserve an environment that supports diversity and variety of individual choice; however, it would not achieve a balance between population and resource use that permits a high standard of living and a wide sharing of life's amenities. Alternative A would not fulfill the responsibilities of each generation as trustee of the environment for succeeding generations due to continued degradation resulting from PWC use within the unit.

Alternative B would have impacts on park resources and visitor use and experience at the Staten Island Unit of Gateway National Recreation Area very similar to those described for alternative A. Alternative B would protect wildlife and wildlife habitats from the adverse effects associated with PWC use associated with nearshore and shoreline areas within the Staten Island Unit, specifically around Hoffman and Swinburne Islands. Alternative B would attain a wide range of beneficial uses of the environment but the potential for degradation and risk to visitor health and safety would still exist, specifically as it relates to water and air quality.

Alternative C would have impacts on park resources and visitor use and experience at the Staten Island Unit very similar to those described for alternatives A and B; however, PWC use would be phased out by reducing the number of parking permits issued for the Great Kills Park boat launch over a three-year period. For the period of PWC use, alternative C would protect wildlife and wildlife habitats from the adverse effects of PWC use in nearshore and shoreline areas within the Staten Island Unit, specifically around Hoffman and Swinburne Islands. Alternative C would prohibit PWC use after the three-year phase-out period, thereby maintaining an environment that supports diversity and variety of individual choice during the phaseout. However, a balance between population and resource use that permits a wide sharing of amenities would not be achieved as a result of eliminating PWC use.

The no-action alternative would ensure safe, healthful, productive, and aesthetically and culturally pleasing surroundings for visitors to access NPS areas without the possibility of PWC users entering the area and introducing noise and safety considerations. The no-action alternative would attain the widest range of beneficial uses of the environment, and it would ensure the highest degree of protection to wildlife and wildlife habitat associated with nearshore and shoreline habitats of the Staten Island Unit. However, the no-action alternative would completely exclude PWC users from the unit and access to the Great Kills Park boat ramp. It would not maintain an environment that supports diversity and variety of individual choice, nor would it achieve a balance between population and resource use that permits a wide sharing of amenities.

Based on the analysis prepared for PWC use at the Staten Island Unit, alternative B is the environmentally preferred alternative, best fulfilling park responsibilities as trustee of this sensitive habitat; ensuring safe, healthful, productive, and aesthetically and culturally pleasing surroundings; and attaining a wider range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.

TABLE 34: SUMMARY OF PWC MANAGEMENT ALTERNATIVES — STATEN ISLAND UNIT

	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period	No-Action Alternative — No PWC Use
Management	Allow PWC use under a special regulation.	Allow PWC use under a special regulation.	Allow PWC use under a special regulation.	Ban PWC use within the Staten Island Unit.
Use Area	All waters within the Staten Island Unit, subject to current regulations.	No PWC use within NPS jurisdictional waters around Hoffman and Swinburne Islands. No PWC use in waters along the oceanside.	Same as alternative B.	No PWC use.
Other Restrictions	PWC launching or landing only at the Great Kills Park ramp. No PWC operation in marsh areas.	Same as alternative A.	Reduce the number of boat ramp permits issued over a three-year period, then ban of PWC use at the Staten Island Unit.	Not applicable.
Engine Type	PWC sold or manufactured in New York must be consistent with California air emissions reduction and regulations for new spark-ignition marine engines in personal watercraft (i.e., hydrocarbon emissions in all new outboard and PWC engines must be reduced by 90% by 2008).	Same as alternative A.	Same as alternative A.	Not applicable.
Use Hours	Sunrise to sunset.	Same as alternative A.	Same as alternative A.	Not applicable.
Numbers	No limits.	Same as alternative A.	Same as alternative A.	Not applicable.
State Regulations	Enforce all state regulations.	Same as alternative A.	Same as alternative A.	Not applicable.

Gateway National Recreation Area

New York / New Jersey

Staten Island Unit

Location Map

United States Department of the Interior/National Park Service WASO/January '03/646-20128

- National Park Service lands
- Recreation area legislative boundary
- Areas outside of regulatory boundary
- Boat launch
- Salt Marsh (PWC use prohibited)
- Swimming Area (PWC use prohibited)

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Gateway National Recreation Area

New York / New Jersey

Staten Island Unit

Alternative A -- Continue PWC Use under a Special Regulation

United States Department of the Interior/National Park Service WASO/January '03/646-20129

- National Park Service lands
- Recreation area legislative boundary
- Areas outside of regulatory boundary
- PWC use prohibited
- Boat launch
- Salt Marsh (PWC use prohibited)
- Swimming Area (PWC use prohibited)

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Gateway National Recreation Area

New York / New Jersey

Staten Island Unit

Alternative B -- Continue PWC Use under a Special Regulation with Additional Geographic Restrictions

United States Department of the Interior/National Park Service WASO/January '03/646-20130

- National Park Service lands
- Recreation area legislative boundary
- Areas outside of regulatory boundary
- PWC use prohibited
- Boat launch
- Salt Marsh (PWC use prohibited)
- Swimming Area (PWC use prohibited)

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Gateway National Recreation Area

New York / New Jersey

Staten Island Unit

Alternative C -- Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period

United States Department of the Interior/National Park Service WASO/January '03/646-20131

- National Park Service lands
- Recreation area legislative boundary
- Areas outside of regulatory boundary
- PWC use prohibited
- Boat launch
- Salt Marsh (PWC use prohibited)
- Swimming Area (PWC use prohibited)

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Gateway National Recreation Area

New York / New Jersey

Staten Island Unit

No-Action Alternative -- No PWC Use

United States Department of the Interior/National Park Service WASO/January '03/646-20137

- National Park Service lands
- Recreation area legislative boundary
- Areas outside of regulatory boundary
- PWC use prohibited
- Boat launch
- Salt Marsh (PWC use prohibited)
- Swimming Area (PWC use prohibited)

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TABLE 35: SUMMARY OF ENVIRONMENTAL CONSEQUENCES — STATEN ISLAND UNIT

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period	No-Action Alternative — No PWC Use
Water Quality	Water quality impacts due to PWC emissions at Great Kills Park / Crookes Point would be negligible to minor for all pollutants in 2002 and 2012. However, risks from benzene under the human health benchmark would be potentially major in 2002 and 2012, depending on volatilization and dilution. Monitoring would be needed to determine if mitigation measures would be required. Cumulative impacts from all motorized vessels under ecotoxicological benchmarks in 2002 would range from potentially major at Great Kills Park / Crookes Point (benzo(a)pyrene, 1-methyl naphthalene, and benzene) to negligible at Great Kills Harbor and Fort Wadsworth / Miller Field (all pollutants). In 2012 only 1-methyl naphthalene would continue to have potentially major impacts at Great Kills Park / Crookes Point, while benzo(a)pyrene and benzene would have moderate impacts. Cumulative impacts under human health benchmarks would be negligible to minor from benzo(a)pyrene in all areas in 2002 and 2012. Cumulative impacts from benzene would range from moderate at Great Kills Harbor and Fort Wadsworth to potentially major at Great Kills Park / Crookes Point in 2002 and 2012. Water quality monitoring would be needed to determine if mitigation measures would be needed. No impairment.	PWC use within a small portion of the unit would have negligible impacts within NPS jurisdictional waters. Water quality impacts in areas that would be closed to further PWC use would be beneficial. Cumulative impacts would be somewhat reduced from those predicted under alternative A. Under ecotoxicological benchmarks impacts would be considered moderate at Great Kills Park / Crookes Point, minor at Great Kills Harbor, and negligible at Fort Wadsworth / Miller Field in 2002 and 2012. Under human health benchmarks impacts from benzo(a)pyrene would be negligible to minor for all areas in 2002 and 2012. Cumulative impacts from benzene would range from potentially major at Great Kills Park / Crookes Point to moderate at Great Kills Harbor and Fort Wadsworth / Miller Field in 2002 and 2012. Water quality monitoring would be needed in areas of high motorboat use to determine if mitigation measures would be required. No impairment.	PWC emissions would have negligible impacts on water quality during the phaseout period because little use would occur in NPS jurisdictional waters. Banning PWC use from unit waters following a three-year phase out period would result in beneficial impacts because no PWC emissions would be released into unit waters. By 2012 water quality would be slightly improved because of reduced emissions. On a cumulative basis, impacts would be the same as alternative B and somewhat reduced from those predicted under alternative A. Under ecotoxicological benchmarks impacts would range from negligible to moderate in NPS jurisdictional waters in 2002 and 2012. Under human health benchmarks impacts from benzo(a)pyrene would range from negligible to minor in all areas in 2002 and 2012, while impacts from benzene would range from potentially major at Great Kills Park / Crookes Point to moderate at Great Kills Harbor and Fort Wadsworth / Miller Field in 2002 and 2012. Water quality monitoring would be needed in areas of high motorboat use to determine if mitigation measures would be required. No impairment.	Banning PWC use within NPS jurisdictional waters would have a beneficial impact by contributing to improved water quality conditions in areas currently open to PWC use. On a cumulative basis, impacts would be the same as alternative B and somewhat reduced from those predicted under alternative A. Under ecotoxicological benchmarks impacts would range from negligible to moderate in NPS jurisdictional waters in 2002 and 2012. Under human health benchmarks impacts from benzo(a)pyrene would range from negligible to minor in all areas in 2002 and 2012, while impacts from benzene would range from potentially major at Great Kills Park / Crookes Point to moderate at Great Kills Harbor and Fort Wadsworth / Miller Field in 2002 and 2012. Water quality monitoring would be needed in areas of high motorboat use to determine if mitigation measures would be required. No impairment.

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period	No-Action Alternative — No PWC Use
Air Quality				
• Impacts on Human Health (Staten Island is in a maintenance area for CO and a severe non-attainment area for ozone.)	PWC use would continue at existing levels, resulting in major adverse impacts from CO in 2002, decreasing to moderate in 2012. Impacts from PM would be negligible. For ozone precursors, the unit would experience major adverse impacts from VOC in 2002, decreasing to moderate by 2012. Impacts from NO_x would be minor adverse in 2002 and 2012. Overall, emissions from all watercraft activity under this alternative would result in major adverse impacts from CO and negligible adverse impacts from PM. Impacts from NO_x and VOC would be major adverse in 2002 and 2012. No impairment.	PWC use would be limited to the waters near the Great Kills Park boat launch. Estimated PWC emissions would be negligible and are assumed to be close to zero. Cumulative impacts would be major adverse for CO and negligible adverse for PM. For ozone precursors impacts from NO_x and VOC would be major adverse in both 2002 and 2012. No impairment.	Impacts on air quality from PWC use during the phase-out period would be negligible. After three years PWC use would be prohibited throughout the unit, resulting in a beneficial impact. Cumulative impacts from all other motorized watercraft would be the same as alternative B, major adverse for CO and negligible adverse for PM; for ozone precursors major adverse impacts from NO_x and VOC in both 2002 and 2012. There would be no contribution from personal watercraft after three years. No impairment.	Banning PWC use would result in beneficial impacts. Cumulative impacts from all other motorized watercraft would be the same as alternative B, major adverse for CO and negligible adverse for PM; for ozone precursors major adverse impacts from NO_x and VOC in both 2002 and 2012. There would be no contribution from personal watercraft. No impairment.
• Impacts on Air Quality Related Values	Annual emissions from PWC use would result in moderate adverse impacts for ozone exposure and negligible impacts to visibility. There are no perceptible visibility impacts on record or observed ozone injury on plants. Cumulative emissions from all motorized boating would result in moderate adverse impacts for ozone and negligible visibility impacts from $PM_{2.5}$. No impairment.	Impacts from PWC use would be negligible because use would be effectively removed from unit waters. Cumulative emissions from all boating activities would result in moderate adverse impacts for ozone and negligible visibility impacts from $PM_{2.5}$. No impairment.	PWC use restrictions under alternative C, similar to alternative B, would result in negligible impacts on air quality related values. After three years PWC use would be banned within the unit, resulting in a beneficial impact on air quality. Cumulative emissions from all boating activities would result in moderate adverse impacts for ozone and negligible visibility impacts from $PM_{2.5}$. No impairment.	Annual emissions from personal watercraft would be removed from unit waters, resulting in beneficial impacts. Cumulative emissions from all boating activities would result in moderate adverse impacts for ozone and negligible visibility impacts from $PM_{2.5}$. No impairment.
Soundscapes	PWC use would have a minor adverse impact to visitors throughout the unit over the short and long term. Cumulative impacts of boating noise, ambient noise levels, and PWC noise would range from minor to moderate, depending on the location and the season and compared to the natural soundscape. No impairment.	Allowing PWC use only at the launch ramp at Great Kills Park, and requiring users to travel at 5 mph or less, would result in minor, adverse impacts over the short and long term. Discontinuing PWC use in the rest of the unit would have a beneficial impact. Cumulative noise impacts from all other noise sources would continue to be minor to moderate adverse over the short and long term, similar to alternative A. No impairment.	PWC use over the three-year phaseout period would result in minor noise impacts within NPS boundaries. After the phaseout period, impacts would be beneficial because PWC use would no longer contribute to noise impacts. Cumulative noise impacts from all other noise sources within and near the unit would continue to be minor to moderate and adverse over the short and long term, similar to alternative A, except there would be no contribution to impacts levels from PWC use after the phaseout period. No impairment.	Banning PWC use within NPS jurisdictional waters would result in beneficial impacts. Cumulative impacts from all other noise sources would continue to be minor to moderate over the short and long term, the same as alternative A, except there would be no contribution from PWC use. No impairment.

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period	No-Action Alternative — No PWC Use
Wildlife and Wildlife Habitat	Impacts would be minor over the short and long term because species sensitive to a high level of noise and human activity are not expected to use the area. Requirements for PWC users to operate under 5 mph within 100 feet of the shoreline would minimize the potential for adverse effects to wildlife in shoreline habitats. In addition, access restrictions to marshes within the Staten Island Unit would reduce the potential for adverse impacts to wildlife species that utilize these habitats. Cumulative impacts would be minor and adverse over the short and long term because wildlife would already have acclimated to uses and because management measures prohibit access to sensitive habitats (i.e., marshes). No impairment.	Impacts would be minor and adverse over the short and long term because species sensitive to a high level of noise and human activity are not expected to use the area. Effectively closing unit waters to PWC use would eliminate the potential for impacts to wildlife and habitat, a beneficial impact. Cumulative impacts would be minor, the same as alternative A, due to the acclimation of wildlife to disturbance, as well as management measures prohibiting access to sensitive habitats (i.e., marshes). No impairment.	Impacts would be minor and adverse during the PWC phaseout period; impacts would be beneficial after PWC use was banned. Cumulative impacts would be minor, the same as alternative A, due to the acclimation of wildlife to disturbance, along with management measures prohibiting access to sensitive habitats (i.e., marshes). There would be no contribution to impacts from PWC use after three years. No impairment.	Banning PWC use within NPS jurisdictional waters would result in beneficial impacts on wildlife and wildlife habitat. Cumulative impacts to wildlife and habitat would be minor and adverse, similar to alternative A, except there would be no contribution to impacts from PWC use. No impairment.
Aquatic Fauna	Continued PWC use would have minor to moderate adverse effects in shallow water areas over the short and long term because of how marine organisms are distributed and a potential reduction in species diversity in shallow water habitats. Cumulative impacts would be similar to those for PWC use; however, the intensity of adverse impacts would be moderate over the short and long term because of all motorized uses in the waters in and around the unit now and in the future, including PWC use. No impairment.	In areas remaining open to PWC use, impacts to aquatic fauna would be minor over the short and long term because PWC use would be restricted compared to alternative A. Cumulative impacts would be similar to alternative A. No impairment.	During the phaseout period, impacts to aquatic fauna in areas remaining open to PWC use would be minor and adverse over the short and long term. After PWC use was banned, impacts would be beneficial. Cumulative impacts to would be similar to alternative A. No impairment	Banning PWC use would result in beneficial impacts. Cumulative impacts would be similar to alternative A. No impairment.
Threatened, Endangered, or Special Concern Species	Alternative A is not likely to adversely affect any federal or state listed species because use restrictions would prohibit access to most shoreline areas and salt marshes, and because PWC users would be required to operate at 5 mph within 100 feet of the shoreline, reducing the potential for collision-related impacts with sea turtles. Future increases in motorized uses, including PWC	Alternative B is not likely to adversely affect federal or state listed threatened or endangered species because use would be limited to the vicinity of the Great Kills Park boat ramp. Similar to alternative A, future increases in motorized uses, including PWC use outside NPS boundaries, are not likely to adversely affect threatened or endangered species. No impairment.	Alternative C is not likely to adversely affect federal or state listed species because use would be limited to the vicinity of the Great Kills Park boat ramp and would be phased out after three years. Similar to alternative A, future increases in motorized uses, including PWC use outside NPS boundaries, are not likely to adversely affect threatened or endangered species.	Banning PWC use within the Staten Island Unit would have no effect on federal or state listed threatened or endangered species. Similar to alternative A, future increases in motorized uses, including PWC use outside NPS boundaries, are not likely to adversely affect threatened or endangered species. No impairment.

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period	No-Action Alternative — No PWC Use
	use, within and around the Staten Island Unit would not be likely to adversely affect any listed species. No impairment.		No impairment.	
Shoreline Vegetation and Wetland Habitats	Minor, short- and long-term, adverse impacts could occur under alternative A. Direct impacts could occur around landing areas as a result of trampling by foot traffic. Impacts are expected to be minor because access to shoreline areas is limited. Cumulative adverse impacts to shoreline vegetation and wetland habitats would be minor and short and long term since shoreline access would continue to be limited. No impairment.	No impacts to shoreline vegetation or wetland habitats are expected because PWC use would be restricted along the oceanside of the unit, reducing the potential for impacts to shoreline vegetation from PWC-related foot traffic. Cumulative adverse impacts related to all motorized uses would be minor (similar to alternative A). No impairment.	No adverse impacts to shoreline vegetation or wetland habitat in the Staten Island Unit are expected because restricted access would eliminate the potential for impacts to shoreline vegetation associated with PWC use. Over time impacts would be beneficial because of phasing out PWC use. Cumulative impacts would be minor as a result of other park uses, similar to alternative A. No impairment.	Banning PWC use within the Staten Island Unit would result in beneficial impacts to shoreline vegetation and wetland habitats. Cumulative impacts to shoreline and wetland habitats would be minor and adverse as a result of impacts associated with other park uses, similar to alternative A. No impairment.
Visitor Use and Experience	Continued PWC use would result in negligible adverse impacts on the visitor experiences of PWC users and other boaters. Impacts on the experiences of swimmers, hikers, and other visitors would be negligible to moderate adverse, depending on locations and seasonal variations in activities. Alternative A would partially meet the park's strategic goal for improved visitor satisfaction (in the case of PWC users). Cumulative impacts related to all other watercraft users and other visitors would continue to be negligible, since there would be little noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences.	Restricting PWC use to certain areas would result in negligible to minor adverse effects on PWC users since they would have continued access from the Great Kills Park boat ramp to PWC activity areas outside NPS boundaries. The impacts to other boaters and visitors would be beneficial, depending on the locations and seasonal variations in activities, as described for alternative A. Alternative B would partially meet the park's strategic goal for improved visitor satisfaction (in the case of other boaters and non-boating visitors) by restricting PWC use to the area of the boat ramp. Cumulative impacts on PWC users, other boaters, and visitors would continue to be negligible adverse, similar to alternative A, since there would be little noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences. Visitors to areas where PWC use was restricted would likely notice the greatest change. Restricting PWC use to the Great Kills Park boat launch could result in some PWC users going to other regional areas, where the additional use could affect	Alternative C would result in minor to moderate adverse impacts on PWC users, who would be prohibited from using park waters after the three-year phaseout period. Impacts to the experiences of other boaters and visitors would be negligible during the phaseout period then beneficial. Alternative C would partially meet the park's strategic goal for improved visitor satisfaction (in the case of other boaters and non-boating visitors) by restricting PWC use to the area of the boat ramp. Similar to alternative A, cumulative impacts would be negligible adverse, since there would be little noticeable change in overall experiences. Most visitors would continue to be satisfied with their experiences in the unit. Phasing out PWC use in NPS waters could force PWC users to other regional areas, where the additional use could affect other recreationists (e.g., other boaters), creating minor, adverse impacts in those areas.	Banning PWC use would have minor to moderate adverse impacts on PWC users over the short and long term. Impacts to the experiences of other boaters and visitors would be beneficial. The no-action alternative would partially meet the park's strategic goal for improved visitor satisfaction (in the case of other boaters and non-boating visitors). Banning PWC use within NPS jurisdictional waters could force PWC users to other regional areas, where the additional use could affect other recreationists (e.g., other boaters), creating minor, adverse cumulative impacts in those areas. Impacts on all other boaters and visitors would be negligible since there would be little noticeable change in overall visitor experiences. Most visitors would continue to be satisfied with their experiences.

Impact Topic	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period	No-Action Alternative — No PWC Use
		other recreationists (e.g., other boaters), creating minor, adverse impacts in those areas.		
Visitor Safety	The potential for conflicts between PWC users and swimmers would result in minor adverse impacts because PWC users are restricted from operating near swimming areas and must travel at no-wake speeds within 100 feet of the shore. The potential for conflicts between PWC users and other boaters would result in moderate adverse impacts because of increasing congestion in unit waters. Cumulative impacts would be minor to moderate as a result of increasing use of most types of watercraft and therefore more congestion in and adjacent to NPS jurisdictional waters.	Eliminating PWC use within all areas of the unit except the Great Kills Park boat ramp would reduce the potential for accidents within NPS jurisdictional waters, a beneficial impact for those visitors who come to the Staten Island Unit to swim, fish, and boat. Impacts on a cumulative basis would be minor to moderate because of the potential increased safety hazards to other boaters in adjacent non-NPS waters if PWC use increased in these areas.	Same as alternative B except eliminating PWC use within all areas of the unit over a three-year period would eliminate the potential for PWC-related accidents within NPS jurisdictional waters, a beneficial impact for those visitors who come to Staten Island Unit to swim, fish, and boat. Impacts on a cumulative basis would be minor to moderate because of the potential of increased safety hazards to other boaters operating in adjacent non-NPS waters due to possibly increased PWC activities.	Impacts on those visitors who come to the Staten Island Unit to swim, fish, and boat would be beneficial because there would be no conflicts with PWC users. Impacts on a cumulative basis would be minor to moderate because of the potential of increased safety hazards to other boaters operating in adjacent non-NPS waters due to possibly increased PWC activities.
Socio-economic Environment	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.	Although no measurable regional economic impacts are expected, PWC dealerships could see a decrease in revenue. Several alternative locations for PWC use exist outside the unit, so PWC users would likely shift some use to other regional locations, potentially mitigating reductions in PWC sales.
Unit Operations and Management				
Conflict with State and Local Ordinances	PWC and boating regulations within the unit would be the same as New York State boating regulations. There would be no conflict with state regulations or local ordinances.	PWC and boating regulations within the unit would be the same as New York State boating regulations. There would be no conflict with state regulations or local ordinances, the same as alternative A.	PWC and boating regulations within the unit would be the same as New York State boating regulations. There would be no conflict with state regulations or local ordinances, the same as alternative A.	PWC and boating regulations within the unit would be the same as New York State boating regulations. There would be no conflict with state regulations or local ordinances, the same as alternative A.
Enforcement Needs	Existing PWC use, as well as existing boat activity, would require U.S. Park Police to continue to patrol and enforce New York State boating regulations. Impacts would be short and long term and negligible to minor due to the need for additional personnel for law enforcement within the unit.	Impacts would be short and long term and negligible to minor due to the potential need for additional personnel to enforce federal and state boating regulations.	Impacts would be short and long term and negligible to minor due to the potential need for additional personnel to enforce federal and state boating regulations.	Impacts would be short and long term and negligible to minor due to the potential need for additional personnel to enforce federal and state boating regulations.

THE AFFECTED ENVIRONMENT

The Staten Island Unit consists of approximately 1,210 acres of land along the southeastern shore of Staten Island. It includes three distinct areas — Fort Wadsworth, Miller Field, and Great Kills Park (see the Staten Island Location map). Hoffman and Swinburne Islands in Lower Bay are man-made islands owned by the National Park Service.

Great Kills Park offers a variety of coastal activities, including sunbathing, biking, birdwatching, boating, fishing, hiking, in-line skating, jogging, nature study, picnicking, and swimming. A public boat ramp at Great Kills Park in Great Kills Harbor is one of two public boat ramps on Staten Island.

WATER RESOURCES

Sensitive aquatic systems and resources near the Staten Island Unit that may be affected by water quality include marshes, fish, reptiles, and marine mammals.

SURFACE WATER

The unit's jurisdictional waters include approximately 1,000 acres of the Lower Bay, consisting of waters within 0.25 mile of the shore of Crookes Point in Great Kills Park, Miller Field, Fort Wadsworth, and Hoffman and Swinburne Islands, as well as the eastern and southern margins of Great Kills Harbor. In addition to the public boat launch at Great Kills Park (within NPS jurisdiction), there is a 130-slip NPS-owned public marina along the south side of Great Kills Harbor, plus several private marinas along the north shore of the harbor that accommodate approximately 350 vessels. Much of Great Kills Harbor is bulkheaded, while the shoreline of the entire unit along the Lower Bay is generally a narrow, sandy, groined beach.

Several major river systems — the Hudson, Raritan, Passaic, Hackensack, and Navesink/Shrewsbury — drain into Lower Bay and share a common outlet and connection to New York Bight in the Atlantic Ocean. Because of substantial freshwater flow into Lower Bay, salinity is highly variable. Lower Bay is characterized by strong diurnal tidal currents, which reach a speed of 2.6 feet per second (NOAA 2002e) off Miller Field. The mean tidal range at the Staten Island Unit (Great Kills Harbor) is 4.7 feet (NOAA 2002a). Navigational channels in Lower Bay require regular dredging to maintain their authorized depth.

WATER QUALITY

Lower Bay is subject to wide fluctuations in temperature and dissolved oxygen, largely from anthropogenic causes, in particular, industrial and sewage effluent and stormwater runoff. Nearby past and present industrial uses have resulted in discharges of heavy metals, hydrocarbons, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) into the bay. Sewage treatment plants and other point and nonpoint sources discharge significant amounts of nutrients, organic matter, and suspended solids. Chemical and oil spills in the navigable waters around Lower Bay are not uncommon. Western Raritan Bay has been found to contain some of the more toxic sediments in the bay (USFWS 1997). The Hudson-Raritan estuary was ranked highest overall in contaminant concentration among estuaries sampled by the National Oceanic and Atmospheric Administration's National Status and Trends Program (NOAA 1993).

High fecal coliform levels in the bay result in beach closures and increased restrictions on shellfishing, particularly after heavy rains. During summer warmwater periods, low dissolved oxygen conditions in the bay are thought to be responsible for large fish kills. Because of a variety of contaminants in Raritan Bay, New York and New Jersey issue regular fish and shellfish consumption advisories.

FEDERAL / STATE REGULATIONS AND STANDARDS

As described for the Jamaica Bay Unit, the U.S. Environmental Protection Agency has developed national recommended water quality criteria for priority pollutants in ambient water for the protection of aquatic life and human health. These criteria have been adopted as enforceable standards by most states. The Clean Water Act and the Federal Pollution Control Act regulate and protect all national waters. Under these laws all states must submit a 305(b) report, which characterizes the quality of their waters on a watershed level, and a 303(d) list, which establishes which specific waterbodies do not meet federal or state water quality standards for designated uses. Table 36 shows the EPA watershed category for Jamaica Bay and the state use designation for the Staten Island Unit.

Once a waterbody is classified, the numeric water quality standards for various chemical, biological, and physical constituents established by New York State Department of Environmental Conservation are applied, and the state standards may be more stringent than the EPA criteria. These numeric standards determine whether or not a waterbody can support the designated uses. If a waterbody does not meet the numeric standards, it is considered impaired and placed on the 303(d) list.

TABLE 36: WATERBODY CLASSIFICATIONS AT STATEN ISLAND UNIT

Waterbody	Watershed	Federal Designation: EPA Watershed Category*	State Use Designation**	303(d) Listed Impairment
Lower NY Bay	Sandy Hook-Staten Island (02030104)	Category I	Class SB	Pathogens

Sources: NYS DEC 1998b; NYS DEC 2002b; US EPA 1998b.

* Category I — Watersheds are in need of restoration and do not meet clean water and natural resource goals.

** Class SB — Best usages are primary and secondary contact recreation and fishing; these waters shall be suitable for fish propagation and survival.

OTHER WATER QUALITY DATA

Gateway National Recreation Area initiated a water quality program in 1977 to form a database for the management of the recreation area's waters for public health and ecological quality. Eight sites at the Staten Island Unit are tested at the surf zone for total and fecal coliform throughout the summer months; historic data for this unit also includes summer surface water temperature and salinity (discontinued in 1992) and dissolved oxygen (1983 only) (NPS 1997, 1998a).

The Bureau of Marine Resources in the New York State Department of Environmental Conservation conducts a shellfish land certification program approved by the Food and Drug Administration. The objective is to safeguard the public health by determining those waters that are safe for shellfishing and by closing areas deemed unsafe. Certification is based on actual bacteriological sampling results and the evaluation of potential pollution sources along the shore. Approximately 200,000 acres (about 17% of the state's total growing waters) are closed to harvesting because sampling shows the waters are not clean enough. All shellfish lands in Westchester, Bronx, Kings, New York, Richmond and Queens Counties, which includes the Staten Island area, are designated as uncertified areas (NYS DEC 2002c).

In addition, the New York City Department of Health tests the water at Great Kills, Midland Beach, and South Beach each week during the summer to determine the sanitary quality of coastal waters used by bathers. Utilizing a comprehensive system of sustained water testing and computer modeling, which can

forecast the effects of weather conditions on beach water quality, the New York City Health Department places limited wet weather advisories at Staten Island's Midland and South Beaches. The New York City Health Department also advises New Yorkers to refrain from swimming in those waters for 12 hours following heavy rains (greater than 1.5 inches) during the previous 6 hours (NYC DOH 2002).

The New York City Department of Environmental Protection has been conducting a water quality survey of New York Harbor since 1909. The survey's purpose is to document the impact of the city's various water pollution control programs on water quality in the harbor. Currently, the survey monitors over a dozen water quality parameters at 45 sites throughout the harbor, including one station off the Staten Island Unit. Key parameters monitored include fecal coliform bacteria, chlorophyll-a, dissolved oxygen, and Secchi transparency.

AIR QUALITY

As described for the Jamaica Bay Unit, the U.S. Environmental Protection Agency has promulgated national ambient air quality standards (NAAQS) and regulations to protect the public health and welfare, allowing for an adequate margin of safety. To date, standards have been established for six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO), particles with a diameter less than or equal to a nominal 10 micrometers (PM_{10}), ozone (O_3), nitrogen dioxide (NO_2), and lead (Pb). Areas that do not meet national standards are called non-attainment areas.

The Staten Island Unit is designated as a class II airshed, which means that the unit's air quality is protected by allowing limited increases (i.e., allowable increments) over baseline concentrations for sulfur dioxide (SO_2), nitrogen oxides (NO_x), and particulate matter (PM).

Staten Island is in Richmond County, within the New York Metropolitan Area and the NY-NJ-CT Air Quality Control Region (40 CFR 81.13, Nov. 6, 1991). The Environmental Protection Agency has designated the Richmond County area as being in attainment for CO, NO_2, PM_{10}, SO_2, and Pb, although the entire metropolitan area is a maintenance area for CO. The area is not in attainment for ozone and is classified as severe-17, requiring that the national ambient air quality standards be met by 2007. Because the area is within an ozone non-attainment area, the emission threshold set for ozone precursor pollutants — NO_x or VOC — is 25 tons/year (the same as for the Jamaica Bay Unit). All ambient air quality levels except ozone meet the national ambient air quality standards.

As described for the Jamaica Bay Unit, the Environmental Protection Agency is requiring outboard personal watercraft, wave-runners, and other small vessels to meet more stringent emissions regulations as outlined in 40 CFR Parts 89–91. New York has adopted an even more expedited schedule for PWC air emissions reduction requirements, which is essentially the same as California's (New York Environmental Statutes, sec. 19-050 2000).

SOUNDSCAPES

For a description of how noise is defined and how it affects visitor use, see the "Soundscapes" section for the Jamaica Bay Unit beginning on page 56.

Located in an urban setting, all areas of the Staten Island Unit are affected by noise from automobile traffic, air traffic, and boat traffic in Lower Bay and Raritan Bay. Smaller boats in this area use outboard engines, similar to PWC engines, with 15 to 130 horsepower. Larger fishing and performance vessels use both inboard and outboard diesel (compression ignition), ranging from 90 to 660 horsepower. Altogether,

noise related to boating activity and background noise is expected to be high, especially during the summer. Natural sounds can be heard occasionally; but motorized noise is the primary noise, especially during daylight hours. Table 37 illustrates common sounds and typical sounds at the Staten Island Unit.

TABLE 37: SOUND LEVEL COMPARISON CHART

Decibels	How it Feels	Equivalent Sounds	Sound Levels at Various Locations in Staten Island Unit
140–160	Near permanent damage level from short exposure	Large caliber rifles (e.g., .243, 30-06)	
130–140	Pain to ears	.22 caliber weapon	
100	Very loud	Air compressor at 20 feet; garbage trucks and city buses	Sitting under the Verrazano Narrows Bridge at Fort Wadsworth
	Conversation stops	Power lawnmower; diesel truck at 25 feet	
90	Intolerable for phone use	Steady flow of freeway traffic; 10 HP outboard motor; garbage disposal	
80		Muffled jet ski at 50 feet; automatic dishwasher; near drilling rig; vacuum cleaner	Standing on the beach on a windy day
70		Drilling rig at 200 feet; window air conditioner outside at 2 feet	Entrance road on a busy day
60	Quiet	Window air conditioner in room; normal conversation	Sitting on the beach at night
50	Sleep interference	Quiet home in evening	Hiking a trail at Great Kills Park
		Bird calls	
40		Library	
30		Soft whisper	
20		In a quiet house at midnight; leaves rustling	

Note: Modified from *Final Environmental Impact Statement, Miccosukee 3-1 Exploratory Well, Broward County, Florida* (U.S. Department of the Interior).

WILDLIFE AND WILDLIFE HABITAT

MAMMALS

Based on a limited number of inventory studies and observational listings, 13 species of land mammals are known to occur in the Staten Island Unit. These include opossum, short-tailed shrew, little brown myotis, cottontail rabbit, gray squirrel, white-footed mouse, meadow vole, muskrat, house mouse, Norway rat, feral dog, raccoon, and feral cat (NPS 1989a).

Marine mammals documented in the area include bottlenose dolphin, harbor seal, and the sperm whale (NPS 1989a). Harbor seals, harp seals, and ringed seals also occur in bay areas around the unit (USFWS 1997).

AMPHIBIANS AND REPTILES

Four amphibian species documented in the unit include the redback salamander, Fowler's toad, northern spring peeper, and green frog. Reptiles include snapping turtle, eastern box turtle, diamondback terrapin, eastern painted turtle, red-eared slider, northern brown snake, and eastern garter snake (NPS 1989a).

BIRDS

The salt marshes and upland islands in the Staten Island Unit provide nesting habitat for a variety of birds.

Shorebirds

Nearly 30 species of shorebirds have been documented in the New York Harbor area, including Staten Island. These include the herring gull, black-backed gull, laughing gull, semipalmated sandpiper, semi-palmated plover, sanderling, ruddy turnstone, black bellied plover, red knot, dunlin, short-billed dowitcher, greater yellowlegs, lesser yellowlegs, and least sandpiper (NYC Department of Health [DOH] 2001). Present during the spring and fall migrations, they feed in marshes, flats, and shallow water areas. The American oystercatcher is known to nest on the edge of beaches and marshes in the unit.

Waterfowl

Waterfowl use the area during the fall migration, which peaks in November, and as a wintering area. Common migratory species include the Atlantic brant, greater scaup, American black duck, canvasback, mallard, bufflehead, oldsquaw, red-breasted merganser, common goldeneye, and American widgeon (USFWS 1997). Waterfowl that overwinter in waters off New York City include the horned grebe, brant, red-breasted merganser, American widgeon, greater scaup, and bufflehead. Common waterfowl that breed in the area include the mallard, American black duck, and Canada goose (NYC DOH 2001).

Wading birds such as species of herons, egrets, and ibises form regionally significant colonies on Hoffman Island. Abundant wading birds include great blue heron, little blue heron, tricolored heron, black-crowned night heron, green heron, American bittern, snowy egret, glossy ibis, cattle egret, and great egret (NYC DOH 2001; USFWS 1997). Cormorants nest on Swinburne Island.

Raptors

Commonly observed raptors that migrate through the Staten Island Unit include the American kestrel, sharp-shinned hawk, merlin, northern harrier, and osprey (NYC DOH 2001).

FISHERIES

More than 90 species of fish have been reported to occur in the bay complex around the Staten Island Unit. The most abundant are some of the estuarine species that use the lower salinity areas as habitat, such as mummichog, white perch, and hogchoker. The bay complex supports recreational fisheries for weakfish, bluefish, winter flounder, summer flounder, striped bass, sea bass, tautog, scup, and spot. Commercial pound net, fyke net, and staked shad net fisheries exist in the bay complex for American shad and American eel (USFWS 1997).

Essential fish habitat, which is protected under the 1996 Magnuson-Stevens Fishery Conservation and Management Act (see page 61), occurs in the waters around the Staten Island Unit, as shown in Table 38.

TABLE 38: ESSENTIAL FISH HABITAT IN THE VICINITY OF THE STATEN ISLAND UNIT

Species	Eggs	Larvae	Juvenile	Adult	Spawning Adult
Atlantic herring (*Clupea harengus*)		x	x	x	
Red hake (*Urophycis chuss*)	x (Atlantic Only)	x	x	x (Bays Only)	
Windowpane flounder (*Scophthalmus aquosus*)	x	x	x	x	x
Winter flounder (*Pleuronectes americanus*)	x	x	x	x	x

SOURCE: NOAA 2002b.

SHELLFISH

Soft-shelled clams occur in high abundance in the broad flats of Great Kills Harbor. Blue mussel are also expected in the harbor area. Horseshoe crabs lay eggs in mud flats associated with Great Kills Park / Crookes Point in May and June.

THREATENED, ENDANGERED, OR SPECIAL CONCERN SPECIES

WILDLIFE

Based on correspondence with the National Park Service, no federal or state threatened or endangered wildlife species are known to occur within the Staten Island Unit in areas where they could be affected by PWC use (D. Riepe, NPS, pers. comm., S. Cauley, LBG, June 27, 2002). Informal consultation with the U.S. Fish and Wildlife Service was initiated regarding federally listed species with the potential to occur at the Staten Island Unit, but no written response was received.

Based on correspondence with the National Marine Fisheries Service, the federally endangered Kemp's ridley sea turtle has the potential to occur in New York Bay waters in the Staten Island area. It is the smallest of the sea turtles and is also considered the most endangered. It is the second most abundant endangered sea turtle found in the New York Bight area. The turtle occurs in the area from June to October. Long Island's waters have been identified as critical habitat for immature Kemp's ridley during its early stages of life (USFWS 1997).

The federally threatened loggerhead sea turtle also has the potential to occur in Lower Bay waters (see appendix B). Loggerhead sea turtles are the most abundant sea turtles occurring in the United States. They prefer estuaries, coastal streams, and salt marshes, and some individuals may become stranded on New York beaches during migrations in the summer. Most observations in New York have occurred in Long Island waters. Loggerheads are omnivorous, feeding on a variety of benthic and pelagic invertebrates and sea grass species (USFWS 1997).

PLANT SPECIES

The New York Natural Heritage Program lists 23 species of threatened or endangered plant species in Gateway National Recreation Area. Four species, including the state threatened red pigweed and the state endangered globose flatsedge, narrow-leaf sea blite, and Roland's sea blite, occur in association with salt marsh habitats and could potentially occur in the Staten Island Unit. The state threatened dune sandspur and hop sedge occur in coastal sands, sand dunes, and dune swales and could also occur in association with these habitats in the Staten Island Unit. The remaining state listed plant species documented to occur in the Staten Island Unit are not likely to be affected by PWC use.

SHORELINE VEGETATION AND WETLAND HABITATS

Great Kills Park is characterized by recreational beaches along the shoreline with inland areas characterized by mixed grasslands with thickets of small trees and shrubs and marsh habitats dominated by phragmites. Vegetation in the upland habitats at Crookes Point is characterized by mixed grasses with shrub thickets dominated by bayberry, beach plum, sumac, hackberry, black cherry, Virginia creeper, and poison ivy, and marsh habitats dominated by phragmites (USFWS 1997). Upland habitats in this area have been severely disturbed by visitor use. Vegetation in the foredune habitats at Crookes Point is dominated by dune grass, seaside goldenrod, sea rocket, prickly pear cactus, and beach cocklebur. The outer shoreline follows a narrow, sandy, groined beach. A salt marsh peat outcrop occurs along the shoreline at the north end of Great Kills Park. Vegetation in the peat outcrop area is characterized by rockweed (*Fucus* sp.) and sea lettuce.

The northwestern area of Miller Field is undeveloped and is characterized by a relic hardwood forest containing several large swamp white oaks. Other plants in the area include magnolia, spicebush, Indian grass, and yellow flag (Stalter et al. 1996). The shoreline south of Miller Field is characterized by intertidal and shallow subtidal mud flats that extend out from the shoreline for about 0.25 mile. A large area of flats also occurs in the Great Kills Harbor, which extends farther south along the Staten Island shoreline (USFWS 1997).

Most of the remaining shoreline associated with the Staten Island Unit is characterized by an unvegetated beach bordered by a boardwalk.

VISITOR USE AND EXPERIENCE

The Staten Island Unit is accessible from Manhattan, Brooklyn, and New Jersey by motor vehicle, watercraft, and ferry. The Staten Island Parkway runs through the northern section of the unit to the Verrazano Narrows Bridge. Access is to the various sections of the unit can be obtained by way of Hylan Boulevard. An interior road provides access to all areas of Great Kills Park out to Crookes Point.

The unit is open year-round. Peak visitation occurs May through September. There are no entrance fees; however, a $25 annual permit is required to park boat trailers at Great Kills Park.

In 2001 the unit received 2,449,845 visitors, a 6.2% decrease from 2000, when there were 2,611,507 visitors.

VISITOR ACTIVITIES

The main attraction at the Staten Island Unit is Great Kills Park, where visitors can enjoy land and coastal activities. The park has a public boat launch for PWC and other watercraft users. The seashore, grassland, and forest habitats provide a unique setting for nature study and enjoyment. Visitor activities include biking, birdwatching, fishing, boating, hiking, in-line skating, flying model airplanes, jogging, nature study, picnicking, and swimming.

Miller Field, an active airfield in the early days of aviation, became part of Gateway National Recreation Area in 1974. The field includes two post-World War I military aircraft hangers, 64 acres of athletic fields, picnic areas, a community garden, and a swamp white oak forest. Miller Field offers a variety of outdoor recreational activities to visitors, including biking, hiking and picnicking.

Fort Wadsworth was a linchpin to the defense of New York Harbor for nearly two centuries and is one of the oldest military installations in the United States. The visitor center provides background information about the site's history and strategic location in New York Harbor. Self-guided and ranger-led tours of the historic fortifications are available. Park rangers lead walks and tours that highlight both the history and the protected natural plant and animal communities at these sites. Battery Weed, one of the fortifications within Fort Wadsworth, was constructed between 1817 and 1864 and formed part of the third system of U.S. coastal fortifications, making this one of the most powerful forts on the eastern seaboard.

Hoffman and Swinburne Islands are only accessible by watercraft.

VISITOR SATISFACTION

Since 1998, NPS staff at the Staten Island Unit have provided visitors the opportunity to rate park services, from visitor center exhibits and concessions to recreational opportunities. Visitor satisfaction scores were 94% in 2000 and 87% in 2001. The goal is to increase overall visitor satisfaction scores by improving customer service and communications, including providing recreational opportunities and providing for the basic needs of visitors (NPS 2000d).

PWC USE

PWC use within the Staten Island Unit began over 20 years ago, when the craft were first introduced. Operators can use the NPS boat ramp at Great Kills Park, privately owned boat ramps at Staten Island, a publicly owned boat launch at Lemon Creek, or private docks. The majority of the PWC users are local residents using privately owned machines. PWC users typically launch from the Great Kills Park boat ramp.

Estimates of typical PWC use in the area come from various sources. NPS staff estimate that personal watercraft make up approximately 10% of all watercraft on the water at any given time of the day during peak season. Of the 2,449,845 recreational visitors to the unit in 2001, 77,914 used watercraft — a 60% increase from 2000 visitation.

PWC use is localized, occurring in the Crookes Point area of Great Kills Park. While PWC users are known to explore the narrower waterways within the park, they more frequently venture out to the open waters of Raritan Bay and Lower Bay to operate at higher speeds and perform stunts. PWC owners are more likely to use their craft for recreation than for transportation (Law et al. 2002). PWC users do not frequent the areas around Miller Field, Fort Wadsworth, or Hoffman and Swinburne Islands due to bulkheaded shorelines, rough waters, and boat traffic (T. O'Connell, NPS, pers. comm., T. Shinskey, LBG, June 27, 2002).

VISITOR SAFETY

STATE BOATING REQUIREMENTS

PWC users must abide by New York State watercraft laws and regulations, as described for the Jamaica Bay Unit (see page 67).

U.S. Park Police monitor PWC use from the Great Kills Park boat ramp. The private launch area in Staten Island and the publicly owned boat launch at Lemon Creek (south of Great Kills Park) are not monitored

or controlled by NPS staff. Enforcement in the Staten Island Unit is a responsibility shared by the National Park Service, the U.S. Park Police, the New York Port Authority, the New York Department of Environmental Conservation, and the U.S. Coast Guard.

PWC ACCIDENTS AND INJURIES

The U.S. Park Police track accidents within the Jamaica Bay and Staten Island Units of the national recreation area (see Table 11, page 68). The statistics, however, do not differentiate between units (S. Dermon, USPP, pers. comm., L. Choy, LBG, July 25, 2002).

SOCIOECONOMIC ENVIRONMENT

The socioeconomic environment affected by PWC use at the Staten Island Unit is provided in the report "Economic Analysis of Personal Watercraft Regulations in Gateway National Recreation Area" (Law et al. 2002). PWC use in the Staten Island Unit most frequently occurs in the area surrounding Great Kills Park, specifically at Crookes Point.

STATEN ISLAND UNIT MANAGEMENT AND OPERATIONS

U.S. Park Police enforce state boating regulations to ensure visitor safety at the Staten Island Unit. Currently, two NPS officers are assigned to patrols and enforcement activities in the unit. Great Kills Park is the only launch site where PWC use is monitored. NPS staff have no control over the use of private launches on Staten Island or the public Lemon Creek boat launch south of Great Kills Park.

In addition, although the National Park Service has regulatory ownership over all waters within recreation area boundaries, it does not have jurisdictional control over waters adjacent to the following (see Location map):

- Oakwood Beach (north of Great Kills Park) north to New Dorp Beach (south of Miller Field)
- Midland Beach (north of Miller Field) north to South Beach (south of Fort Wadsworth).

Law enforcement and rescue operations in unit waters are conducted with concurrent jurisdiction by the National Park Service, the U.S. Park Police, and other law enforcement agencies, such as the New York Port Authority, the New York Department of Environmental Conservation, and the U.S. Coast Guard (Law et al. 2002).

ENVIRONMENTAL CONSEQUENCES

The legal foundation and the methodologies for analyzing environmental consequences are the same as those described for the Jamaica Bay Unit, and they are not repeated in this chapter. Only information specific to the Staten Island Unit is discussed below; however, the approaches and methodologies that were previously described also apply to all impact analyses for the Staten Island Unit (the full description of impact methodologies for the Jamaica Bay Unit begins on page 70). Alternative A is the baseline for determining the context, duration, and intensity of resource impacts. For easy reference, impact thresholds for each impact topic are highlighted in text boxes in this chapter.

Definitions of Terms Used in the Impact Analysis

Potential impacts are described in terms of type (Are the effects beneficial or adverse?), context (Are the effects site-specific, local, or even regional?), duration (Are the effects short term or long term?), and intensity (Are the effects negligible, minor, moderate, or major?). Because definitions of intensity (negligible, minor, moderate, or major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this document (see text boxes).

For the purposes of analysis, the following assumptions are used for all impact topics (unless otherwise noted in the analysis, impacts are considered to be adverse; the terms "impact" and "effect" are used interchangeably):

Short-term impacts: Those occurring from PWC use in the immediate future (per trip through a single season of use, usually 1 to 6 months).

Long-term impacts: Those occurring from PWC use over several seasons of use through the next 10 years.

Direct impacts: Those occurring from the direct use or influence of personal watercraft.

Indirect impacts: Those occurring from PWC use that have indirectly altered a resource or condition.

Impact analysis area: Each resource impact is assessed in direct relationship to those resources affected both inside and outside the park, to the extent that the impacts can be substantially traced, linked, or connected to PWC use inside park boundaries. Each impact topic, therefore, has an impact analysis area relative to the resource being assessed, and it is further defined in the impact methodology.

Impairment: An impact to any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park; or
- identified as a goal in the park's *General Management Plan* or other relevant NPS planning documents.

PWC AND VISITOR USE TRENDS

PWC and visitor use trends were determined using data from the recreation area, discussions with park staff and with the staff of the New York State Department of Environmental Conservation and the New York State Department of State Division of Coastal Resources, and information from Kings, Queens, and Richmond Counties. Typical use patterns of motorized watercraft, including numbers and hours used, were determined from the counties' boating registration data, the *New York State 2000 Recreational Boating Report*, and observations by NPS personnel at the Staten Island Unit. National trends in PWC ownership were also used.

As discussed for Jamaica Bay, Gateway National Recreation Area does not have detailed visitation information specific to PWC usage, but annual watercraft visitation is recorded by counting vessels at each park unit, including Staten Island. PWC use at Staten Island occurs most frequently in the area surrounding Great Kills Park. According to NPS records, between 2000 and 2001 Staten Island had an annual average of 62,579 watercraft visits, or an average of 391 watercraft per day, assuming usage during a 160-day period during the summer. NPS staff estimate that 10% of the watercraft in the unit are personal watercraft (T. O'Connell, NPS, pers. comm., June 27, 2002). PWC users frequently launch at the Great Kills Park boat ramp, but because of the 5 mph speed limit in the harbor, they immediately leave the harbor after launching, generally heading to the waters off Crookes Point; no significant PWC use occurs at Miller Field, Fort Wadsworth, or Hoffman and Swinburne Islands (T. O'Connell, NPS, pers. comm., June 27, 2002).

Boats other than personal watercraft were distributed in the unit as follows: 55% at Great Kills Park, 10% at Miller Field, and 35% at Fort Wadsworth. Of the 55% of all watercraft present within NPS waters at Great Kills Park, 80% of the personal watercraft can typically be found at Crookes Point and 20% in Great Kills Harbor (T. O'Connell, NPS, pers. comm., June 27, 2002).

For purposes of this analysis, it is assumed that PWC use at the Staten Island Unit would continue to increase in the future, even though national trends indicate new ownership is on the decline. Regional information and surveys combined with the national trends helped provide a more accurate picture of PWC use trends at Staten Island. Based on this approach, the analyses in this environmental assessment assumed an annual increase in PWC use within the unit of 0.3% over the next 10 years, the same as for Jamaica Bay. Table 39 shows the baseline conditions at Staten Island for the number of personal watercraft compared to all other boats, as well as projected use by 2012. A change in the national socioeconomic conditions (as well as industry's marketing strategies) could cause this trend to vary one way or the other.

TABLE 39: STATEN ISLAND UNIT BOATING AND PWC DAILY USE TRENDS

	Motorized Vessels		Personal Watercraft		Total	
	2002	2012	2002	2012	2002	2012
Great Kills Harbor	38	39	0	0	38	39
Great Kills Park / Crookes Point	156	161	39	40	195	201
Fort Wadsworth / Miller Field	158	164	0	0	158	164
Total	**352**	**364**	**39**	**40**	**391**	**404**

SOURCE: Law et al. 2002; L. Migliozzi, NYS OPRHP, pers. comm., T. Taylor, LBG, Apr. 1, 2002; T. O'Connell, pers. comm., June 27, 2002.

NOTE: Due to qualitative nature of NPS surveys, the analysis was based on a highest use estimate, therefore, 39 personal watercraft/day was the value used in all estimated projections. It is assumed that all personal watercraft would operate for a total of four hours per day and would be located in the Great Kills Park / Crookes Point area.

WATER QUALITY

GUIDING REGULATIONS AND POLICIES

As stated for the Jamaica Bay Unit, the mission statement for Gateway National Recreation Area is to "maintain, improve, and make [the natural systems, wildlife habitats, historic resources, and recreational opportunities] available to the public." To achieve this, one long-term water quality goal was identified in the recreation area's *Strategic Plan*: By September 30, 2005, Gateway estuarine and ocean waters have unimpaired water quality.

Gateway National Recreation Area does not have quantifiable water quality data documenting the effects of PWC emissions. To address water quality impacts potentially resulting from continued PWC use,

water quality standards were used in the absence of park-specific data as a basic principle to guide the analysis. Another consideration in assessing the magnitude of water quality impacts is the effect on those resources that depend on a certain quality or condition of water. Sensitive aquatic organisms, riparian areas, and wetlands are affected by changes in water quality from direct and indirect sources.

METHODOLOGY AND ASSUMPTIONS

To assess the magnitude of water quality impacts to waters in the Staten Island Unit under the various PWC management alternatives, the following methods and assumptions were used, in addition to those stated for the Jamaica Bay Unit beginning on page 77:

1. The number and distribution of personal watercraft for the Staten Island Unit are shown in Table 39.
2. While boating activity is distributed over a full day from 4 A.M. to 6 P.M., it peaks between 10 A.M. and 2 P.M. The contaminant loading to water was calculated for one day, assuming a given number of personal watercraft (on average, 39 personal watercraft operating per hour) each operating for four hours (156 PWC-hours during peak hours), and each discharging 3 gallons of gasoline per PWC-hour. Boat use was also estimated at four hours per day for the cumulative impact analysis.
3. At the Staten Island Unit, the area for determining water threshold volumes was established from NOAA chart 12327 (2002e) and includes the NPS jurisdictional waters and Great Kills Harbor. NPS jurisdictional waters in Great Kills Harbor total 758 acre-feet, while total water volume in the harbor is 3,179 acre-feet.
4. As noted on page 78 and in Table 14, the U.S. Environmental Protection Agency (2002a) recently lowered the human health fish ingestion criterion for benzo(a)pyrene from 0.049 µg/L to 0.018 µg/L. Application of this new, lower criterion to the Staten Island Unit would increase the threshold volumes for benzo(a)pyrene, and conclusions described as negligible to minor impacts in reference to human health criteria would change to negligible to moderate impacts.

IMPACT ANALYSIS AREA

Pollutant loads were calculated for the three areas of watercraft activity within Staten Island Unit — Great Kills Park / Crookes Point, Great Kills Harbor, Miller Field, and Fort Wadsworth. Although motorized watercraft are present in all areas of the unit, PWC users are typically found only in the Great Kills Park / Crookes Point area, near the Great Kills Park boat ramp. Due to rough waters and rocky shorelines, they do not typically access the waters around Miller Field and Fort Wadsworth. Because PWC users are not known to frequent the waters around Hoffman and Swinburne Islands, this area is not included in the water quality analysis.

IMPACT TO WATER QUALITY FROM PWC USE

The same impact thresholds that were defined for the Jamaica Bay Unit were used to describe the relative changes in water quality under the various PWC management alternatives at the Staten Island Unit. The thresholds are highlighted in the text box.

Thresholds for Impacts on Water Quality

Negligible: Impacts are chemical, physical, or biological effects that would not be detectable, would be well below water quality standards or criteria, and would be within historical or desired water quality conditions.

Minor: Impacts (chemical, physical, or biological effects) would be detectable but would be well below water quality standards or criteria and within historical or desired water quality conditions.

Moderate: Impacts (chemical, physical, or biological effects) would be detectable but would be at or below water quality standards or criteria; however, historical baseline or desired water quality conditions would be altered on a short-term basis.

Major: Impacts (chemical, physical, or biological effects) would be detectable and would be frequently altered from the historical baseline or desired water quality conditions; and/or chemical, physical, or biological water quality standards or criteria would be locally, slightly and singularly, exceeded on a short-term and temporary basis.

Impairment: Impacts are chemical, physical, or biological effects that would be detectable and would be substantially and frequently altered from the historical baseline or desired water quality conditions and/or water quality standards, or criteria would be exceeded several times on a short-term and temporary basis. In addition, these adverse, major impacts to park resources and values would

- contribute to deterioration of the park's water quality and aquatic resources to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;
- affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or
- affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Under alternative A all unit waters would remain open to PWC use, and the New York State boating regulations would continue to be enforced. The PWC user trend analysis indicates a 0.3% per year increase in the overall average number of personal watercraft operating per hour in these waters. PWC numbers are therefore projected to increase from 39 to 40 in the Great Kills Park / Crookes Point area by 2012. PWC use in the waters of the Staten Island Unit would result in chemical and physical impacts. Chemical impacts would occur due to the emissions of hydrocarbons directly into the water. Physical impacts would be associated with the resuspension of sediments and an increase in turbidity during PWC operation in shallow waters.

In addition, a reduction in impacts to water quality associated with pollutant emissions is expected in the long term due to the fact that PWC hydrocarbon emissions are projected to decrease by 60% by 2012 (NYS DEC 1998b). This is due to newer models gradually coming into use (US EPA 1996b; date modified in US EPA 1997), and New York's adoption of the California emission reduction schedule. The threshold volumes (in acre-feet) are based on the PWC user trends and the forecast reductions in emissions by 2012. Since nearly all PWC use occurs in the Great Kills Park / Crookes Point area, it was assumed that all 39 personal watercraft would be used in the Great Kills area for four hours per day, and that no or negligible PWC use would occur in other areas.

The results of the water quality analysis for PWC activity show that for all discharged pollutants evaluated, the ecotoxicological threshold volumes estimated for 2002 and 2012 would be less than the volume of water available at Great Kills Park / Crookes Point (see Table 40).

TABLE 40: THRESHOLD WATER VOLUMES NEEDED TO DILUTE PWC POLLUTANTS, ALTERNATIVE A — STATEN ISLAND UNIT

	Great Kills Harbor		Great Kills Park / Crookes Point		Miller Field	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters	738 (Total harbor water volume is 3,179 ac-ft.)		752		8,076	
Ecotoxicological Benchmarks*						
Benzo(a)pyrene (fuel and exhaust)	0	0	220	89	0	0
Naphthalene	0	0	85	35	0	0
1-methyl naphthalene	0	0	430	180	0	0
Benzene	0	0	200	84	0	0
MTBE	0	banned	9	banned	0	banned
Human Health Benchmarks**						
Benzo(a)pyrene (fuel and exhaust)	0	0	62	25	0	0
Benzene	0	0	2,700	1,100	0	0

* Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
** Threshold volumes (ac-ft) below which human health might be impacted.

Threshold volumes would range from 9 to 434 acre-feet, while the available jurisdictional water volume at Crookes Point is 752 acre-feet. Impacts to aquatic organisms are expected to be minor (1-methyl naphthalene) to negligible (all other pollutants evaluated).

While the waters around Great Kills Park / Crookes Point are not used for drinking purposes, and while it is unlikely that a large amount of incidental ingestion of seawater would occur, visitors to the unit could be affected by an increase in pollutant loadings through the ingestion of biota (e.g., shellfish) that have accumulated pollutants. For human health benchmarks, the threshold volume for benzo(a)pyrene in 2002 and 2012 would be less than the available jurisdictional water volume at Great Kills Park / Crookes Point. However, the threshold volume for benzene in 2002 (2,700 ac-ft) would be nearly four times greater than the available jurisdictional water volume, and in 2012 the threshold volume (1,100 ac-ft) would still be greater than the jurisdictional water volume. It is important to emphasize that while concentrations of benzene might exceed available water volumes, the environmental conditions (e.g., water exchange, temperature, weather conditions), as well as the behavior, fate, and transport of benzene, play important roles in limiting potential impacts to human health and the aquatic environment. Tidal and wind-driven mixing of unit waters with immediately adjacent Lower Bay waters, combined with benzene's estimated half-life in water of five hours, would quickly decrease benzene concentrations. As previously mentioned, Lower Bay is characterized by strong diurnal tidal currents. Tidal currents at the Staten Island Unit exceed 2 feet per second. During flood tides, the water volume of Great Kills Park / Crookes Point is significantly increased, further diluting soluble pollutants. During outgoing tides, pollutants are transported throughout Lower New York Bay.

Overall, water quality impacts to human health due to PWC emissions of organic pollutants in 2002 would be potentially major for benzene and negligible for other pollutants. By 2012 benzene would continue to have potentially major impacts to water quality. Monitoring would be necessary to determine if mitigation measures would be required at Great Kills Park / Crookes Point.

Cumulative Impacts. Cumulative impacts associated with alternative A would result from the actions taking place around the Staten Island Unit, including motorized watercraft that use nearby waters and point and non-point sources of urban pollutants. Marine traffic includes recreational (personal use), commercial (fishing boats and cruises), and official units (police, Coast Guard, etc.), as well as personal watercraft. Although some of these craft could be using four-stroke engines, data were not available; therefore, it was assumed that current use of four-stroke engines would be small and it was not accounted for in the calculations.

TABLE 41: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE A — STATEN ISLAND UNIT

	Great Kills Harbor		Great Kills Park / Crookes Point		Fort Wadsworth / Miller Field	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	738 (Total harbor water volume is 3,179 ac-ft.)		752		8,076	
Ecotoxicological Benchmarks*						
Benzo(a)pyrene (fuel and exhaust)	210	86	1,100	440	870	360
Naphthalene	83	34	430	180	350	140
1-methyl naphthalene	420	170	2,200	900	1,800	730
Benzene	200	82	1,000	420	830	340
MTBE	9	banned	44	banned	35	banned
Human Health Benchmarks**						
Benzo(a)pyrene (fuel and exhaust)	60	25	310	130	250	100
Benzene	2,600	1,100	13,000	5,000	11,000	4,500

* Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
** Threshold volumes (ac-ft) below which human health might be impacted.

To calculate cumulative impacts for 2002, the total number of motorboats operating per hour in the unit is estimated to be 391, 39 of which (10%) would be personal watercraft and 352 other motorized vessels. For 2002 all watercraft were assumed to be distributed throughout the unit's jurisdictional waters as follows: 38 in Great Kills Harbor, 195 in Great Kills Park / Crookes Point, and 158 at Fort Wadsworth and Miller Field (see Table 39). By 2012 use would increase to 404, with 39 in Great Kills Harbor, 201 in Great Kills Park / Crookes Point, and 164 at Fort Wadsworth and Miller Field (based on T. O'Connell, NPS, pers. comm., June 27, 2002). As shown in Table 39, PWC use is assumed to remain only in the Great Kills Park / Crookes Point area. Municipal discharges from nearby areas, as well as from local marinas, are also sources of hydrocarbons to surface waters, but were not included in the calculations. Threshold volumes calculated for cumulative impacts are shown in Table 41.

Results of the water quality analysis for all motorboat activity shows that for all pollutants evaluated the estimated ecotoxicological threshold volumes for 2002 and 2012 would be less than water volumes available in NPS jurisdictional waters of Great Kills Harbor and Fort Wadsworth / Miller Field. At Great Kills Park / Crookes Point, however, the 2002 threshold volumes for benzo(a)pyrene, 1-methyl naphthalene, and benzene would exceed the water volume within NPS boundaries (752 ac-ft) by up to three times. In 2012 only the threshold for 1-methyl naphthalene (900 ac-ft) would exceed the volume within NPS boundaries at Great Kills Park / Crookes Point. However, the majority of these compounds would be from other motorboats operating throughout the unit's waters. Because the available water volume for this calculation only includes water within the NPS jurisdictional boundaries, this volume is less than the total volume available in the area to dilute pollutants. Mixing, flushing, and the resulting dilution from adjacent Lower Bay waters would likely reduce concentrations of these compounds. For PAHs additional removal from the water column would occur as a result of adsorption onto particulate matter and sedimentation. Based solely on the analysis and its parameters, cumulative impacts to aquatic organisms based on ecotoxicological benchmarks would be potentially major for the Great Kills Park / Crookes Point area; however, with the other removal mechanisms, it is likely that this would be reduced to a moderate level in most cases. Impacts in the Great Kills Harbor and Fort Wadsworth / Miller Field areas would be negligible or minor.

Human health threshold volumes for benzo(a)pyrene would be lower than jurisdictional water volumes in all three areas in 2002 and 2012, with minor to negligible impacts. Threshold volumes for benzene in 2002, however, would be from 3 to nearly 20 times larger than available water volumes in the NPS jurisdictional waters of all three areas.

Great Kills Harbor — While the jurisdictional volume of water (738 ac-ft) is smaller than the threshold volume for benzene (2,600 ac-ft) in 2002, the entire volume of the harbor (3,179 ac-ft) would be larger than the benzene threshold volume from 2002 through 2012.

Great Kills Park / Crookes Point — The NPS jurisdictional volume (752 ac-ft) would be much smaller than the benzene threshold volumes in 2002 (13,000 ac-ft) and 2012 (5,500 ac-ft). As previously mentioned, the majority of these compounds are from other motorboats operating throughout the unit's waters, and many mechanisms serve to reduce the concentration of pollutants in the area analyzed (i.e., NPS jurisdictional waters). For benzene in particular, a half-life of five hours would reduce concentrations in water considerably.

Fort Wadsworth / Miller Field — The NPS jurisdictional water volume (8,076) would be slightly less than the threshold volume for benzene in 2002 (11,000 ac-ft), but greater than the benzene threshold in 2012 (4,500 ac-ft).

Cumulative impacts from benzene would be moderate at Great Kills Harbor and Fort Wadsworth / Miller Field and potentially major at Great Kills Park / Crookes Point. Monitoring would be needed to determine if mitigation measures would be required at Great Kills Park / Crookes Point.

Conclusion. Under alternative A water quality impacts due to PWC emissions at Great Kills Park / Crookes Point would be negligible to minor for all pollutants in 2002 and 2012. However, risks from benzene under human health benchmarks would be potentially major in 2002 and 2012, depending on volatilization and dilution. Monitoring would be needed to determine if mitigation measures would be required.

Cumulative water quality impacts to aquatic organisms under ecotoxicological benchmarks from all motorized vessels in 2002 would range from potentially major at Great Kills Park / Crookes Point (benzo(a)pyrene, 1-methyl naphthalene, and benzene) to negligible at Great Kills Harbor and Fort Wadsworth / Miller Field (all pollutants). In 2012 only 1-methyl naphthalene would continue to have potentially major impacts at Great Kills Park / Crookes Point, while benzo(a)pyrene and benzene would have moderate impacts. Cumulative impacts under human health benchmarks would be negligible to minor from benzo(a)pyrene in all areas in 2002 and 2012. Cumulative impacts from benzene would range from moderate at Great Kills Harbor and Fort Wadsworth to potentially major at Great Kills Park / Crookes Point in 2002 and 2012. In view of the potentially major impacts to water quality throughout the assessment period, water quality monitoring of these organics in areas of high PWC and boat use in the Staten Island Unit would be needed to confirm the predicted level of impact.

This alternative would not impair water quality.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Under alternative B all of the NPS jurisdictional waters in Great Kills Harbor would remain open to PWC use; all other areas of the unit would be closed to personal watercraft. Because the NPS boundary is fairly close to the shore in Great Kills Harbor, PWC users would have to travel at 5 mph within NPS waters, and they would likely quickly leave this area. Consequently, there would be no detectable PWC emissions of organic pollutants within park waters, and PWC-related impacts to water quality would be negligible. In areas no longer open to PWC use (compared to alternative A), impacts would be beneficial.

Cumulative Impacts. Under this alternative there would be no detectable contribution to cumulative impacts from PWC use because no operation would be allowed in unit waters other than the Great Kills

Park boat ramp area. Impacts from all other forms of motorized vessels would continue, but at somewhat reduced levels from those described under alternative A (see Table 42).

TABLE 42: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE B — STATEN ISLAND UNIT

	Great Kills Harbor		Great Kills Park / Crookes Point		Fort Wadsworth / Miller Field	
	2002	2012	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	738 (Total harbor water volume is 3,179 ac-ft.)		752		8,076	
Ecotoxicological Benchmarks*						
Benzo(a)pyrene (fuel and exhaust)	210	86	860	360	870	360
Naphthalene	83	34	340	140	350	180
1-methyl naphthalene	420	170	1,700	720	1,800	730
Benzene	200	82	820	340	830	340
MTBE	9	banned	35	banned	35	banned
Human Health Benchmarks**						
Benzo(a)pyrene (fuel and exhaust)	60	25	250	100	250	100
Benzene	2,600	1,100	11,000	4,400	11,000	4,500

NOTE: This alternative would close Crookes Point, Swinburne and Hoffman Islands, Miller Field, and Fort Wadsworth to PWC use. PWC use in Great Kills Harbor would be negligible (based on staff observations and because of speed restrictions) under alternative B.
* Threshold volumes (acre-ft) below which ecotoxicological effects might occur.
** Threshold volumes (acre-ft) below which human health might be impacted.

Results of the cumulative water quality analysis shows that threshold volumes for ecotoxicological benchmarks for 2002 would be less than NPS jurisdictional water volumes in Great Kills Harbor and Fort Wadsworth / Miller Field for all pollutants evaluated. At Great Kills Park / Crookes Point, the available water volume (752 ac-ft) would be somewhat less than the threshold volume for 1-methyl naphthalene (1,700 ac-ft) in 2002, but greater than the threshold volume (720 ac-ft) in 2012. The benzo(a)pyrene threshold (860 ac-ft) and benzene threshold (820 ac-ft) would slightly exceed the available water volume (752 ac-ft) in 2002, but not in 2012. Given the additional dilution and removal mechanisms that would occur in the Great Kills Park waters, it is unlikely that major impact levels would occur; therefore, cumulative impacts to aquatic organisms based on ecotoxicological benchmarks would be considered moderate at Great Kills Park / Crookes Point, minor at Great Kills Harbor, and negligible at Fort Wadsworth / Miller Field in 2002 and 2012.

Human health threshold volumes for benzo(a)pyrene would be well below NPS jurisdictional water volumes in all three areas in 2002 and 2012. Cumulative impacts to human health from benzo(a)pyrene would be considered minor to negligible in 2002 and 2012. However, threshold volumes for benzene would be 3 to 14 times larger than available NPS jurisdictional water volumes in all three areas in 2002.

Great Kills Harbor — While the NPS jurisdictional water volume (738 ac-ft) would be less than the threshold volume for benzene (2,600 ac-ft) in 2002, the entire volume of the harbor (3,179 ac-ft) is larger than the benzene threshold volumes in 2002 and 2012.

Great Kills Park / Crookes Point — The NPS jurisdictional volume (752 ac-ft) would be much smaller than the benzene threshold volume in 2002 (11,000 ac-ft) and 2012 (4,400 ac-ft).

Fort Wadsworth / Miller Field — The NPS jurisdictional water volume (8,076 ac-ft) would be slightly less than the benzene threshold volume in 2002 (11,000 ac-ft), but greater than the benzene threshold in 2012 (4,500 ac-ft).

Even given the expected removal of benzene through volatilization, cumulative impacts to human health from benzene would be moderate at Great Kills Harbor and Fort Wadsworth / Miller Field and possibly

major at Great Kills Park / Crookes Point in 2002 and 2012. Water quality monitoring would be needed in areas of high motorboat use to determine if mitigation measures would be required.

Conclusion. PWC use within a small portion of the unit would have negligible impacts on water quality within NPS jurisdictional waters. Water quality impacts in areas that would be closed to further PWC use would be beneficial.

Cumulative impacts would be somewhat reduced from those predicted under alternative A. Under eco-toxicological benchmarks impacts would be considered moderate at Great Kills Park / Crookes Point, minor at Great Kills Harbor, and negligible at Fort Wadsworth / Miller Field in 2002 and 2012. Under human health benchmarks impacts from benzo(a)pyrene would be negligible to minor for all areas in 2002 and 2012. Cumulative impacts from benzene would range from potentially major at Great Kills Park / Crookes Point to moderate at Great Kills Harbor and Fort Wadsworth / Miller Field in 2002 and 2012. Water quality monitoring would be needed in areas of high motorboat use to determine if mitigation measures would be required.

This alternative would not impair water quality.

Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period

Analysis. The same restrictions proposed under alternative B would be applied under alternative C; however, permits at the Great Kills Park boat ramp would be phased out over a three-year period, thus ending PWC use in the unit. Pending the phaseout of PWC use, impacts on water quality would continue to be negligible because relatively little use would occur within NPS jurisdictional waters. While PWC users would use the Great Kills Park boat ramp, they would have to travel at 5 mph hour within the park boundary and would quickly leave jurisdictional waters. After three years, PWC use would be prohibited throughout the unit; therefore, no impact to water quality resulting from PWC use would occur. Banning PWC use within NPS jurisdictional waters would result in beneficial impacts because no PWC emissions would be released into unit waters. By 2012 water quality would be slightly improved because overall emissions would be reduced with improvements in engine technology.

Cumulative Impacts. Cumulative impacts under alternative C would be the same as alternative B (see Table 42) and somewhat reduced from those predicted under alternative A. Cumulative impacts to aquatic organisms based on ecotoxicological benchmarks would be considered moderate at Great Kills Park / Crookes Point, minor at Great Kills Harbor, and negligible at Fort Wadsworth / Miller Field in 2002 and 2012. Cumulative risks to human health from benzo(a)pyrene would be negligible to minor for all areas in 2002 and 2012. Cumulative risks from benzene would range from potentially major at Great Kills Park / Crookes Point to moderate at Great Kills Harbor and Fort Wadsworth / Miller Field in 2002 and 2012. Water quality monitoring would be needed in areas of high motorboat use to determine if mitigation measures would be required.

Conclusion. PWC emissions would have negligible impacts on water quality during the phaseout period because little use would occur in NPS jurisdictional waters. Banning PWC use from unit waters following a three-year phaseout period would result in beneficial impacts because no PWC emissions would be released into unit waters. By 2012 water quality would be slightly improved because of reduced emissions.

On a cumulative basis, impacts would be the same as alternative B. Under ecotoxicological benchmarks impacts would range from negligible to moderate in NPS jurisdictional waters in 2002 and 2012. Under

human health benchmarks impacts from benzo(a)pyrene would range from negligible to minor in all areas in 2002 and 2012, while impacts from benzene would range from potentially major at Great Kills Park / Crookes Point to moderate at Great Kills Harbor and Fort Wadsworth / Miller Field in 2002 and 2012. Water quality monitoring would be needed in areas of high motorboat use to determine if mitigation measures would be required.

This alternative would not impair water quality.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Banning PWC use within NPS jurisdictional waters in the Staten Island Unit would result in beneficial impacts because no PWC emissions would be released into unit waters. By 2012 water quality would be slightly improved.

Cumulative Impacts. While PWC use within the unit would not contribute to cumulative impacts from motorized boat emissions within NPS waters, impacts from other sources would continue. Threshold volumes for pollutants from other motorized craft would be the same as those described in alternative B (see Table 42) and would be reduced somewhat from those predicted under alternative A. Cumulative water quality impacts from motorboats based on ecotoxicological benchmarks for organic pollutants would range from negligible to moderate. Cumulative risks to human health from benzo(a)pyrene would be minor to negligible for all areas in 2002 and 2012. Cumulative risks from benzene would range from potentially major (Great Kills Park / Crookes Point) to moderate (Great Kills Harbor and Fort Wadsworth) in 2002 and 2012. Water quality monitoring would be needed in areas of high motorboat use to determine if mitigation measures would be required.

Conclusion. Banning PWC use within NPS jurisdictional waters would have a beneficial impact by contributing to improved water quality conditions in areas currently open to PWC use.

On a cumulative basis, impacts would be the same as alternative B and somewhat reduced from those predicted under alternative A. Under ecotoxicological benchmarks impacts would range from negligible to moderate in NPS jurisdictional waters in 2002 and 2012. Under human health benchmarks impacts from benzo(a)pyrene would range from negligible to minor in all areas in 2002 and 2012, while impacts from benzene would range from potentially major at Great Kills Park / Crookes Point to moderate at Great Kills Harbor and Fort Wadsworth / Miller Field in 2002 and 2012. Water quality monitoring would be needed in areas of high motorboat use to determine if mitigation measures would be required.

This alternative would not impair water quality.

AIR QUALITY

GUIDING REGULATIONS AND POLICIES

Clean Air Act. As described for the Jamaica Bay Unit, the Clean Air Act establishes national ambient air quality standards to protect the public health and welfare from air pollution. The act also establishes the prevention of significant deterioration (PSD) of air quality program to protect the air in relatively clean areas. The Staten Island Unit is designated a class II area, and only moderate air quality deterioration is allowed in these areas. In no case, however, may pollution concentrations violate any of the national ambient air quality standards.

Conformity Requirements. Located in Richmond County, New York, the Staten Island Unit is designated by the U.S. Environmental Protection Agency as a severe non-attainment area for ozone. The unit is in attainment for all other criteria pollutants (CO, NO_x, SO_2, PM_{10}, and Pb), although it is a maintenance area for CO. The New York State Implementation Plan (revised October 2001) established control measures to ensure that the national ambient air quality standards for of ozone will be met by year 2007. Therefore, the State Implementation Plan applies to the analysis area, and the proposed action(s) are subject to federal conformity determination or requirement. The proposed actions are not predicted to add air pollutants not already included in the state plan; therefore, the project is presumed to conform with the state plan, and a conformity determination is not required (40 CFR 93.158).

In addition, the New York metropolitan area was previously designated as a moderate non-attainment area for CO based on ambient data recorded in Kings County — Brooklyn (56 FR 56694 and 57 FR 56762). Effective May 20, 2002, the U.S. Environmental Protection Agency redesignated the entire metropolitan area in attainment for CO with an approved maintenance plan (67 FR 19337, April 19, 2002). The CO emissions from PWC use will not be subject to a conformity determination because they are already accounted for in the State Implementation Plan.

Applicable PWC Emission Standards. As described for the Jamaica Bay Unit, New York State law (NYSCL, Environmental Conservation, 19-0306-A) prescribes the adoption of standards and regulations equivalent to those California has adopted for accelerating the reduction of exhaust emissions of ozone precursor chemicals HC (which relates to VOC) and NO_x from new spark-ignition marine engines. The Division of Air Resources is scheduled to promulgate regulations by the end of 2002, which by 2012 are predicted to result in approximately a 60% reduction of VOC compared to the baseline emissions in the 1998 State Implementation Plan (CARB 1998a).

NPS Management Policies. Under its *Management Policies 2001* the National Park Service will

> seek to perpetuate the best possible air quality in parks to (1) preserve natural resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas (NPS 2000c).

The *Management Policies* further state that the National Park Service will assume an aggressive role in promoting and pursuing measures to protect air quality related values from the adverse impacts of air pollution. In cases of doubt as to the impacts of existing or potential air pollution on park resources, the National Park Service "will err on the side of protecting air quality and related values for future generations."

The *Management Policies* apply equally to all areas of the national park system, regardless of an area's designation under the Clean Air Act. Furthermore, the Organic Act and the *Management Policies* provide additional protection from that afforded by the Clean Air Act's national ambient air quality standards alone because the National Park Service has documented that specific park air quality related values can be adversely affected at levels below the national standards or by pollutants for which no standard exists.

METHODOLOGY AND ASSUMPTIONS

The methods and assumptions for assessing air quality impacts at the Staten Island Unit are the same as those described for the Jamaica Bay Unit (see page 91). In addition, the following assumptions related specifically to State Island:

1. The Staten Island Unit is in attainment for all criteria pollutants except ozone, for which the area is in severe non-attainment. The unit is in a maintenance area for CO.

2. Cumulative impacts were analyzed quantitatively for all recreational watercraft. The Staten Island Unit is accessible to cars, trucks, and recreational vehicles; emissions from these vehicles and other local and regional sources of air pollutants were not assessed quantitatively but were considered in the cumulative impact assessment.

Two categories of potential airborne pollution impacts from personal watercraft and other motorized watercraft are analyzed: (1) impacts on human health, and (2) impacts on air quality related values in the park area. Thresholds (negligible, minor, moderate, and major) are discussed below for each impact category.

IMPACT ANALYSIS AREA

The impact analysis area includes the immediate location of PWC use and the surrounding nearshore environment where air pollutants may accumulate. Air quality impacts were assessed at the three areas of watercraft activity within the Staten Island Unit — Great Kills Park / Crookes Point, Great Kills Harbor, and Miller Field / Fort Wadsworth.

IMPACT TO HUMAN HEALTH FROM AIRBORNE POLLUTANTS RELATED TO PWC USE

Because the Staten Island Unit is in attainment with all national ambient air quality standards except ozone, and because it is in a maintenance area for CO, two sets of thresholds must be considered, as described for the Jamaica Bay Unit and as highlighted in the text box.

Thresholds for Impacts to Human Health from Airborne Pollutants

Attainment Pollutants (NO_x, SO_2, PM_{10}, Pb): The following impact thresholds have been defined:

	Activity Analyzed		Current Air Quality
Negligible:	Emission levels would be less than 50 tons/year for each pollutant.	**and**	The first highest 3-year maximum for each pollutant is less than NAAQS.
Minor:	Emission levels would be less than 100 tons/year for each pollutant.	**and**	The first highest 3-year maximum for each pollutant is less than NAAQS.
Moderate:	Emission levels would be greater than or equal to 100 tons/year for any pollutant.	**or**	The first highest 3-year maximum for each pollutant is greater than NAAQS.
Major:	Emission levels would be greater than or equal to 250 tons/year for any pollutant.	**and**	The first highest 3-year maximum for each pollutant is greater than NAAQS.

Non-attainment or maintenance pollutants (O_3 and CO): The following impact thresholds have been defined (for ozone, the precursor pollutants are VOC and NOx):

Negligible:	There would be a net decrease in emissions from current levels.
Minor:	Emissions would be 0–5 tons/year.
Moderate:	Emissions would be greater than 5 tons/year and less than conformity *de minimus** levels (25 tons/year for ozone, 100 tons/year for CO).
Major:	Emissions would be equal to or greater than conformity *de minimus* levels (25 tons/year for ozone, 100 tons/year for CO).

* Conformity *de minimis* levels are levels of emissions below which a federal action in a non-attainment or maintenance area is presumed to conform to a state's implementation plan and not require further review. Actions in attainment areas are presumed to conform and do not require analysis with respect to *de minimis* levels.

Impairment (for both attainment and non-attainment areas): Impacts would have a major adverse effect on park resources and values; and

contribute to deterioration of the park's air quality to the extent the park's purpose could not be fulfilled as established in its enabling legislation; or

affect resources key to the recreation area's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the recreation area's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Under alternative A there would be 39 personal watercraft per hour at peak times in 2002, increasing to 40 watercraft by 2012 (see "PWC and Visitor Use Trends," page 177). Estimated PWC emissions are shown in Table 43.

TABLE 43: PWC EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE A — STATEN ISLAND UNIT

	CO		PM		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	110.2	89.94	2.19	0.35	0.51	1.65	50.42	9.42
Impact Level (adverse)	Major	Moderate	Negligible	Negligible	Minor	Minor	Major	Moderate

The ambient air quality levels would continue to be met for all national ambient air quality standards except ozone. For a CO maintenance area the air quality impact levels would be major adverse in 2002 (PWC emissions would be greater than 100 tons/year), decreasing to moderate in 2012 with a projected reduction in emissions due to cleaner burning PWC engines. Impacts would be negligible adverse for PM. For ozone precursors, impacts from NO_x would be minor adverse (less than 25 tons/year). Impacts from VOC would be major adverse in 2002 because the PWC emission levels would be more than the emission threshold (25 tons/year) for a non-attainment area, decreasing to moderate adverse (less that 25 tons/year) in 2012.

Cumulative Impacts. A variety of commercial and recreational watercraft are found in the waters in and around the unit. According to an informal NPS survey, the number of other boats present within unit waters could total 352 boats during peak hours, plus 39 personal watercraft. Considering the average national trend of motorized watercraft use and the current and future emission levels generated within the unit, the cumulative emissions and impacts of all boating activities under alternative A are presented in Table 44.

TABLE 44: PWC AND MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE A — STATEN ISLAND UNIT

	CO		PM		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	1,048.56	984.77	18.67	13.06	29.68	38.36	341.18	134.52
Impact Level (adverse)	Major	Major	Negligible	Negligible	Major	Major	Major	Major

PM emission levels would be negligible in 2002 and 2012. The cumulative impacts from CO would be major adverse for a maintenance area (more than 100 tons/year). For ozone precursors in a non-attainment

area, impacts would be major adverse for NO_x and VOC throughout the assessment period because emissions would exceed 25 tons/year.

Conclusion. PWC use would continue at existing levels within the unit boundary, resulting in major adverse impacts from CO in 2002, decreasing to moderate in 2012. Impacts from PM would be negligible. Located in an ozone non-attainment area, the unit would experience major adverse impacts to air quality from VOC in 2002, decreasing to moderate by 2012. Impacts from NO_x would be minor adverse throughout the assessment period.

Overall, emissions from all watercraft activity under this alternative would result in major adverse impacts for CO and negligible adverse impacts for PM. Impacts for NO_x and VOC would be major adverse in 2002 and 2012.

The alternative would not impair air quality resources.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Under alternative B the unit's jurisdictional waters in Great Kills Harbor would remain open to PWC use and the 5 mph speed limit would continue to be a barrier to PWC use other than launching at the boat ramp. The Great Kills Park / Crookes Point area would be closed to PWC use, as would Swinburne and Hoffman Islands, Miller Field, and Fort Wadsworth. Therefore, with speed restrictions and limited use areas, estimated PWC emissions under alternative B would be negligible and are assumed to be close to zero.

Cumulative Impacts. Impacts on air quality from other sources, including all other forms of motorized recreation, would continue, but at reduced levels from those described under alternative A because of the absence of personal watercraft (Table 45).

TABLE 45: PWC AND MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE B — STATEN ISLAND UNIT

	CO		PM		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	938.36	894.83	16.48	12.71	29.17	36.71	290.76	125.10
Impact Level (adverse)	Major	Major	Negligible	Negligible	Major	Major	Major	Major

Under alternative B the impact of PM emissions would be negligible in 2002 and 2012, while the cumulative emission levels for CO would be major adverse (more than 100 tons/year) in a maintenance area. Emission levels for VOC and NO_x would be major adverse throughout the assessment period because they would exceed the emission threshold (25 tons/year) for an ozone non-attainment area.

Conclusion. PWC use would be limited to waters near the Great Kills Park boat launch under alternative B. Estimated PWC emissions under alternative B would be negligible and are assumed to be close to zero.

The cumulative impacts from all boating activities under this alternative would be major adverse for CO and negligible adverse for PM. Impacts from NO_x, and VOC would be major adverse in both 2002 and 2012.

The alternative would not impair air quality resources.

Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period

Analysis. Under alternative C the restrictions proposed under alternative B would be applied; however, permits at the Great Kills Park boat ramp would be gradually phased out, resulting in negligible impacts on air quality from PWC use. After three years PWC use would be prohibited throughout the unit, resulting in a beneficial impact.

Cumulative Impacts. Cumulative impacts under alternative C would be the same as alternative B (see Table 45).

Conclusion. Impacts on air quality from PWC use during the phaseout period would be negligible. After three years PWC use would be prohibited throughout the unit, resulting in a beneficial impact.

Cumulative air quality impacts from all other motorized watercraft would range from negligible (PM) to major adverse (CO, NO_x, and VOC), the same as alternative B, with no contribution from PWC use after three years.

The alternative would not impair air quality resources.

Impacts of the No-Action Alternative — No PWC Use

Analysis. The no-action alternative would close all unit waters to PWC use, so there would be no resulting emissions within the unit boundary, resulting in beneficial impacts.

Cumulative Impacts. Cumulative impacts would be the same as those described for alternatives B and C (see Table 45). Under the no-action alternative, emissions within the unit would result from other motorized boat activity only; PWC use would not contribute to those impacts.

Overall, the cumulative emission levels for CO would be major adverse, as would emission levels for VOC and NO_x since they would exceed the emission threshold (25 tons/year) for an ozone non-attainment area. PM emission levels would be negligible adverse.

Conclusion. Banning PWC use would remove this source of air pollution within NPS jurisdictional waters, resulting in beneficial impacts.

Cumulative air quality impacts from all other motorized watercraft would range from negligible (PM) to major adverse (CO, NO_x, and VOC), the same as alternative B, with no contribution from PWC use.

The alternative would not impair air quality resources.

IMPACT TO AIR QUALITY RELATED VALUES FROM PWC POLLUTANTS

As described for the Jamaica Bay Unit, impacts to air quality related values include effects on visibility and biological resources (specifically ozone effects on plants) from airborne pollutants related to PWC use. To assess the impacts of ozone on plants, the existing area average ozone index values were used and are represented as SUM06. Based on the five-year average data provided by National Park Service, the SUM06 for the impact analysis area is within a range of 19–25 ppm-hrs based on urban site data. $PM_{2.5}$ as a fraction of particulate matter is evaluated for visibility impairment. The impact thresholds are summarized in the following text box.

Thresholds for Impacts to Air Quality Related Values

	Activity Analyzed		Current Air Quality
Negligible:	Emissions would be less than 50 tons/year for each pollutant.	**and**	There are no perceptible visibility impacts (photos or anecdotal evidence). **and** There is no observed ozone injury on plants. **and** SUM06 ozone is less than 12 ppm-hours.
Minor:	Emissions would be less than 100 tons/year for each pollutant.	**and**	SUM06 ozone is less than 15 ppm-hours.
Moderate:	Emissions would be greater than 100 tons/year for any pollutant. **or** Visibility impacts from cumulative PWC emissions would be likely (based on past visual observations).	**or**	Ozone injury symptoms are identifiable on plants. **and** SUM06 ozone is less than 25 ppm-hours.
Major:	Emissions would be equal to or greater than 250 tons/year for any pollutant. **or** Visibility impacts from cumulative PWC emissions would be likely (based on modeling or monitoring).	**and**	Ozone injury symptoms are identifiable on plants. **or** SUM06 ozone is greater than 25 ppm-hours.

Impairment: Impacts would have a major adverse effect on park resources and values; and

contribute to deterioration of the park's air quality to the extent that the park's purpose could not be fulfilled as established in its enabling legislation; or

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Under alternative A all unit waters would remain open to PWC use, and the New York State boating regulations would continue to be enforced. PWC use is projected to increase from 39 to 40 PWC units at Great Kills Park / Crookes Point by 2012. Projected emissions are shown in Table 46.

TABLE 46: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS, ALTERNATIVE A — STATEN ISLAND UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	2.02	0.32	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

SUM06 ozone levels would be 19–25 ppm-hrs, resulting in a moderate adverse impact level related to ozone injury. Currently, there are no perceptible qualitative visibility impacts of record or observed ozone

injury to plants. PWC emission levels would be less than 50 tons/year for $PM_{2.5,}$ a negligible adverse impact on visibility.

Cumulative Impacts. The cumulative impact analysis includes a quantitative assessment of fine particulate matter ($PM_{2.5}$) for other marine recreational vehicle use, taking into consideration national use trends, as well as current and future emission levels. Cumulative emissions and impacts of all PWC and other boating use under alternative A are shown in Table 47.

The cumulative impact from all emissions related to PWC and motorized boat use would be moderate adverse for ozone (between 15 and 25 SUM06 ozone values) and negligible for visibility as a function of $PM_{2.5}$ emissions (less than 50 tons/year) Future emission levels would decrease as a result of U.S. Environmental Protection Agency and state marine engine emission requirements taking effect.

TABLE 47: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, ALTERNATIVE A — STATEN ISLAND UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	17.18	12.02	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

Conclusion. Annual emissions from PWC use under alternative A would result in moderate adverse impacts for ozone exposure and negligible impacts to visibility. There are no perceptible visibility impacts on record or observed ozone injury on plants.

Cumulative emissions from all motorized boating activities would result in moderate adverse impacts from ozone and negligible visibility impacts from $PM_{2.5}$.

This alternative would not impair air quality related values.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Under alternative B only the boat launch in Great Kills Harbor at Great Kills Park would remain open to PWC use, but operators would have to travel at 5 mph until they left NPS jurisdictional waters. Alternative B would effectively close the unit to PWC use, so PWC emissions would be negligible, and there would be no PWC-related impacts on visibility or ozone exposure.

Cumulative Impacts. There would be no contribution to cumulative impacts from PWC use under this alternative. Impacts from other sources, including all other forms of motorized recreation, would continue, but they would be slightly reduced from those described under alternative A (see Table 47).

The cumulative impact from all emissions related to PWC and motorized boat use would be moderate adverse for ozone (between 19 and 25 ppm-hrs SUM06 ozone values) and negligible for visibility as a function of $PM_{2.5}$ emissions (less than 50 tons/year). Future emission levels would decrease as a result of U.S. Environmental Protection Agency and state marine engine emission standards.

TABLE 48: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, ALTERNATIVE B — STATEN ISLAND UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	15.16	11.69	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

Conclusion. Impacts from PWC use under alternative B would be negligible because use would be effectively removed from unit waters.

Cumulative emissions from all boating activities would result in moderate adverse impacts from ozone and negligible visibility impacts from $PM_{2.5}$.

This alternative would not impair air quality related values.

Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period

Analysis. Under alternative C PWC use would be restricted as described under alternative B, with negligible impacts to air quality. After three years, PWC use would be prohibited throughout the unit, thus eliminating any contribution to air quality impacts from PWC use. This would be a beneficial impact.

Cumulative Impacts. Cumulative impacts would be the same as alternative B (see Table 48), with moderate adverse impacts from ozone (between 19 and 25 ppm-hrs SUM06 ozone values) and negligible visibility impacts ($PM_{2.5}$ emissions less than 50 tons/year). Future emission levels would decrease as a result of U.S. Environmental Protection Agency and state marine engine emission standards taking effect.

Conclusion. Use restrictions under alternative C, similar to alternative B, would result in negligible impacts on air quality related values. After three years PWC use would be banned within the unit, resulting in a beneficial impact on air quality.

Cumulative emissions from all boating activities would result in moderate adverse impacts from ozone and negligible visibility impacts from $PM_{2.5}$.

This alternative would not impair air quality related values.

Impacts of the No-Action Alternative — No PWC Use

Analysis. The no-action alternative would close all unit waters to PWC use, resulting in beneficial impacts to air quality related values.

Cumulative Impacts. Cumulative impacts under the no-action alternative would be the same as for alternatives B and C. Impacts would be moderate adverse for ozone (between 19 and 25 ppm-hrs SUM06 ozone values) and negligible for visibility based on $PM_{2.5}$ emissions (less than 50 tons/year). Future emis-

sion levels would decrease as a result of emission standards adopted by the U.S. Environmental Protection Agency and the state taking effect.

Conclusion. Annual emissions from personal watercraft under the no-action alternative would be removed from unit waters, resulting in beneficial impacts to air quality related values.

Cumulative emissions from all boating activities would result in moderate adverse impacts from ozone and negligible visibility impacts from $PM_{2.5}$.

This alternative would not impair air quality related values.

SOUNDSCAPES

As described for the Jamaica Bay Unit (see page 101), personal watercraft must meet the NPS watercraft noise regulation of 82 dB at 82 feet at full acceleration. The noise from personal watercraft may be more noticeable and therefore more annoying than noise from other motorcraft because of rapid increases and changes in sound frequency distribution due to quick changes in acceleration and direction, and jumping into the air. Human-generated noise sources at the Staten Island Unit include personal watercraft and other types of motorized vessels, vehicular traffic, aircraft, and noise from the private communities.

GUIDING REGULATIONS AND POLICIES

As described for the Jamaica Bay Unit, NPS policy requires degraded soundscapes to be restored to the natural condition whenever possible, and natural soundscapes to be protected from degradation due to undesirable human-caused sound (*Management Policies 2001,* sec. 4.9). The National Park Service is specifically directed to "take action to prevent or minimize all noise that, through frequency, magnitude, or duration, adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified as being acceptable to, or appropriate for, visitor uses at the sites being monitored" (*Management Policies 2001,* sec. 4.9). Overriding this is the Park Service's fundamental purpose to conserve park resources and values, and adverse impacts on park resources and values must be avoided or minimized to the greatest degree practicable (*Management Policies 2001,* sec 1.4.3).

METHODOLOGY AND ASSUMPTIONS

Impacts to the soundscape at the Staten Island Unit were evaluated based on the existing sound levels compared to potential sound levels under each alternative. This evaluation is a qualitative assessment based on the general trends of PWC use in the park and best professional judgment. While specific background noise studies are not available for Staten Island, certain conditions have been taken into account given the number of PWC users in the identified impact analysis area and adjacent land use patterns. For example, it is assumed that the soundscape throughout the majority of the unit is that of an urban area. Impacts to wildlife from noise are addressed separately under "Wildlife and Wildlife Habitat."

Context: The Staten Island Unit includes areas characterized by intense motorized boat activity, and other activities associated with an urban park.

Time Factor: PWC use is assumed to occur from May through September (a period of approximately 160 days), with peak use from Memorial Day to Labor Day. PWC use occurs during daylight hours as mandated under New York State boating regulations. Use generally stops during periods of inclement weather (e.g., cold, thunderstorms). In areas of concentrated

PWC use, such as Crookes Point, noise from personal watercraft and other boats can be constant from sunrise to sunset. In areas of low PWC use, noise from other boat types as well as highways (e.g., the Verrazano Narrows Bridge) can be constant.

Intensity: Noise generated by watercraft is expected to affect visitors differently. Impacts must take into account the effect of noise levels on different types of recreational users within the impact analysis area. The following are other considerations for evaluating sound impacts:

A maximum of 39 personal watercraft would operate per hour in 2002, increasing to 40 by 2012. Highest daily use would be at midday during the peak season.

Ambient noise levels can be assumed to be high and include noise associated with heavy visitation, high boat and PWC usage, traffic noise, and noise associated with an urban setting.

The methodology used to assess impacts for the Staten Island Unit is the same as that used for the Jamaica Bay Unit (see page 103). For the Staten Island Unit the noise levels calculated for the analysis area, based on average PWC numbers per hour, would be 82 dB for 39 PWC at 500 feet from shore in the Great Kills Park / Crookes Point area.*

IMPACT ANALYSIS AREA

The impact analysis area for soundscapes is related to the location that personal watercraft operate and the distance that PWC noise travels. PWC use is present at Crookes Point at the southern end of the Staten Island Unit (see "PWC and Visitor Use Trends," page 177). PWC noise can travel inland and is expected to dissipate within 0.75 mile of the source. Therefore, the impact analysis area is Crookes Point and Great Kills Park.

IMPACT TO VISITORS FROM PWC NOISE

The impact thresholds defined for soundscapes would be the same as for the Jamaica Bay Unit and are highlighted below.

Thresholds for Impacts to Visitors from PWC Noise

Negligible: Natural sounds would prevail; motorized noise would be very infrequent or absent, mostly immeasurable.

Minor: Natural sounds would be predominant in areas where management objectives call for natural processes to predominate, with motorized noise infrequent at low levels. In areas where motorized noise is consistent with park purpose and objectives, noise could be heard frequently throughout the day at moderate levels, or infrequently at higher levels, and natural sounds could be heard occasionally.

Moderate: In areas where management objectives call for natural processes to predominate, natural sounds would predominate, but motorized noise could occasionally be present at low to moderate levels. In areas where motorized noise is consistent with park purpose and objectives, motorized noise would predominate during daylight hours and would not be overly disruptive to noise-sensitive visitor activities in the area; in such areas, natural sounds could still be heard occasionally.

* In this assessment the noise of two or more personal watercraft operating at the same time (when one unit produces 82 dB), and at a distance of 82 feet from the source, was shown to be 85 dB. To calculate the noise level at 500 feet, the equation used was $10 \times \log((10^{82/10}) + (10^{82/10})) = 85$ dB. The equation used was $20 \times \log(D1/D2)$, where D1 = the location to be calculated, and D2 = the distance of the known noise source.

Major: In areas where management objectives call for natural processes to predominate, natural sounds would be impacted by human noise sources frequently or for extended periods of time at moderate intensity levels (but no more than occasionally at high levels), and in a minority of the area. In areas where motorized noise is consistent with park purpose and zoning, the natural soundscape would be impacted most of the day by motorized noise at low to moderate intensity levels, or more than occasionally at high levels; motorized noise would disrupt conversation for long periods of time and/or make enjoyment of other activities in the area difficult; natural sounds would rarely be heard during the day.

Impairment: The level of noise associated with PWC use would be heard consistently and would be readily perceived by other visitors throughout the day, especially in areas where such noise would potentially conflict with the intended use of that area. In addition, these adverse, major impacts to park resources and values would:

contribute to deterioration of the park's soundscape to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Under alternative A all unit waters would remain open to PWC use, and the New York State boating regulations would continue to be enforced. During peak operating hours it is assumed that 39 personal watercraft would be present in the Great Kills Park / Crookes Point area. PWC users are required to maintain a distance of 500 feet from any marked bathing beaches. PWC users launch from the Great Kills Park boat ramp; however, speeds of less than 5 mph must be maintained.

Noise limits established by the National Park Service are 82 dB at 82 feet. On average more than 30 personal watercraft are present at any point within the unit boundary. Two personal watercraft that emit 82 dB of sound would emit 85 dB at 82 feet. Noise levels generated by 5 personal watercraft at 85 dB would reach the shoreline at 77 dB when traveling greater than 200 feet from shore. Visitors sunbathing or fishing within the unit boundary would be directly exposed to noise generated by personal watercraft. At 500 feet, 39 personal watercraft would produce sound levels of 82 dB on shore.

Within the unit boundary the noise levels recede as the noise travels over the shoreline, dunes, and vegetation. As sound travels inland, the attenuating properties of the terrain and natural vegetation would further reduce noise levels. However, the ambient noise levels within the unit may be considered high due to the urban location of the unit.

Overall, minor adverse impacts would result from PWC noise levels within the Staten Island Unit over the short and long term. Due to current boat and PWC traffic in Raritan Bay and Lower Bay, PWC noise generated within the unit would be consistent with ambient noise levels. Potential reduction in noise emissions (as forecasted by the industry; see Sea-Doo 2001b and Yamaha Motor 2001) could contribute to a reduction of adverse impacts to park visitors.

Cumulative Impacts. Cumulative impacts associated with alternative A would result from all noise sources around the Staten Island Unit, including air traffic, automobile traffic, private communities, and other motorized watercraft. Other boating activities within the unit generate noise levels similar to personal watercraft. Boats often outnumber personal watercraft by nine to one. Cumulative impacts of boating noise, ambient noise levels, and PWC noise would range from minor to moderate, depending on the location within the unit and the season.

Other activities contribute to noise levels within the unit, including beach users, hikers, walkers, and people gathering in picnic areas and near the Great Kills Park boat ramp. Visitors consider these sounds compatible with their activities. Noise impacts would be negligible to minor over the short and long term compared to the natural soundscape.

Conclusion. PWC use would have a minor adverse impact to visitors throughout the unit over the short and long term.

Cumulative impacts of boating noise, ambient noise levels, and PWC noise to other visitors would range from minor to moderate, depending on the location and the season and compared to the natural soundscape.

This alternative would not impair any soundscape-related values.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use would only be allowed at the Great Kills Park boat ramp. After launching, PWC users would be required to travel no faster than 5 mph within the unit boundary, so resulting noise levels would be minor. Banning PWC use within the rest of the unit would have a beneficial impact by eliminating related noise within NPS jurisdictional waters.

Cumulative Impacts. Similar to alternative A, noise from personal watercraft and other boats traveling outside the unit boundary would continue to have minor to moderate adverse impacts on other recreational users within the unit, depending on location and season and compared to the natural soundscape. Motorized boats would continue to have access to all areas of the unit, and noise generated by them would still impact visitors.

Conclusion. Allowing PWC use only at the launch ramp at Great Kills Park, and requiring users to travel at 5 mph or less, would result in minor, adverse impacts over the short and long term. Discontinuing PWC use in the rest of the unit would have a beneficial impact.

Cumulative noise impacts from all other noise sources within and near the unit would continue to be minor to moderate adverse over the short and long term, depending on the location and season, and compared to the natural soundscape, similar to alternative A.

This alternative would not impair any soundscape-related values.

Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period

Analysis. This alternative would effectively close the unit to PWC use, with the exception of launching from the Great Kills Park boat ramp for a three-year period. During the phaseout period, PWC use would result in minor adverse impacts over the short and long term, similar to alternative B. After the phaseout period, there would be beneficial impacts because personal watercraft would no longer operate within the unit.

Cumulative Impacts. Cumulative impacts would be similar to alternative A except there would be no contribution to noise after the three-year PWC phaseout period within NPS boundaries. Noise from other

motorized uses within and near the unit, as well as from personal watercraft during the phaseout period, would continue to have minor to moderate adverse impacts on other recreational users over the short and long term, depending on the location and season, and compared to the natural soundscape.

Conclusion. PWC use over the three-year phaseout period would result in minor noise impacts within NPS boundaries. After the phaseout period, impacts would be beneficial because PWC use would no longer contribute to noise.

Cumulative impacts from all other noise sources within and near the unit would be similar to alternative A, minor to moderate, and adverse impacts over the short and long term, depending on the location and season, and compared to the natural soundscape. There would be no contribution to impacts levels from PWC use after the phaseout period.

This alternative would not impair any soundscape-related values.

Impacts of the No-Action Alternative — No PWC Use

Analysis. The no-action alternative would close all unit waters to PWC use; therefore, there would be no impact to soundscapes resulting from PWC use. Impacts would be beneficial.

Cumulative Impacts. Cumulative impacts under the no-action alternative would be similar to alternative A, except there would be no contribution to impacts from PWC use within NPS boundaries. Other motorized uses would continue to result in minor to moderate, adverse impacts over the short and long term, depending on the location and the season and compared to the natural soundscape.

Conclusion. Under the no-action alternative banning PWC use within NPS jurisdictional waters would result in beneficial impacts.

Cumulative impacts from all other noise sources within the unit would continue to be minor to moderate, and adverse over the short and long term and compared to the natural soundscape, the same as alternative A, except there would be no contribution from PWC use.

This alternative would not impair any soundscape-related values.

WILDLIFE AND WILDLIFE HABITAT

As described for the Jamaica Bay Unit (see page 109), PWC use may impact wildlife by interrupting normal activities, causing alarm or flight, causing animals to avoid habitat, displacing habitat, and affecting reproductive success. PWC use may have a greater impact on waterfowl and nesting birds. Disturbance may force nesting birds to abandon eggs during crucial embryo development stages and flush other waterfowl from habitat, causing stress and associated behavior changes. Collisions with waterfowl may also be of concern.

GUIDING REGULATIONS AND POLICIES

Guiding regulations and policies for assessing impacts on wildlife and wildlife habitat would be the same as those described for the Jamaica Bay Unit (see page 111).

METHODOLOGY AND ASSUMPTIONS

Information on avian species likely to occur in areas accessible by personal watercraft was considered in the analysis. The analysis of potential impacts to non-avian species was based on the potential for wildlife species that are likely to occur in habitats to be affected by the alternatives being considered.

A similar methodology was used to determine the relative magnitude of impacts from PWC-generated noise to avian species. Studies indicate that flushing distances for avian species vary based on whether the bird is incubating, its location, and by individual birds. Studies conducted on piping plovers indicate that flushing distances vary widely (USFWS 2000b). No specific monitoring data are available at the park to quantify impacts; therefore, personal observations of NPS staff were used to determine areas of concern (nesting areas, critical habitat, etc.). These areas were identified and impacts were assessed relative to the number and proximity of PWC users potentially traveling during critical seasons and by the type of species present in those sensitive areas (state, federally listed, species of concern, etc.).

IMPACT ANALYSIS AREA

The impact analysis area includes the immediate locations of PWC use and the surrounding nearshore environment where wildlife and wildlife habitat may occur. For purposes of this review, the analysis area is the Staten Island Unit, specifically focusing on Great Kills Park / Crookes Point.

IMPACT OF PWC USE ON WILDLIFE AND WILDLIFE HABITAT

The thresholds used to determine the magnitude of effects on wildlife and wildlife habitat are the same as those used for the Jamaica Bay Unit and are highlighted below. (Special status species are discussed in "Threatened, Endangered, or Special Concern Species," beginning on page 207.)

Thresholds for Impacts on Wildlife and Wildlife Habitat

Negligible: There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them. Impacts would be short-term and well within natural fluctuations.

Minor: Impacts would be detectable, but they would not be expected to be outside the natural range of variability and would not be expected to have any long-term effects on native species, their habitats, or the natural processes sustaining them. Population numbers, population structure, genetic variability, and other demographic factors for species might have small, short-term changes, but long-term characteristics would remain stable and viable. Occasional responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, or other factors affecting population levels. Key ecosystem processes might have short-term disruptions that would be within natural variation. Sufficient habitat would remain functional to maintain viability of all species. Impacts would be outside critical reproduction periods for sensitive native species.

Moderate: Breeding animals of concern are present; animals are present during particularly vulnerable life-stages, such as migration or juvenile stages; mortality or interference with activities necessary for survival would expected on an occasional basis, but would not expected to threaten the continued existence of the species in the unit. Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they could be outside the natural range of variability for short periods of time. Population numbers, population structure, genetic variability, and other demographic factors for species might have short-term changes, but would be expected to rebound to pre-impact numbers and to remain stable and viable in the long-term. Frequent responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors affecting short-term population levels. Key ecosystem processes might have short-term disruptions that would be outside natural variation (but would soon return to natural conditions). Sufficient habitat would remain functional to maintain viability of all native species. Some impacts might occur during critical periods of reproduction or in key habitat for sensitive native species.

Major: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be outside the natural range of variability for long periods of time or be permanent. Population numbers, population structure, genetic variability, and other demographic factors for species might have large, short-term declines, with long-term population numbers significantly depressed. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a long-term decrease in population levels. Breeding colonies of native species might relocate to other portions of the unit. Key ecosystem processes might be disrupted in the long term or permanently. Loss of habitat might affect the viability of at least some native species.

Impairment: Some of the major impacts described above might be an impairment of park resources if their severity, duration, and timing resulted in the elimination of a native species or significant population declines in a native species. In addition, these adverse, major impacts to unit resources and values would

- contribute to deterioration of the park's wildlife resources and values to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;
- affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or
- affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. All unit waters would remain open to PWC use, and the New York State boating regulations would continue to be enforced. PWC operation is prohibited in tidal marshes within the Staten Island Unit.

Within the Staten Island Unit PWC operators use the Great Kills Park boat ramp for water access. Much of the remaining shoreline has been bulkheaded. Background noise related to human activity, vehicular traffic, other watercraft, and aircraft is high. Beach and watercraft activity is particularly high on summer weekends. Noise levels associated with PWC use and their ability to rapidly approach landing areas could adversely affect terrestrial wildlife, such as shorebirds and waterfowl, by causing alarm or flight. Effects would likely be minor adverse because species sensitive to a high level of noise and human activity are not expected to regularly use these areas during high use periods. Requirements for PWC users to operate under 5 mph within 100 feet of the shoreline would further minimize adverse effects associated with rapid approach and noise to wildlife using shoreline habitats.

Noise generated by personal watercraft has the potential to affect birds and wildlife in certain areas, particularly within marshes and on the islands in the Staten Island Unit. Although background noise associated with the surrounding urban environment tends to be greater than that from PWC use, noise from rapidly approaching PWC users could be a problem in certain areas. Hoffman Island supports several species of herons and other wading birds, and Swinburne Island supports nesting cormorants. Sudden fluctuating noise associated with PWC use could create a disturbance to the bird populations inhabiting the islands. However, PWC use is not known to occur in this area, and rip-rapping around both Hoffman and Swinburne Islands limits access to the areas, reducing the potential for adverse effects on avian species.

Porpoises and seals can be directly affected by collisions; however, limited occurrence of porpoises in the vicinity of the Staten Island Unit and use of the area by seals during the winter months limits the potential for adverse effects as a result of PWC use. (Indirect impacts caused by noise generated underwater are discussed separately beginning on page 204.)

Short- and long-term, minor adverse effects to fish species that occur in nearshore habitats could occur. Essential fish habitat established under the Magnuson-Stevens Fishery Conservation and Management Act occurs for several fish species within the Staten Island Unit. Species common in shallow waters around the unit, such as Atlantic herring and several species of flounder, could be disrupted from normal feeding behavior as a result of PWC use in nearshore areas. Continuous PWC use in areas providing essential fish habitat functions, particularly in shallow water areas, could adversely affect the suitability of these areas to meet life-cycle requirements.

Overall, short- and long-term, minor adverse impacts to wildlife and habitat are expected as a result of continued PWC use in the Staten Island Unit.

Cumulative Impacts. Cumulative impacts associated with alternative A would result from the actions taking place around the Staten Island Unit, including motorized watercraft use in nearby waters. The total number of motorized watercraft operating per hour in the unit is 391. Cumulative impacts to wildlife and habitat would be similar to those discussed above; impacts would be minor due to the acclimation of individual animals to the use, as well as management measures prohibiting access to sensitive habitats (i.e., marshes).

Conclusion. Impacts on wildlife and wildlife habitat would be minor and adverse over the short and long term because species sensitive to a high level of noise and human activity are not expected to use the area. Requirements for PWC users to operate under 5 mph within 100 feet of the shoreline would minimize the potential for adverse effects to wildlife in shoreline habitats. In addition, access restrictions to marshes within the Staten Island Unit would reduce the potential for adverse impacts to wildlife species that utilize these habitats.

Cumulative impacts to wildlife and habitat would be adverse, short and long term, and minor because wildlife using the unit would already have acclimated to uses and because management measures prohibit access to sensitive habitats (i.e., marshes).

This alternative would not impair wildlife or wildlife habitat.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Under alternative B PWC use would only be allowed at the Great Kills Park boat ramp. There is little wildlife use in this area since it is so developed, and the wildlife that are present have likely acclimated to human activity and disturbance. Eliminating PWC use throughout most of the unit would buffer terrestrial and nearshore wildlife and habitats from the adverse effects of PWC use occurring beyond NPS boundaries.

Cumulative Impacts. Cumulative impacts to wildlife and habitat would be similar to those discussed for alternative A. Impacts would be minor due to the acclimation of individual animals in the unit, as well as management measures prohibiting access to sensitive habitats (i.e., marshes).

Conclusion. Impacts to wildlife and habitat would be minor and adverse over the short and long term because species sensitive to a high level of noise and human activity are not expected to use the area. Effectively closing unit waters to PWC use would eliminate the potential for impacts to wildlife and habitat, a beneficial impact.

As described for alternative A, cumulative impacts to wildlife and habitat would be minor due to the acclimation of wildlife to disturbance, as well as management measures prohibiting access to sensitive habitats (i.e., marshes).

This alternative would not impair wildlife or wildlife habitat.

Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period

Analysis. PWC use restrictions under alternative C would be similar to those under alternative B, except PWC use would be phased out over three years. Until the ban went into effect, short-term minor impacts would occur as described under alternative B. Eliminating PWC use in the unit would buffer terrestrial and nearshore wildlife and habitats from the adverse effects of PWC use occurring beyond NPS boundaries. Restricting PWC access to the unit would enhance the quality of potential essential fish habitat that may occur in the Staten Island Unit, a beneficial impact.

Cumulative Impacts. Cumulative impacts to wildlife and habitat would be similar to alternative A, except there would be no contribution to impacts as a result of PWC use within park boundaries after three years. Impacts would be minor due to the acclimation of individual animals to the noise and activity in the area, along with management measures prohibiting access to sensitive habitats (i.e., marshes).

Conclusion. Impacts during the PWC phaseout period would be short and long term, minor, and adverse. Impacts after PWC use was banned would be beneficial.

As described for alternative A, cumulative impacts to wildlife and habitat would be minor due to the acclimation of wildlife to disturbance, along with management measures prohibiting access to sensitive habitats (i.e., marshes). There would be no contribution to impacts from PWC use after three years.

This alternative would not impair wildlife or wildlife habitat.

Impacts of the No-Action Alternative — No PWC Use

Analysis. The no-action alternative would close all unit waters to PWC use. Eliminating PWC use would buffer terrestrial and nearshore wildlife and habitats from the adverse effects of PWC use occurring beyond NPS boundaries. Restricting PWC access to the unit would also enhance the quality of potential essential fish habitat that may occur in the Staten Island Unit, a beneficial impact.

Cumulative Impacts. Cumulative impacts to wildlife and habitat would be similar to those discussed for alternative A, but there would be no contribution from PWC use. The intensity of adverse impacts would be minor due to the acclimation of wildlife to disturbance, along with management measures prohibiting access to sensitive habitats (i.e., marshes).

Conclusion. Banning PWC use within NPS jurisdictional waters would result in beneficial impacts on wildlife and wildlife habitat.

Cumulative impacts to wildlife and habitat would be minor and adverse, similar to alternative A, except there would be no contribution to impacts from PWC use.

This alternative would not impair wildlife or wildlife habitat.

AQUATIC FAUNA

BACKGROUND

As described for the Jamaica Bay Unit (see page 116), the full impact noise has on marine mammals is not completely understood, and the increase in human-made underwater noises could be a serious problem to their survival to the extent that it interferes with their methods of communication and hunting strategy (CCU 1998). Aquatic wildlife react to high levels of underwater noise in various ways, depending on the species, exposure period, intensities, and frequencies. PWC motors produce noise levels in the range of 70–102 dB per unit. Because of the way the craft are used, noise is usually produced at various intensities, and this continual change in loudness during normal use makes PWC-caused noise much more disturbing than the constant sounds of conventional motorboats (Bluewater Network 2001; Komanoff and Shaw 2000).

Recent studies have found that some mammals have stopped feeding and resting and became overly alert when human noise sources increased. Temporary noise disturbances may alter the swimming path, heart rate, or breathing of a marine mammal, while long-term noise disturbances may inhibit mammals from accessing critical feeding, nesting, and mating habitat (Acoustical Society of America 2000).

METHODOLOGY AND ASSUMPTIONS

As described for the Jamaica Bay Unit, data on PWC-related noise effects on aquatic fauna are limited, and no specific monitoring has been done at Gateway National Recreation Area to quantify impacts. Therefore, personal observations of staff were used to determine areas of concern, which were then assessed relative to the number of personal watercraft being used, their proximity during critical seasons of use, and the type of species present in those sensitive areas.

Marine mammals having the potential to be affected by increased noise levels in the Staten Island Unit include dolphins and seals. Kemp's ridley and loggerhead sea turtles and diamondback terrapins also have potential to occur in unit waters; however, most Kemp's ridley and loggerhead sea turtles are juveniles that are feeding in the area. In addition, over 90 species of fish have been identified in waters around the Staten Island Unit, and essential fish habitat occurs in the area for several fish species.

Sound produced in air behaves differently than when produced underwater. The measurement scales for sound in water and in air have a difference of 63 dB between them. Sound measured at 100 dB underwater is equivalent to 160 dB in air (Cornell University n.d.). That is, a PWC engine producing 100 dB in air would produce 163 dB underwater. In this assessment the surface noise of two or more personal watercraft operating at the same time (when one unit produces 82 dB), and at a distance of 82 feet from the source, was calculated to be 85 dB. Underwater noise from the same source at a distance of 82 feet would be approximately 148 dB. The air and underwater noise calculated for the Crookes Point area, based on the peak number of personal watercraft operating per hour, as estimated in the "PWC and Visitor Use Trends" section for Staten Island, would be 39 craft / hour, which would equate to 98 dB in the air and 161 dB underwater at a distance of 82 feet.

Sound travels 4.5 times faster in water than it does in air, and low frequency sounds travel farther underwater than high frequency sounds.

IMPACT ANALYSIS AREA

The impact analysis area includes the immediate locations of PWC use and the surrounding nearshore environment where aquatic wildlife and habitat may occur. For purposes of this review, the analysis area is the Staten Island Unit, focusing on Great Kills Park / Crookes Point.

IMPACT OF PWC NOISE ON AQUATIC FAUNA

The same impacts thresholds as defined for wildlife and wildlife habitat (see page 200) were used for aquatic fauna.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. All unit waters would remain open to PWC use and New York State regulations would continue to be enforced. PWC operation is prohibited in tidal marshes within the Staten Island Unit.

PWC-generated noise could affect the activities of marine reptiles, mammals, and fish in the vicinity of the Staten Island Unit. While these impacts might not cause mortality, they could adversely affect how marine organisms are distributed. Impacts from PWC activity in the shallow waters of the unit would be minor to moderate over the short and long term. A potential reduction in noise emissions (Sea-Doo 2001b; Yamaha Motor 2001) could reduce adverse impacts. Long-term effects under this alternative include a potential reduction in species diversity in shallow water habitats.

Cumulative Impacts. There is a high level of use by both personal watercraft and conventional watercraft in and around the Staten Island Unit. As a result, human activity and noise levels are typically high, especially during summer weekends. New technologies are expected to reduce noise emissions from new personal and conventional watercraft in the future. Cumulative impacts to aquatic fauna are expected to be similar to those discussed above for PWC use; however, the intensity of adverse impacts would be moderate because of all motorized uses in the waters around the Staten Island Unit now and in the future, including PWC use.

Conclusion. Continued PWC use under alternative A would have minor to moderate adverse effects on aquatic fauna in shallow water areas over the short and long term because of how marine organisms are distributed and a potential reduction in species diversity in shallow water habitats.

Cumulative impacts to aquatic fauna would be similar to those for PWC use alone; however, the intensity of impacts would be moderate and adverse over the short and long term because of all motorized uses in the waters in and around the Staten Island Unit, including PWC use.

This alternative would not impair aquatic fauna.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use would be restricted in all areas of the unit except the Great Kills Park boat ramp. Restricting PWC access within NPS jurisdictional boundaries would reduce the potential for adverse effects to aquatic fauna, with minor adverse effects over the short and long term. In the long term, reductions in noise emissions as a consequence of eliminating PWC operation within the unit (excluding

the boat ramp), and a potential reduction in noise emissions (as forecasted by the industry) from newer machines, could contribute to a reduction of adverse impacts to aquatic fauna in nearshore areas.

Cumulative Impacts. Cumulative impacts to aquatic fauna would be similar to those discussed under alternative A, but there would be no contribution to PWC-related impacts within NPS jurisdictional waters away from the Great Kill Park boat ramp area. Because of a high level of conventional watercraft use in and around the Staten Island Unit, human activity and noise levels are typically high, especially during summer weekends. New technologies are expected to reduce noise emissions from new personal and conventional watercraft in the future. Cumulative impacts to aquatic fauna are expected to be moderate because of all motorized uses in the waters around the Staten Island Unit.

Conclusion. In areas remaining open to PWC use, impacts to aquatic fauna would be minor over the short and long term because PWC use would be restricted compared to alternative A.

Cumulative impacts to aquatic fauna would be similar to those discussed under alternative A. The intensity of adverse impacts would be moderate and adverse because of all the motorized uses in the waters in and around the Staten Island Unit.

This alternative would not impair aquatic fauna.

Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period

Analysis. PWC use restrictions would be the same as alternative B except all use would be phased out after three years. Following the phaseout, beneficial impacts could be expected.

Cumulative Impacts. Cumulative impacts to aquatic fauna would be similar to those discussed under alternative A, but there would be no contribution from PWC use within NPS jurisdictional waters away from the Great Kill Park boat ramp area, and all PWC-related impacts in NPS jurisdictional waters would cease after three years. Because of a high level of conventional watercraft use in and around the Staten Island Unit, human activity and noise levels are typically high, especially during summer weekends. New technologies are expected to reduce noise emissions from new personal and conventional watercraft in the future. Cumulative impacts to aquatic fauna are expected to be moderate because of all motorized uses in the waters around the Staten Island Unit.

Conclusion. During the phaseout period, impacts to aquatic fauna in areas remaining open to PWC use would be minor and adverse over the short and long term. After PWC use was banned, impacts would be beneficial.

Cumulative impacts to wildlife and habitat would be moderate and adverse because of all motorized uses in and around the waters of the Staten Island Unit, similar to alternative A.

This alternative would not impair aquatic fauna.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Eliminating PWC use in the Staten Island Unit would provide aquatic fauna protected habitat and feeding areas away from adverse effects of PWC use. Impacts would be beneficial.

Cumulative Impacts. Cumulative impacts to aquatic fauna would be similar to those discussed under alternative A, but there would be no contribution to PWC-related impacts within NPS jurisdictional waters. Because of a high level of conventional watercraft use in and around the Staten Island Unit, human activity and noise levels are typically high, especially during summer weekends. New technologies are expected to reduce noise emissions from new personal and conventional watercraft in the future. Cumulative impacts to aquatic fauna are expected to be moderate because of all motorized uses in the waters around the Staten Island Unit.

Conclusion. Banning PWC use within the Staten Island Unit would result in beneficial impacts to aquatic fauna.

Cumulative impacts to aquatic fauna would be moderate and adverse over the short and long term, similar to alternative A.

This alternative would not impair aquatic fauna.

THREATENED, ENDANGERED, OR SPECIAL CONCERN SPECIES

GUIDING REGULATIONS AND POLICIES

Guiding regulations and policies would be the same as described for the Jamaica Bay Unit (see page 121). An analysis of the potential impacts to each species listed with the potential to occur in the area of the Staten Island Unit is included in this section. This environmental assessment will be submitted to the U.S. Fish and Wildlife Service and the National Marine Fisheries Service for review. If no species is likely to be adversely affected, and if the agencies concur with such findings, no further consultation will be required.

The NPS *Management Policies 2001* state that potential effects of agency actions will also be considered on state or locally listed species. The National Park Service is required to control access to critical habitat of such species, and to perpetuate the natural distribution and abundance of these species and the ecosystems upon which they depend.

Informal consultation was initiated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service during the internal scoping period for this project. A list of species that are known to occur or may occur within or adjacent to PWC use areas within the boundaries of the Staten Island Unit was requested. Responses from National Marine Fisheries Service are included in appendix B. A response from U.S. Fish and Wildlife Service was not received at the time of publication.

METHODOLOGIES AND ASSUMPTIONS

The same methodologies and assumptions used for the Jamaica Bay Unit were used for the Staten Island Unit (see page 122). Documentation of the occurrence and locations of federal and state threatened, endangered, or rare species in the Staten Island Unit was provided by the National Park Service through several studies and surveys that have been conducted at the park. The determination of the potential for adverse effects to listed species was based on the locations of sensitive species with respect to PWC use and the potential for that use to affect listed species. All known federally listed species that occur at the Staten Island Unit are discussed in the analysis. Only state listed species that occur in the vicinity of the PWC use areas, or that have potential to be affected by PWC use, are discussed in the analysis.

Based on correspondence with the National Marine Fisheries Service, the federally endangered Kemp's ridley sea turtle and the federally threatened loggerhead sea turtle have the potential to occur in New York Bay waters in the area of the Staten Island Unit (see appendix B). Other than sea turtles, no known federal or state listed threatened or endangered species occur or nest in areas with the potential to be affected by PWC use (D. Riepe, NPS, pers. comm., June 27, 2002).

IMPACT ANALYSIS AREA

The impact analysis area includes the immediate locations of PWC use and the surrounding nearshore environment where wildlife and wildlife habitat may occur. For purposes of this assessment, the analysis area is the Staten Island Unit, specifically focusing on Great Kills Park / Crookes Point.

IMPACT OF PWC USE ON SUCH SPECIES

Impact thresholds are the same as those defined for the Jamaica Bay Unit and are highlighted below.

Thresholds for Impacts on Threatened, Endangered, or Special Concern Species

No effect: A proposed action would not affect a listed species or designated critical habitat.

May affect / not likely to adversely affect: Effects on special status species would be discountable (i.e., extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated) or completely beneficial.

May affect / likely to adversely affect: When an adverse effect to a listed species might occur as a direct or indirect result of proposed actions and the effect would not be discountable or would be completely beneficial.

Is likely to jeopardize proposed species / adversely modify proposed critical habitat (impairment): The appropriate conclusion when the National Park Service, U.S. Fish and Wildlife Service, or the National Marine Fisheries Service identify situations in which PWC use could jeopardize the continued existence of a proposed species or adversely modify critical habitat to a species within or outside park boundaries.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Under alternative A all unit waters would remain open to PWC use, and the New York State boating regulations would continue to be enforced. It is not expected that alternative A would adversely affect Kemp's ridley or loggerhead sea turtles. Potential for impacts to sea turtles would be unlikely due to very shallow water conditions within most of the unit boundaries and because sea turtles would likely avoid the immediate area due to a high level of human related activity. Requirements for PWC users to operate at 5 mph within 100 feet of the shoreline would further minimize the potential for collision-related impacts within the unit.

The state threatened dune sandspur and hop sedge occur in coastal sands, sand dunes, and dune swales and could be adversely affected by foot traffic associated with PWC use if riders came ashore in habitat areas. However, foot traffic associated with PWC use is not expected to impact this species because of limited potential for the plants to occur in these areas.

The state threatened red pigweed and the state endangered globose flatsedge, narrow-leaf sea blite, and Roland's sea blite occur in association with salt marsh habitats in the Gateway National Recreation Area

and could potentially occur in the Staten Island Unit. PWC use is not likely to adversely affect these species because salt marshes are closed to PWC access.

No federal or state species identified as threatened, endangered, or of concern is likely to be adversely affected under this alternative.

Cumulative Impacts. Future increases in motorized uses are expected within and around the Staten Island Unit; however, access restrictions to most of the shoreline and salt marsh habitats would continue to be enforced. Consequently, no known threatened or endangered species within the unit would be affected by PWC or other conventional watercraft use. Therefore, this alternative is not likely to adversely affect any listed species.

Conclusion. Alternative A is not likely to adversely affect any federal or state listed threatened or endangered species because use restrictions would prohibit access to most shoreline areas and salt marshes, and because PWC users would be required to operate at 5 mph within 100 feet of the shoreline, reducing the potential for collision-related impacts with sea turtles.

Future increases in motorized uses, including PWC use, within and around the Staten Island Unit would not be likely to adversely affect any listed species.

This alternative would not impair threatened, endangered, or sensitive species.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use would be excluded from all areas of the Staten Island Unit except for the Great Kills Park boat ramp. No known threatened or endangered species are known to occur in areas that could be affected by PWC use under this alternative. Therefore, impacts would be similar to those described for alternative A, and alternative B is not likely to adversely affect federal or state listed threatened or endangered species.

Cumulative Impacts. Future increases in motorized uses are expected within and around the Staten Island Unit, and PWC use could increase outside the unit. However, access restrictions to most of the shoreline and salt marshes would continue to be enforced, so no known habitats for threatened or endangered species would be affected as a result of PWC or other conventional watercraft use. Threatened or endangered species within the unit are not likely to be adversely affected, similar to alternative A.

Conclusion. Alternative B is not likely to adversely affect federal or state listed threatened or endangered species because use would be limited to the vicinity of the Great Kills Park boat ramp.

Similar to alternative A, future increases in motorized uses, including PWC use outside NPS boundaries, are not likely to adversely affect threatened or endangered species.

This alternative would not impair threatened, endangered, or sensitive species.

Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period

Analysis. The PWC use restrictions proposed under alternative B would also apply to alternative C, except that PWC use would be phased out over a three-year period. Alternative C is not likely to adversely affect federal or state listed threatened or endangered species because none are known to occur within areas that could be affected by PWC use.

Cumulative Effects. Future increases in motorized uses in the area around the Staten Island Unit are expected, including PWC use outside the unit. However, no known threatened or endangered species occur in areas that could be affected by PWC or other conventional watercraft use. Furthermore, access restrictions within the unit would continue to be implemented, so this alternative is not likely to adversely affect threatened or endangered species within the unit.

Conclusion. Alternative C is not likely to adversely affect federal or state listed species because use would be limited to the vicinity of the Great Kills Park boat ramp and would be phased out after three years.

Future increases in motorized uses, including PWC use outside NPS boundaries, are not likely to adversely affect threatened or endangered species.

This alternative would not impair threatened, endangered, or sensitive species.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Banning PWC use within the Staten Island Unit would have no effect on federal or state listed threatened or endangered species.

Cumulative Effects. Future increases in motorized uses in and around the Staten Island Unit are expected, including PWC use outside NPS boundaries. However, there are not likely to be adverse effects on threatened or endangered species within the unit because of access restrictions and the absence of known threatened or endangered species within areas accessible to conventional watercraft.

Conclusion. Banning PWC use within the Staten Island Unit would have no effect on federal or state listed threatened or endangered species.

Future increases in motorized uses, including PWC use outside NPS boundaries, are not likely to adversely affect threatened or endangered species.

This alternative would not impair threatened, endangered, or sensitive species.

SHORELINE VEGETATION AND WETLAND HABITATS

METHODOLOGY AND ASSUMPTIONS

Personal watercraft have the potential to impact shoreline vegetation as a result of operating in shallow waters or adjacent to wetland habitats. Direct impacts resulting from collision or mechanical removal can occur. Potential indirect impacts include the deposition of suspended sediments on aquatic vegetation or

the modification of substrates. Impacts to shoreline vegetation associated with foot traffic adjacent to landing areas can also occur.

As described for the Jamaica Bay Unit, impacts to shoreline vegetation and wetland habitats were determined based on the (1) occurrence and location of vegetation in areas likely to be affected, (2) current and future use and distribution of personal watercraft, (3) habitat impact or alteration caused PWC use, and (4) disturbance potential of the actions and the potential to affect shoreline vegetation. The analysis is based on the best professional judgment of park staff and experts in the field, and on a literature review.

IMPACT ANALYSIS AREA

The impact analysis area includes the immediate locations of PWC use and the surrounding nearshore environment where wildlife and wildlife habitat may occur. For purposes of this review, the analysis area is the Staten Island Unit, consisting of Fort Wadsworth, Miller Field, and Great Kills Park.

IMPACTS ON SHORELINE VEGETATION AND WETLAND HABITATS FROM PWC USE

The same thresholds as defined under the impact assessment for Jamaica Bay were used, as highlighted in the text box.

Thresholds for Impacts on Shoreline Vegetation and Wetland Habitats

Negligible: No shoreline vegetation or wetland habitats are present in areas likely to be accessed by personal watercraft; no impacts or impacts with only temporary effects are expected.

Minor: Shoreline vegetation or wetland habitats are present, but only in low numbers. Occasional impacts to species or communities are expected, but with no impacts or limited impacts on the continued existence of the species or viable, functioning communities within the unit.

Moderate: Shoreline vegetation or wetland habitats are present in areas accessible by personal watercraft. Direct loss of vegetation or other effects are expected on an occasional basis, but are not expected to threaten the continued existence of the species or viable, functioning communities in the unit.

Major: Shoreline vegetation or wetland habitats are present in relatively high numbers in areas accessible by personal watercraft. Direct loss of vegetation or other effects are expected on a regular basis and could threaten the continued survival of species or communities of species in the park.

Impairment: PWC use would contribute substantially to the deterioration of shoreline vegetation or wetland habitats to the extent that the park's shoreline would no longer function as a natural system. In addition, these adverse major impacts to park resources and values would

- contribute to deterioration of these resources to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;
- affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or
- affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Under alternative A all unit waters would remain open to PWC use, and the New York State boating regulations would continue to be enforced. Minor, adverse, short- and long-term impacts to shoreline vegetation and wetland habitats are expected under alternative A. Direct impacts would occur

around landing areas as a result of vegetation being trampled by foot traffic. Impacts would be minor because access to shoreline areas is limited.

Cumulative Impacts. Future increases in motorized use, including PWC use, in the area around the Staten Island Unit are expected; however, access would continue to be restricted along large areas of the shoreline. Increases in potential impacts associated with conventional motorized watercraft are not expected due to limited access to shorelines. Cumulative impacts to shoreline vegetation would be similar to those discussed above and would be adverse, direct, short and long term, and minor.

Conclusion. Minor, short- and long-term, adverse impacts to shoreline vegetation and wetland habitats could occur under alternative A. Direct impacts could occur around landing areas as a result of trampling by foot traffic. Impacts are expected to be minor because access to shoreline areas is limited.

Cumulative adverse impacts to shoreline vegetation and wetland habitats would be minor and short and long term since shoreline access would continue to be limited.

This alternative would not impair shoreline vegetation or wetland habitats.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use would be prohibited from all areas of the Staten Island Unit, excluding the Great Kills Park boat ramp. No adverse impacts to shoreline vegetation in the Staten Island Unit are expected under alternative B. Restricting PWC access on the oceanside of the unit would eliminate the potential for vegetation impacts associated with PWC-related foot traffic. Impacts to wetland habitat are not expected because PWC access to wetland habitats is restricted.

Cumulative Impacts. Future increases in motorized uses in and around the Staten Island Unit, including PWC uses outside NPS jurisdictional waters, are expected; however, access to most of the unit would continue to be restricted. Increased impacts associated with conventional motorized watercraft are not expected due to limited access to shorelines and wetland habitats. Cumulative impacts to shoreline vegetation would be minor under alternative B.

Conclusion. No impacts to shoreline vegetation or wetland habitats in the Staten Island Unit are expected under alternative B because PWC use would be restricted along the oceanside of the unit, reducing the potential for impacts to shoreline vegetation from PWC-related foot traffic.

Cumulative adverse impacts to shoreline vegetation related to all motorized uses would be minor, similar to alternative A.

This alternative would not impair shoreline vegetation or wetland habitats.

Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period

Analysis. PWC use would be banned within unit boundaries except at the Great Kills Park boat ramp for a three-year period, after which time PWC use would be prohibited within NPS jurisdictional waters. No adverse impacts to shoreline vegetation or wetland habitats in the Staten Island Unit would occur under alternative C because the potential for impacts to shoreline vegetation associated with PWC-related foot

traffic would be eliminated. Over time beneficial impacts to shoreline vegetation and wetland habitat could occur.

Cumulative Impacts. Future increases in motorized uses in and around the Staten Island Unit are expected, including PWC use outside NPS jurisdictional waters. However, access restrictions throughout the unit would continue to be enforced, and adverse impacts to shoreline vegetation or wetland habitats would be minor.

Conclusion. No adverse impacts to shoreline vegetation or wetland habitat in the Staten Island Unit are expected because restricted access would eliminate the potential for impacts to shoreline vegetation associated with PWC use. Over time impacts to shoreline vegetation and wetland habitat would be beneficial because of phasing out PWC use.

Cumulative impacts to shoreline vegetation or wetland habitats would be minor as a result of impacts associated with other park uses, similar to alternative A.

This alternative would not impair shoreline vegetation or wetland habitats.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Banning PWC use within the Staten Island Unit under the no-action alternative would be expected to result in beneficial impacts to shoreline vegetation and wetland habitats.

Cumulative Impacts. Under the no-action alternative future increases in motorized uses in and adjacent to the Staten Island Unit are expected, including increases in PWC use outside NPS jurisdictional waters. Minor, adverse impacts are expected because of continued high use of the area by other conventional watercraft users, even though access restrictions to shorelines and wetland habitats within the unit would continue to be enforced.

Conclusion. Banning PWC use within the Staten Island Unit would result in beneficial impacts to shoreline vegetation and wetland habitats.

Cumulative impacts to shoreline and wetland habitats would be minor and adverse as a result of impacts associated with other park uses, similar to alternative A.

This alternative would not impair shoreline vegetation or wetland habitats.

VISITOR USE AND EXPERIENCE

GUIDING REGULATIONS AND POLICIES

Guiding regulations and policies for visitor use and experience would be the same as those described for the Jamaica Bay Unit — provide for the enjoyment of park resources and values by the people of the United States, and provide appropriate, high-quality opportunities for visitors to enjoy the parks. Forms of enjoyment should be uniquely suited and appropriate to the superlative natural and cultural resources found in the parks, and the broader spectrum of recreational needs and demands should be met by local, state, and other federal agencies; private industry; and nongovernmental organizations.

Unless mandated by statute, activities would not be allowed that would impair park resources or values, create an unsafe or unhealthful environment for other visitors or employees, or be contrary to the purposes for which the park was established. Furthermore, activities should not unreasonably interfere with the atmosphere of peace and tranquility; with the natural soundscape; with NPS, concessioner, or contractor operations or services; or other existing, appropriate park uses

Part of the purpose of Staten Island Unit is to offer opportunities for public access, use, and enjoyment. Its significance lies in that the unit is comprised of relatively unspoiled and undeveloped beaches, dunes, other natural features, and a diverse barrier island ecosystem. As previously stated, the following long-term goal relates to visitor experience, as defined in the park's *Strategic Plan*:

> *Visitor Satisfaction* — By September 30, 2005, 88% of visitors to Gateway National Recreation Area are satisfied with appropriate park facilities, services, and recreational opportunities.

METHODOLOGIES AND ASSUMPTIONS

The purpose of this impact analysis is to determine if PWC use at the Staten Island Unit is compatible or in conflict with the purpose of the park, its visitor experience goals, and the direction provided by the NPS *Management Policies*. Thus, these policies and goals were integrated into the impact thresholds.

As described for the Jamaica Bay Unit, impacts were determined based on the current level of PWC use throughout the unit, other recreational activities, and the types of visitor experiences that are proposed for these locations. Visitor surveys (if available) and staff observations were also evaluated to determine visitor attitudes and satisfaction in areas where personal watercraft are encountered.

Data suggest that the vast majority of visitors are satisfied with their current experiences. The potential for change in visitor experiences was evaluated by identifying projected increases or decreases in both PWC and other visitor uses, and by determining whether these changes would affect the desired visitor experience and result in greater safety concerns or additional user conflicts.

IMPACT ANALYSIS AREA

The impact analysis area for analyzing visitor experience impacts includes the locations related to PWC operation and the distance that PWC-related noise travels. Personal watercraft are allowed to operate in all waters of the Staten Island Unit; however, they predominantly use the area around Crookes Point (see "PWC and Visitor Use Trends").

IMPACT OF PWC USE ON VISITOR EXPERIENCE GOALS

The same thresholds as defined for the Jamaica Bay Unit were used, as highlighted in the text box.

Thresholds for Impacts on Visitor Experience Goals

Negligible: Visitors would not likely be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources.

Minor: Visitors would likely be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources; however, the changes in visitor uses and experience would be slight and likely short term. Other areas in the park would remain available for similar visitor experiences and uses without derogation of park resources and values.

Moderate: Visitors would be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources. Changes in visitor uses and experiences would be readily apparent and likely long term. Other areas in the park would remain available for similar visitor experiences and uses without derogation of park resources and values, but visitor satisfaction could be measurably affected (either beneficially or adversely). Some visitors who desire to continue their use and enjoyment of the activity/visitor experience would be required to pursue their choices in other available local or regional areas.

Major: Visitors would be highly aware of the effects associated with changes proposed for visitor use and enjoyment of park resources. Changes in visitor uses and experiences would be readily apparent and long term. The proposed change in visitor use and experience would preclude future generations of some visitors to enjoy park resources and values. Some visitors who desire to continue their use and enjoyment of the activity / visitor experience would be required to pursue their choice in other available local or regional areas.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. *Impacts on PWC Users* — Continuing PWC use under alternative A would have negligible impacts on the experiences of PWC users or their level of satisfaction since access to the park because PWC use inside the park boundary would not change.

Impacts on Other Boaters — Other boaters within the unit would continue to interact with PWC operators in the same manner they do now. Alternative A would have a negligible adverse effect on the visitor experience of other boaters.

Impacts on Other Visitors — Visitors to the Staten Island Unit are dispersed throughout the park. Because the number of personal watercraft within NPS waters is expected to increase between 2002 and 2012 by only one to two machines, the increase would not be noticeable when compared to existing conditions. Based on this analysis, PWC activity under alternative A would have a negligible to moderate adverse impact on the experience of swimmers, hikers, and other visitors, depending on seasonal variations in activities. Effects to park visitors would be negligible during the off-season or non-peak hours (weekdays), with the reduction in PWC use.

Cumulative Impacts. The location and number of other boats and their proximity to other visitors affect the quality of visitor experiences. Motorized boats would continue to be present within the unit boundary. No change to other park visitors and activities would result under this alternative. No other actions are currently planned that would affect PWC use or the visitor experience within the park. Cumulative impacts related to personal watercraft, other boats, and visitors on the visitor experience would be negligible, since there would be little noticeable change from existing conditions. Most visitors would continue to be satisfied with their experiences at the Staten Island Unit.

Conclusion. Continued PWC use at the Staten Island Unit would result in negligible adverse impacts on the visitor experiences of PWC users and other boaters. Impacts on the experiences of swimmers, hikers, and other visitors would be negligible to moderate adverse, depending on locations and seasonal variations in activities. Alternative A would partially meet the park's strategic goal for improved visitor satisfaction (in the case of PWC users).

Cumulative impacts related to all other watercraft users and other visitors would continue to be negligible, since there would be little noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences in the Staten Island Unit.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use would be permitted exclusively at the Great Kills Park boat ramp and would be eliminated from all other areas of the unit.

Impacts on PWC Users — PWC users would maintain access to Great Kills Harbor and Raritan Bay by means of the Great Kills Park boat ramp; however, access to all other areas within NPS boundaries would be restricted. While PWC use would be eliminated at Crookes Point, PWC users could easily go to areas outside the unit boundaries, where use would not be restricted. Therefore, this alternative would have negligible to minor adverse effects on the experiences of PWC users since they would have continued access from the Great Kills Park boat ramp to PWC activity areas outside NPS boundaries.

Impacts on Other Boaters — Other boaters within the Staten Island Unit would continue to interact with PWC operators, but only within the vicinity of the Great Kills Park boat ramp. As a result, alternative B would have negligible to minor adverse effects on the experiences of other boaters now and in the future.

Impacts on Other Visitors — Other visitors to Staten Island Unit would continue to interact with PWC operators, but only in the vicinity of the Great Kills Park boat ramp. The effects to park visitors would be minor during peak use periods because within NPS jurisdictional waters PWC users could only travel at 5 mph; impacts would be negligible during the off-season or non-peak hours (weekdays). Impacts to visitors in areas where PWC use was restricted, particularly swimmers, would likely notice the greatest change.

Cumulative Impacts. Cumulative impacts would be similar to those described for alternative A. Motorized boats would continue to be present within park boundaries; however, the potential for PWC use to affect visitors would be eliminated except in the vicinity of the Great Kills Park boat ramp. Restricting PWC use to the Great Kills Park boat launch could result in some PWC users going to other regional areas, where the additional use could affect other recreationists (e.g., other boaters), creating minor, adverse impacts in those areas. Cumulative visitor experience impacts related to personal watercraft, other boats, and visitors would be beneficial, since there would be a noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences at the Staten Island Unit.

Conclusion. Restricting PWC use to certain areas would result in negligible to minor adverse impacts on PWC users since they would have continued access from the Great Kills Park boat ramp to PWC activity areas outside NPS boundaries. Impacts to other boaters and visitors would be beneficial, depending on the locations and seasonal variations in activities. Alternative B would partially meet the park's strategic goal for improved visitor satisfaction (in the case of other boaters and non-boating visitors) by restricting PWC use to the area of the boat ramp.

Cumulative impacts on PWC users, other boaters, and visitors would continue to be negligible and adverse, similar to alternative A, since there would be little noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences at the unit. Visitors to areas where PWC use was restricted would likely notice the greatest change. Restricting PWC use to the Great Kills Park boat launch could result in some PWC users going to other regional areas, where the additional use could affect other recreationists (e.g., other boaters), creating minor, adverse impacts in those areas.

Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period

Analysis. PWC use would be banned within unit boundaries except at the Great Kills Park boat ramp during a three-year phaseout, after which use would be banned in all areas.

Impacts on PWC Users — Following the three-year phaseout period, the impact on PWC users who use the Great Kills Park boat ramp for access to Raritan Bay would be minor to moderate and adverse. PWC users would have to go to privately owned boat ramps outside NPS jurisdictional waters or the public ramp at Lemon Creek to obtain access. PWC users who wanted to continue using unit waters and/or the boat ramp would be adversely affected over the long term.

Impacts on Other Boaters — Other boaters in Staten Island Unit would interact with PWC operators on a limited basis only in the vicinity of the Great Kills Park boat ramp and only during the three-year phase-out period. Alternative C would reduce potential impacts to visitor experiences within NPS jurisdictional waters by reducing potential conflicts between PWC users and other recreational boaters. Based on this analysis, impacts within unit boundaries would be negligible adverse during the phaseout period, and beneficial after PWC use was discontinued within the unit.

Impact on Other Visitors — Alternative C would have a negligible effect during the off-season or non-peak hours (weekdays). Impacts to other visitors from PWC use during peak use times would be beneficial.

Cumulative Impacts. Cumulative impacts would be similar to those described for alternative A. Motorized boats would continue to be present within NPS boundaries; however, the potential for PWC use to affect visitor experiences would be reduced within the unit boundary. Cumulative impacts related to personal watercraft, other boats, and visitors would be negligible adverse, since there would be little noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences at the Staten Island Unit. Phasing out PWC use within NPS jurisdictional waters over three years could force PWC users to other regional areas, where the additional use could affect other recreationists (e.g., other boaters), creating minor, adverse impacts in those areas.

Conclusion. Alternative C would result in minor to moderate adverse impacts on PWC users, who would be prohibited from using park waters after the three-year phaseout period. Impacts on other boaters and visitors would be negligible during the phaseout period and then beneficial. Alternative C would partially meet the park's strategic goal for improved visitor satisfaction (in the case of other boaters and non-boating visitors) by restricting PWC use to the area of the boat ramp.

Similar to alternative A, cumulative impacts related to personal watercraft, other boats, and visitors would be negligible adverse, since there would be little noticeable change in overall visitor experiences. Most visitors would continue to be satisfied with their experiences at the unit. Phasing out PWC use within NPS jurisdictional waters over three years could force PWC users to other regional areas, where the additional use could affect other recreationists (e.g., other boaters), creating minor, adverse impacts in those areas.

Impacts of the No-Action Alternative — No PWC Use

Analysis. PWC use would be discontinued within the unit.

Impacts on PWC Users — Banning PWC use within the unit would have minor to moderate adverse impacts on those PWC users who use the Great Kills Park boat ramp for access to Raritan Bay. PWC users would have to go to privately owned boat ramps to obtain access. PWC users who desired to continued using the unit waters and/or the boat ramp would be adversely affected over the long term.

Impacts on Other Boaters — Interactions between other boaters and PWC users would be eliminated within the NPS boundaries of the unit, resulting in a beneficial impact.

Impacts on Other Visitors — The no-action alternative would have beneficial effects on the visitor experiences of other visitors to the park.

Cumulative Impacts. Banning PWC use within NPS jurisdictional waters would have minor to moderate adverse effects on those PWC users who use the Great Kills Park boat ramp for access to Raritan Bay. Additional PWC use in waters outside the unit boundary could result in more congestion that could affect other recreationists (e.g., other boaters), creating minor, adverse cumulative impacts in those areas.

Conclusion. Banning PWC use within the unit boundary would have minor to moderate adverse impacts on PWC users over the short and long term. Impacts to the experiences of other boaters and visitors would be beneficial. The no-action alternative would partially meet the park's strategic goal for improved visitor satisfaction (in the case of other boaters and non-boating visitors).

Banning PWC use within NPS jurisdictional waters could force PWC users to other regional areas, where the additional use could affect other recreationists (e.g., other boaters), creating minor, adverse cumulative impacts in those areas. Impacts on all other boaters and visitors would be negligible since there would be little noticeable change in overall visitor experiences. Most visitors would continue to be satisfied with their experiences at the Staten Island Unit.

VISITOR SAFETY

GUIDING REGULATIONS AND POLICIES

As described for the Jamaica Bay Unit (see page 135), the NPS *Management Policies 2001* state, "While recognizing that there are limitations on [the Service's] capability to totally eliminate all hazards, the Service and its concessioners, contractors, and cooperators will seek to provide a safe and healthful environment for visitors and employees" (sec. 8.2.5.1). Further, the National Park Service will strive to protect human life and provide for injury-free visits (sec. 8.2.5).

Part of the purpose of the Staten Island Unit is to offer opportunities for public access, use, and enjoyment. The following long-term goal for visitor safety is defined in the park's *Strategic Plan*:

> *Visitor Safety* — By September 30, 2005, the visitor accident/incident rate at Gateway National Recreation Area will be at or below 4.0 per 100,000 visitor days (a 28% decrease from the FY92 – FY96 baseline of 5.53 per 100,000 visitor days).

In New York, PWC users are required to comply with all federal boating laws and regulations. In addition to these requirements, the owner/operator is required to comply with additional regulations and/or laws specific to the state (see "Affected Environment," page 67).

The National Park Service, within the boundaries of the Staten Island Unit, has jurisdiction over the waters of the state of New York. Based on concurrent jurisdiction agreements, the U.S. Park Police enforce boating regulations within the unit's boundary.

METHODOLOGY AND ASSUMPTIONS

The methodology for assessing impacts on visitor safety is similar to that described under "Visitor Experience." The potential visitor-related impacts attributable to personal watercraft — a higher rate of accidents than other watercraft and conflicts with other park users — could potentially affect the mandate to provide for injury-free visits.

IMPACT ANALYSIS AREA

The impact analysis area for visitor safety impacts includes the locations related to PWC operation and the distance that PWC-related noise travels. Personal watercraft are allowed to operate in all waters of the Staten Island Unit; however, they predominantly use the area around Crookes Point (see "PWC and Visitor Use Trends").

IMPACT TO VISITOR SAFETY FROM PWC USE

The impact intensities for visitor safety are highlighted below. As described for the Jamaica Bay Unit, at the point where impacts to visitor safety became moderate, it is assumed that current visitor satisfaction and safety levels would begin to decline and that some of the unit's long-term visitor goals would not be achieved.

Thresholds for Impacts on Visitor Safety

Negligible: The impact to visitor safety would not be measurable or perceptible.

Minor: The impact to visitor safety would be measurable or perceptible, but it would be limited to a relatively small number of visitors at localized areas. Impacts to visitor safety might be realized through a minor increase in the potential for visitor conflicts in current accident areas.

Moderate: The impact to visitor safety would be sufficient to cause a change in accident rates at existing low accident locations or to create the potential for additional visitor conflicts in areas that currently do not exhibit noticeable accident trends.

Major: The impact to visitor safety would be substantial. Accident rates in areas usually limited to low accident potential are expected to substantially increase in the short and long term.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. All unit waters would remain open to PWC use. Personal watercraft, due to their ability to reach speeds up to 70 mph and their ability to access shallow-draft areas, can create wakes that pose a conflict and safety hazard to other users. The capability of NPS staff to enforce boating laws is directly dependent on the presence of patrols in use areas.

Conflicts between PWC Users and Swimmers — Potential accidents involving PWC users and swimmers may occur in nearshore waters at Crookes Point (most swimmers do not venture farther than 200 feet from shore). In accordance with New York State law, PWC operators are not to come within 500 feet of a swimming area (unless the area is less than 500 feet wide), and they are required to operate at 5 mph within 100 feet of the shore. With projected future increases in both visitors and PWC users at the unit, the potential adverse impacts to swimmers would be minor.

Conflicts between PWC Users and Other Boaters — The high-speed capabilities of personal watercraft pose threats not only to the safety of the PWC operator but also to boaters in vessels that are slower to turn, such as sailboats, canoes, and kayaks. The increased numbers of all types of boaters operating in these waters in recent years has increased the possibility of accidents with personal watercraft. Because of the level of activity in the waters around the Staten Island Unit, the potential for accidents with boaters is considered moderate.

Cumulative Impacts. Cumulative impacts under alternative A would continue to be minor to moderate over the next 10 years as the number of motorized watercraft and congestion in the water increased, resulting in a higher potential for accidents.

Conclusion. The potential for conflicts between PWC users and swimmers would result in minor adverse impacts because PWC users are restricted from operating near swimming areas and must travel at no-wake speeds within 100 feet of the shore. The potential for conflicts between PWC users and other boaters would result in moderate adverse impacts because of increasing congestion in unit waters.

Cumulative impacts would be minor to moderate as a result of increasing use of most types of watercraft and therefore more congestion in and adjacent to NPS jurisdictional waters.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use would be eliminated from all areas of the unit with the exception of the Great Kills Park boat ramp.

Conflicts between PWC Users and Swimmers — Potential accidents involving PWC users and swimmers would be eliminated within NPS jurisdictional waters because personal watercraft would be prohibited in all swimming areas within the unit. This would result in a beneficial impact to swimmers. No swimming occurs in the vicinity of Great Kills Park boat ramp, where PWC users would continue to be allowed.

Conflicts between PWC Users and Other Boaters — The potential for accidents with other boaters (canoeists, kayakers, sailboaters, and motorboaters) in NPS jurisdictional waters would be reduced with the elimination of personal watercraft in all areas except the Great Kills Park boat ramp. This would result in beneficial impacts to other boaters.

Cumulative Impacts. Cumulative impacts would be similar to those described for alternative A, but restricting PWC use within NPS waters would reduce the potential for conflicts in these areas, a beneficial impact. Any displacement of PWC users to waters outside the unit boundaries would contribute to congestion and possible increases in conflicts. This would result in minor to moderate adverse impacts outside unit boundaries.

Conclusion. Eliminating PWC use within all areas of the unit except the Great Kills Park boat ramp would reduce the potential for accidents within NPS jurisdictional waters, a beneficial impact for those visitors who come to the Staten Island Unit to swim, fish, and boat.

Impacts on a cumulative basis would be minor to moderate because of the potential increased safety hazards to other boaters in adjacent non-NPS waters if PWC use increased in these areas.

Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period

Analysis. PWC use would be restricted to the Great Kills Park boat ramp (the same as alternative B), but all PWC use would be eliminated after three years.

Conflicts between PWC Users and Swimmers — As described for alternative B, no swimming occurs at the boat ramp, and prohibiting PWC use in all other areas would eliminate the potential for accidents between PWC users and swimmers. This would be a beneficial impact.

Conflicts between PWC Users and Other Boaters — The potential for accidents with other boaters (canoeists, kayakers, sailboaters, and motorboaters) would be eliminated following the ban on PWC use in all areas of the unit. This would result in beneficial impacts to other boaters within the unit.

Cumulative Impacts. As described for alternative B, restricting PWC use within NPS waters would reduce the potential for conflicts, a beneficial impact. Any displacement of PWC users to waters outside the unit boundaries would contribute to congestion and possible increases in conflicts. This would result in minor to moderate adverse impacts outside unit boundaries.

Conclusion. Eliminating PWC use within all areas of the unit over a three-year period would eliminate the potential for PWC-related accidents within NPS jurisdictional waters, a beneficial impact for those visitors who come to the Staten Island Unit to swim, fish, and boat.

Impacts on a cumulative basis would be minor to moderate because of the potential of increased safety hazards to other boaters operating in adjacent non-NPS waters due to possibly increased PWC activities.

Impacts of the No-Action Alternative — No PWC Use

Analysis. PWC use would be eliminated from all areas of the unit.

Conflicts between PWC Users and Swimmers — Potential accidents involving PWC and swimmers would be eliminated, a beneficial impact to swimmers.

Conflicts between PWC Users and Other Boaters — The potential for PWC-related accidents with other boaters within the Staten Island Unit would be eliminated, resulting in beneficial impacts to other boaters.

Cumulative Impacts. As described for alternatives B and C, restricting PWC use within NPS waters would reduce the potential for conflicts, a beneficial impact. Any displacement of PWC users to waters outside the unit boundaries would contribute to congestion and possible increases in conflicts. This would result in minor to moderate adverse impacts outside unit boundaries.

Conclusion. Impacts on those visitors who come to the Staten Island Unit to swim, fish, and boat would be beneficial because there would be no conflicts with PWC users.

Impacts on a cumulative basis would be minor to moderate because of the potential for increased safety hazards to other boaters operating in adjacent non-NPS waters due to possibly increased PWC activities.

SOCIOECONOMIC EFFECTS

The socioeconomic effects specific to the Staten Island Unit are summarized from a report by Law Engineering et al. (2002).

BENEFIT-COST ANALYSIS

As described for the Jamaica Bay Unit, the benefit-cost analysis determines whether an alternative would generate more benefits than costs. These costs and benefits accrue directly to households that use personal watercraft, and indirectly to those who are affected by PWC use (e.g., those who benefit from reduced noise). The resulting changes in PWC use could also impose costs on those who own or work for a PWC-related business (Law et al. 2002).

Under alternative A there would be no change in current conditions because PWC use would continue to be allowed within the Staten Island Unit.

Under alternative B PWC use would not be allowed in shoreline areas and users could not land anywhere in the unit except at the Great Kills Park boat ramp. The impact on boaters would likely be beneficial, especially in the Great Kills Park and Crookes Point areas. The adverse effects to swimmers, anglers, canoeists, and other boaters that use the park would be reduced to a greater degree under this alternative than alternative A. PWC users and PWC dealerships could be adversely affected.

Alternative C and the no-action alternative would have beneficial impacts for all visitors except PWC users and PWC dealerships. The magnitude of change would be larger than under alternative B.

COSTS TO PWC USERS

PWC dealerships indicated that most PWC users live in the local area and own their machines. Other local areas and private marinas/boat ramps offer an alternative to riders who might be displaced from the area as a result of PWC use restrictions.

PWC users currently riding in the Staten Island Unit, as well as those riders in other areas who could be affected if users were displaced from that park area. For present and future PWC users in the park, use restrictions or prohibitions could result in consumer surplus losses. To the extent that individuals considered nearby PWC areas close substitutes, the loss in consumer surplus associated with restricting PWC use in the park would be lower. PWC users who currently ride in nearby areas and who could be affected by users displaced from the Staten Island Unit would lose some consumer surplus if these areas subsequently became more crowded. Although no studies were available that examined the impact of congestion on the value of a PWC trip, other recreation demand studies find that congestion lowers the value of a recreational experience.

Under alternative A consumer surplus to PWC riders would remain unchanged from current conditions.

Under alternative B there would be impacts on PWC users at the Staten Island Unit since use would be restricted to landing and launching at the Great Kills Park boat ramp, and consumer surplus losses would likely be somewhat greater under this alternative.

Under alternative C impacts on PWC users would be the same as alternative B during the phaseout period. Once use of the Great Kills Park boat ramp was discontinued, PWC users would have to use private and public boat ramps or marinas to access park waters. The Lemon Creek boat ramp is the only

public boat ramp on Staten Island that PWC users could use instead of the public ramp at Great Kills Park, but they would have to pay a higher fee. A seasonal permit to use the Great Kills Park boat ramp costs $25 and a seasonal permit to use the Lemon Creek boat ramp costs $100. Some PWC users would not be willing to pay this fee and would lose all consumer surplus from PWC use because they would no longer choose to use their personal watercraft. Others would pay the higher fee but would lose some of their consumer surplus because of the added cost. It is also possible that the public ramp might not be able to provide service to all of the PWC users that formerly used the Great Kills Park boat ramp. In this case, consumers who would have been willing to pay the fee may not be able to use their watercraft unless they were willing to travel to another boat ramp. To get to another ramp they would need to cross several toll bridges and travel more than an hour, so this is not a likely substitute.

The no-action alternative would result in a total ban on PWC use in the unit. PWC users who used park waters would be adversely affected. The no-action alternative would require PWC operators to use private and public boat ramps or marinas to access nonpark waters.

COSTS TO LOCAL AREA BUSINESSES

Based on the information currently available, it is not possible to quantify the magnitude of impacts that PWC restrictions would have. If PWC riding decreased as a result of regulation, then the suppliers of PWC sales and rental services could be adversely affected. Lodging establishments, restaurants, gas stations, and other businesses that serve PWC riders would be unlikely to experience a substantial reduction in business under any alternative because PWC users are believed to be primarily local residents on day trips and because PWC users account for a very small share of total visitation to the area.

MANAGEMENT AND OPERATIONS

CONFLICT WITH STATE AND LOCAL ORDINANCES AND POLICIES REGARDING PWC USE

As described for the Jamaica Bay Unit, consistency with state and local plans must be evaluated in accordance with the National Environmental Policy Act. Impacts related to conflicts with state and local ordinances have been analyzed qualitatively using professional judgment to define impact thresholds.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use would continue to be managed under New York State boating regulations. PWC regulations within the unit boundary would not conflict with state regulations or local ordinances and policies.

Cumulative Impacts. Management of PWC and boating use would be consistent with existing New York State boating regulations.

Conclusion. PWC and boating regulations within the unit boundaries would continue to be the same as New York State boating regulations. There would be no conflict with state regulations or local ordinances.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Like alternative A, PWC use would continue to be managed under New York State boating regulations. PWC users could only launch from the Great Kills Park boat ramp, and no use would be allowed in the rest of the unit. PWC regulations within the unit would not conflict with state regulations or local ordinances and policies, so there would be no impact on unit management.

Cumulative Impacts. As described for alternative A, management of PWC and boating use would be consistent with New York State boating regulations, except where PWC use was prohibited.

Conclusion. As described for alternative A, PWC and boating regulations would be the same as state regulations. There would be no conflict with state regulations or local ordinances.

Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period

Analysis. During the phaseout period PWC users could only launch from the Great Kills Park boat ramp, and use would be managed consistent with New York State boating regulations. PWC regulations would not conflict with state regulations or local ordinances and policies, with no impact on unit management.

Cumulative Impacts. Management of PWC and boating use would continue to be consistent with New York State boating regulations, except where PWC use was prohibited or restricted to no-wake speeds.

Conclusion. As described for alternative A, PWC and boating regulations would be the same as state regulations. There would be no conflict with state regulations or local ordinances.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Banning PWC use within the Staten Island Unit would not affect the enforcement of other New York State boating regulations within the unit.

Cumulative Impacts. The management of other motorized watercraft would continue to be consistent with New York State boating regulations.

Conclusion. Similar to alternative A, boating regulations would be the same as for the state. There would be no conflict with state regulations or local ordinances.

IMPACT TO UNIT OPERATIONS FROM INCREASED ENFORCEMENT NEEDS

The National Park Service at the Staten Island Unit is responsible for ensuring for the safety of unit visitors and the protection of unit resources, including the enforcement of PWC use regulations. The U.S. Park Police, the New York State Department of Environmental Conservation, the New York Port Authority, and the U.S. Coast Guard have jurisdiction within NPS waters. New York State has strict boating regulations applicable to PWC use that include boater education courses. *Director's Order #9: Law Enforcement* (NPS 2000c), in conjunction with *Reference Manual #9: Law Enforcement*, establishes and defines standards and procedures for NPS law enforcement. Impacts to park operations from increased enforcement needs have been analyzed qualitatively using best professional judgment.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Under this alternative unit waters would remain open to PWC use, with a continuing need for enforcement related to visitor safety and visitor conflicts with PWC users. The U.S. Park Police would continue to enforce New York State boating regulations; two officers would be assigned to patrols and enforcement activities throughout the unit. Impacts under alternative A would be short and long term and negligible to minor due to the potential need for additional personnel within the unit to enforce federal and state boating regulations.

Cumulative Impacts. Present enforcement agencies would continue to have jurisdiction within and adjacent to unit waters. The U.S. Park Police would continue to provide assistance to the various user groups to the park, both to resolve conflicts and to ensure safety.

Conclusion. Impacts under alternative A would be short and long term and negligible to minor due to the need for additional personnel to enforce federal and state boating regulations.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Under this alternative unit waters would remain open to PWC use only at the Great Kills Park boat ramp, thus reducing the need for enforcement related to visitor safety and visitor conflicts with PWC users outside the launch area. The U.S. Park Police would continue to enforce New York State boating regulations, with two officers assigned to patrols and enforcement activities throughout the unit. Impacts under alternative B would be long term and negligible to minor, the same as alternative A, due to the potential need for additional personnel within the unit to enforce federal and state boating regulations.

Cumulative Impacts. Present enforcement authorities would continue to have jurisdiction within and adjacent to unit waters. The U.S. Park Police would continue to provide assistance to the various user groups to the park, both to resolve conflicts and to ensure safety.

Conclusion. Impacts under alternative B would be short and long term and negligible to minor due to the potential need for additional personnel within the unit to enforce federal and state boating regulations.

Impacts of Alternative C — Continue PWC Use under a Special Regulation, but Phase Out Use over a Three-Year Period

Analysis. Under this alternative unit waters would remain open to PWC use only at the Great Kills Park boat ramp during the phaseout period. The U.S. Park Police would continue to enforce New York State boating regulations, with two officers assigned to patrols and enforcement activities throughout the unit. Impacts would be short and long term and negligible to minor, the same as alternative A, due to the potential need for additional personnel within the unit to enforce federal and state boating regulations.

Cumulative Impacts. Present enforcement authorities would continue to have jurisdiction within and adjacent to unit waters. The U.S. Park Police would continue to provide assistance to various park user groups, both to resolve conflicts and to ensure safety.

Conclusion. Impacts under alternative B would be short and long term and negligible to minor due to the potential need for additional law enforcement personnel to enforce federal and state boating regulations.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Under this alternative unit waters would be closed to PWC use, with a continuing need for enforcement related to visitor safety and visitor conflicts with PWC users. The U.S. Park Police would continue to enforce New York State boating regulations, with two officers assigned to patrols and enforcement activities throughout the unit.

Cumulative Impacts. Present enforcement authorities would continue to have jurisdiction within and adjacent to unit waters. The U.S. Park Police would continue to provide assistance to the various park user groups, both to resolve conflicts and to ensure safety.

Conclusion. Impacts would be short and long term and negligible to minor due to the potential increased need for additional personnel to enforce federal and state boating regulations.

UNAVOIDABLE ADVERSE IMPACTS

As described for the Jamaica Bay Unit, under all alternatives there would be adverse cumulative impacts if emissions reduced water or air quality.

Continuing PWC use throughout the Staten Island Unit under alternative A would adversely impact soundscapes, affecting wildlife and visitor experiences. Visitor experiences would continue to be compromised, with the potential for conflict between boaters and PWC users remaining high.

Under alternatives B and C the potential for similar impacts would exist, but at greatly reduced levels. Prohibiting PWC use along the oceanside of the unit would reduce the potential for visitor conflicts with shoreside visitors. However, the potential for conflicts would be increased outside unit boundaries to the extent that PWC users used adjacent waters outside NPS boundaries and congestion increased.

Alternative C (after the three-year phaseout period) and the no-action alternative would adversely impact PWC users who use the Great Kills Park boat ramp to access waterways for recreation.

LOSS IN LONG-TERM AVAILABILITY OR PRODUCTIVITY TO ACHIEVE SHORT-TERM GAIN

As noted above, some resources could be degraded as a result of implementing alternative A, B, or C. None of these resources would be impacted to the degree of "impairment" or long-term permanent loss. Enforcement of existing federal and state laws, as well as park regulations, would likely result in the long-term protection of these resources. These conditions could only be achieved by an increase in rangers and resources (boats) made available to the park.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irretrievable commitments of resources are those that can be reversed, that is, the commitment of a renewable resource or the short-term commitment of any resource. These include the commitment of water quality and air quality by allowing all mobile sources desiring to do so, including personal water-craft, to continue using the unit under alternative A, and to a lesser extent under alternatives B and C. The use of fossil fuels to power personal watercraft would be an irretrievable commitment of this resource; however, this use is minor.

Sandy Hook Unit

ALTERNATIVES

Four alternatives for managing PWC use are described for the Sandy Hook Unit. The action alternatives address continued PWC use under a special regulation, with various management strategies and mitigation measures. The no-action alternative assumes the National Park Service would not take action to promulgate a special regulation to keep Sandy Hook waters open to PWC use. The alternatives are summarized in Table 49 and the environmental consequences in Table 50. No other alternatives were considered.

ALTERNATIVE A — CONTINUE PWC USE UNDER A SPECIAL REGULATION

A special regulation would be promulgated to continue the current management and regulation of personal watercraft, as provided for in the "Superintendent's Compendium" for the Sandy Hook Unit (see appendix A). PWC use would continue to be prohibited from all waters in Horseshoe Cove, Spermaceti Cove, the area between the south end of Skeleton Hill Island and the north end of Plum Island, and within 500 feet of swimming beaches or 300 feet of other beaches (see the Alternative A map). This alternative is considered the "baseline" alternative to compare against other management strategies, including closure of the unit to PWC use.

Operational restrictions at the unit include those regulations mandated by New Jersey State boating regulations:

- no operation between sunset and sunrise
- no operating in excess of 5 mph within 100 feet of a swimmer or 500 feet of a public beach
- no operating above idle speed within 50 feet of a bounded bathing beach, the shoreline, or any person in the water
- no operating in such a manner as to make the personal watercraft completely leave the water or otherwise become airborne while crossing the wake of another vessel
- must have a personal flotation device
- must be 13 years old to ride PWC (with boat safety certification)
- must complete a boater safety course.
- no operating a vessel that exceeds 90 dB or that exceeds 82 dB at 82 feet

ALTERNATIVE B — CONTINUE PWC USE UNDER A SPECIAL REGULATION WITH GEOGRAPHIC RESTRICTIONS

Alternative B would continue PWC use but would limit use to navigational channels in the Sandy Hook Unit. PWC use would be prohibited in all NPS jurisdictional waters in Sandy Hook Bay except for the Shrewsbury River Channel and the Sandy Hook Channel. The oceanside of the unit would be closed to PWC use within 500 feet of all beaches (see the Alternative B map). All other operational restrictions at the unit, including the New Jersey State boating regulations, would continue to be enforced, as described under alternative A.

ALTERNATIVE C — CONTINUE PWC USE UNDER A SPECIAL REGULATION WITH ADDITIONAL GEOGRAPHIC RESTRICTIONS (PREFERRED ALTERNATIVE)

PWC use would continue under alternative C, but only in the navigational channel connecting the Shrewsbury River (at the southernmost boundary of the unit) with the waters of Sandy Hook Bay west of the park boundary. PWC use would not be allowed in the Sandy Hook Channel, the False Hook Channel (which parallels the Atlantic coast beaches), or in any of the oceanside waters (see the Alternative C map). As described under alternative A, all operational restrictions, including the New Jersey State boating regulations, would continue to be enforced within the Shrewsbury River Channel.

NO-ACTION ALTERNATIVE — NO PWC USE

For the purposes of this analysis, the no-action alternative assumes a scenario of discontinuing all PWC use within this national park system unit. The National Park Service would take no further action to promulgate a special regulation to retain PWC use, which would result in a ban on PWC use within the unit, including the portions of the Shrewsbury River Channel and the Sandy Hook Channel within the unit (see the No-Action Alternative map).

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is the alternative that would promote the National Environmental Policy Act, as expressed in section 101 of the act. The identification of the environmentally preferred alternative is that which best meets the following requirements:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Ensure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
- Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

This discussion also summarizes the extent to which each alternative meets section 102(1) of the National Environmental Policy Act, which asks that agencies administer their own plans, regulations, and laws so that they are consistent with the policies outlined above to the fullest extent possible.

Alternative A would not satisfy the majority of the six requirements detailed above. Alternative A would attain the widest range of beneficial park uses to PWC users and would preserve an environment that supports diversity and variety of individual choice; however, it would not achieve a balance between population and resource use that permits a high standard of living and a wide sharing of life's amenities. Alternative A would limit protection of wildlife and wildlife habitats. Alternative A would not fulfill the

responsibilities of each generation as trustee of the environment for succeeding generations due to continued degradation resulting from PWC use within the unit.

Alternative B would have beneficial impacts on park resources and visitor use and experience at the Sandy Hook Unit very similar to those described for alternative A; it would restrict PWC use to the navigational channels surrounding the unit. Alternative B would provide for the protection of wildlife and wildlife habitats associated with nearshore and shoreline areas from adverse effects of PWC use in these areas. Alternative B would attain a wide range of beneficial uses of the environment.

Alternative C would have additional beneficial impacts on park resources and visitor use and experience in the Sandy Hook Unit, similar to those described for alternative B; it would restrict PWC use to the Shrewsbury River Channel. Alternative C would provide a high degree of protection to water and air quality, soundscapes, wildlife and wildlife habitat in nearshore and shoreline habitats of the unit from adverse effects of PWC use in these areas. Alternative C would allow PWC access to those waters of the unit that would permit free movement through Sandy Hook Bay and would therefore maintain an environment that supports diversity and variety of individual choice, thus achieving a balance between population and resource use that permits a wide sharing of amenities.

The no-action alternative would ensure safe, healthful, productive, and aesthetically and culturally pleasing surroundings for visitors without PWC users entering the area and introducing noise and safety considerations. The no-action alternative would attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences of removing PWC use from the park entirely. The no-action alternative would ensure the highest degree of protection to wildlife and wildlife habitat associated with nearshore and shoreline habitats of the Sandy Hook Unit by excluding PWC use from these areas. However, the no-action alternative would completely exclude personal watercraft from access to the navigational channels near Sandy Hook, inhibiting access to waters other than NPS jurisdictional waters. This would not maintain an environment that supports diversity and variety of individual choice, nor would it achieve a balance between population and resource use that permits a wide sharing of amenities.

Based on the analysis prepared for PWC use at Sandy Hook Unit, alternative C is the environmentally preferred alternative, best fulfilling park responsibilities as trustee of this sensitive habitat; ensuring safe, healthful, productive, and aesthetically and culturally pleasing surroundings; and attaining a wider range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.

TABLE 49: SUMMARY OF PWC MANAGEMENT ALTERNATIVES — SANDY HOOK UNIT

	Alternative A — Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions	Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	No-Action Alternative — No PWC Use
Management	Allow PWC use under a special regulation.	Allow PWC use under a special regulation.	Allow PWC use under a special regulation.	Ban PWC use.
Use Area	No PWC use in Horseshoe Cove, Spermaceti Cove, between the south end of Skeleton Hill Island and the north end of Plum Island, within 500 feet of swimming beaches, or within 300 feet of other beaches.	No PWC use in oceanside waters up to 500 feet from shore. No PWC use in Sandy Hook Bay waters under NPS jurisdiction except for the Shrewsbury River and Sandy Hook Channels.	No PWC use in any NPS jurisdictional waters except for the Shrewsbury River Channel.	No PWC use
Other Restrictions	No launching from parklands.	Same as alternative A.	Same as alternative A.	Not applicable.
Engine Type	No restrictions.	Same as alternative A.	Same as alternative A.	Not applicable.
Use Hours	Sunrise to sunset.	Same as alternative A.	Same as alternative A.	Not applicable.
Numbers	No limits.	Same as alternative A.	Same as alternative A.	Not applicable.
State Regu-lations	Enforce all state regulations.	Same as alternative A.	Same as alternative A.	Not applicable.

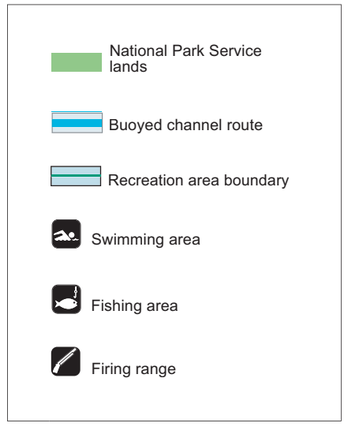
Gateway National Recreation Area

New York and New Jersey

Sandy Hook Unit

Location Map

United States Department of the Interior / National Park Service WASO/January '03/646-20132

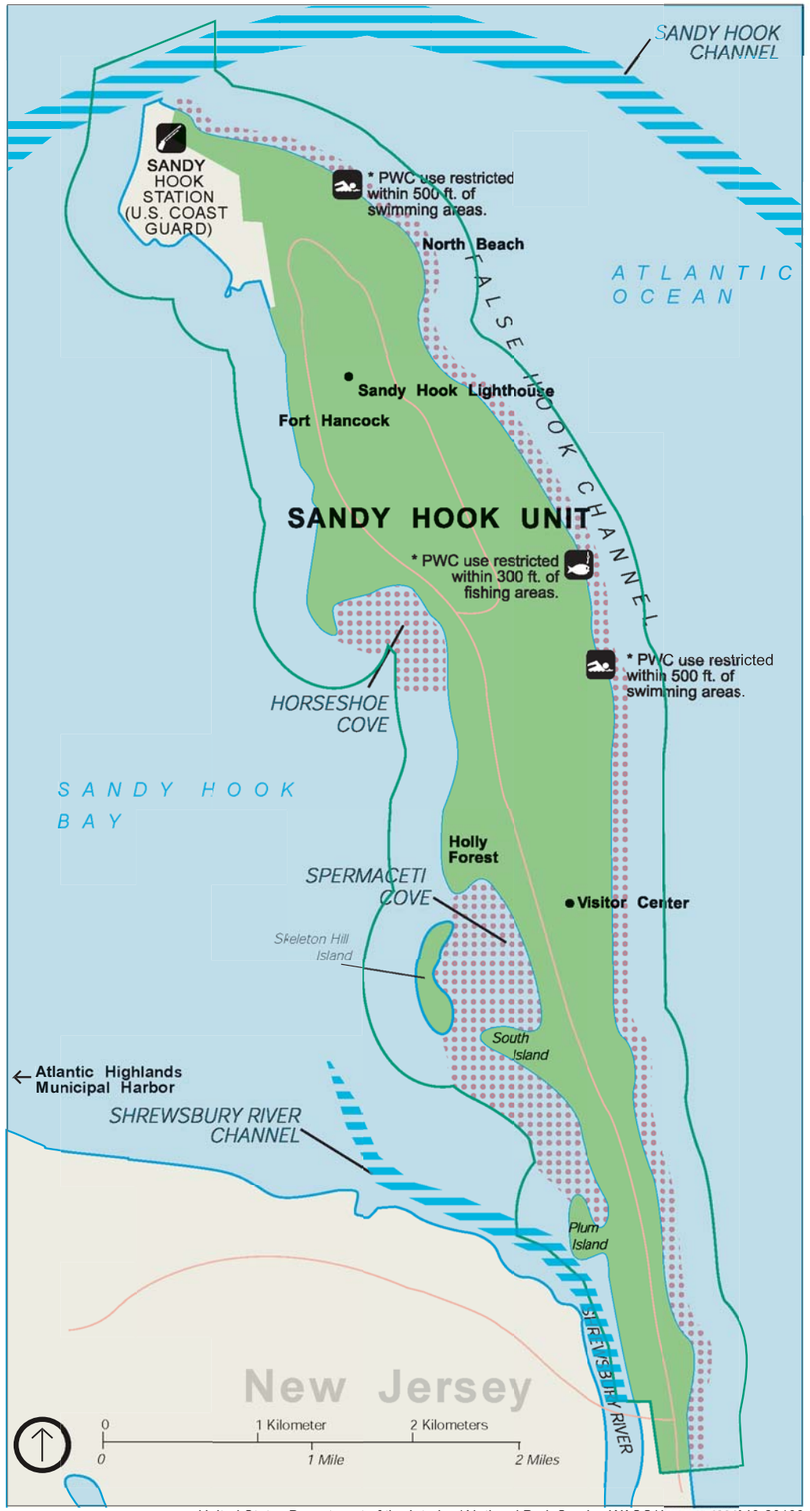


Gateway National Recreation Area

New York and New Jersey

Sandy Hook Unit

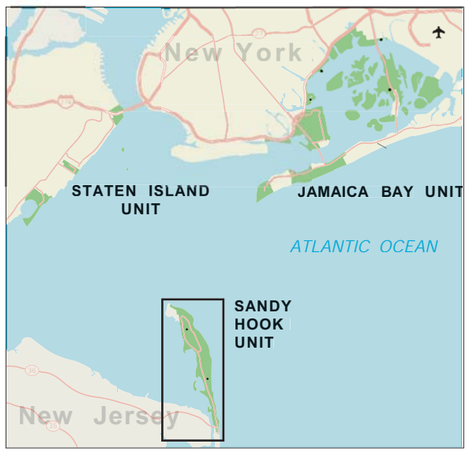
Alternative A -- Continue PWC Use under a Special Regulation



United States Department of the Interior / National Park Service WASO/January '03/646-20133

- National Park Service lands
- PWC use prohibited
- Buoyed channel route
- Recreation area boundary
- Swimming area
- Fishing area
- Firing range

* Due to scale, the map does not differentiate between the 500 foot buffer for bathing beaches and 300 foot buffer for fishing areas



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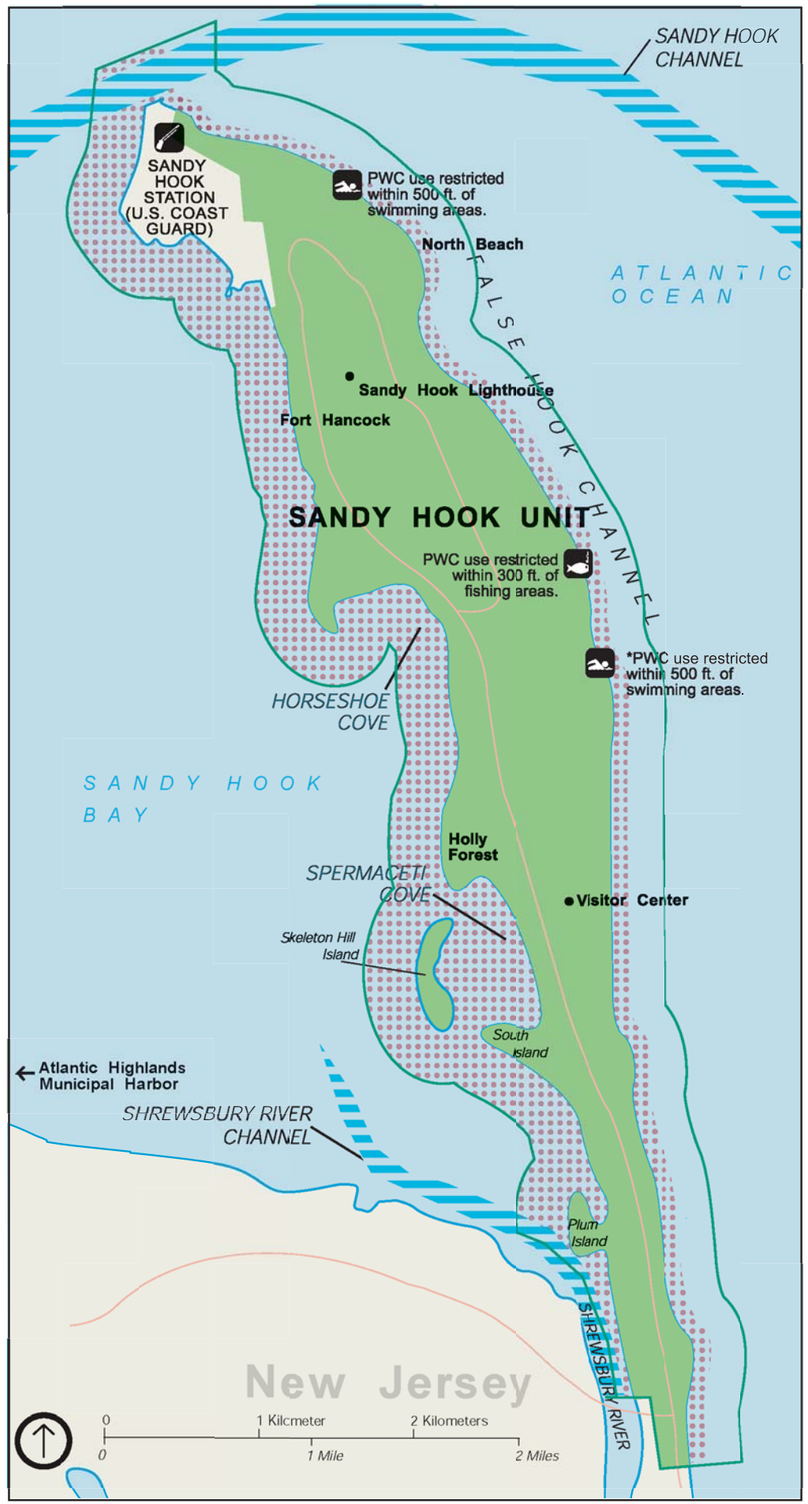
Gateway National Recreation Area

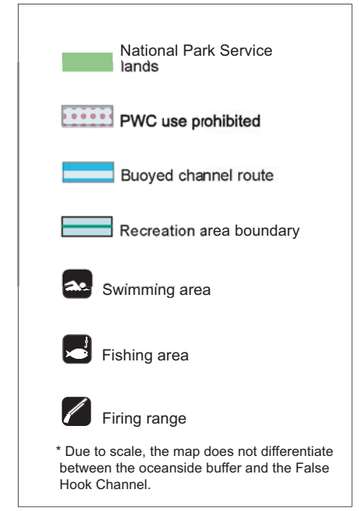
New York and New Jersey

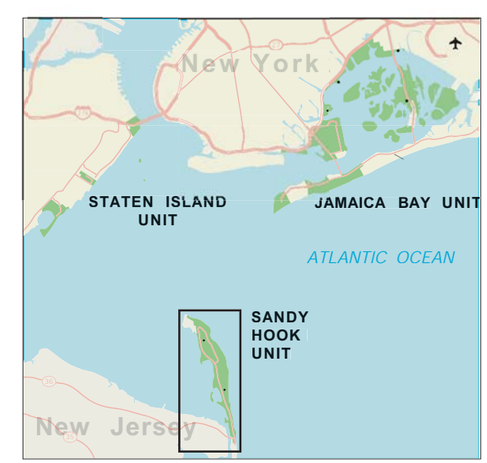
Sandy Hook Unit

Alternative B -- Continue PWC Use under a Special Regulation with Geographic Restrictions



United States Department of the Interior / National Park Service WASO/January '03/646-20134





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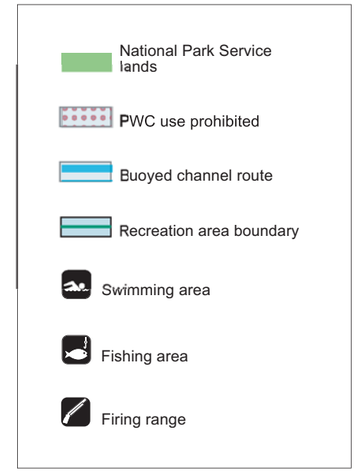
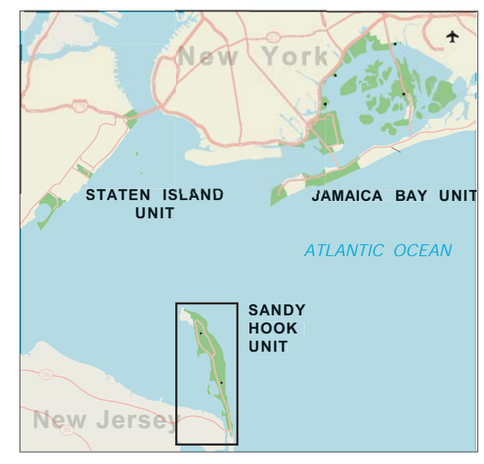
Gateway National Recreation Area

New York and New Jersey

Sandy Hook Unit

Alternative C -- Continue PWC Use under a Special Regulation with Additional Geographic Restrictions





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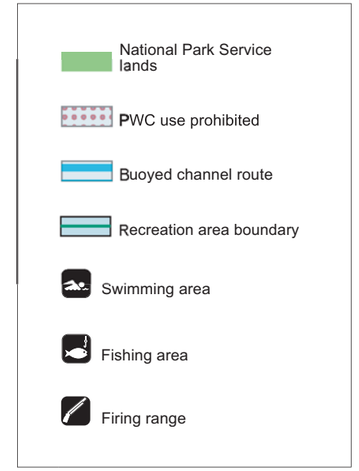
Gateway National Recreation Area

New York and New Jersey

Sandy Hook Unit

No-Action Alternative -- No PWC Use



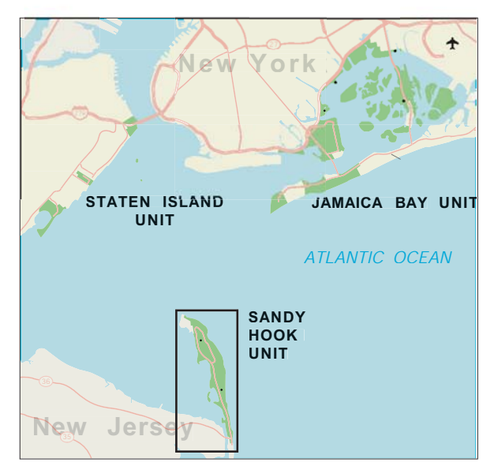


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TABLE 50: SUMMARY OF ENVIRONMENTAL CONSEQUENCES — SANDY HOOK UNIT

Impact Topic	Alternative A —: Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions	Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	No-Action Alternative — No PWC Use
Water Quality	Water quality impacts based on ecotoxicological and human health benchmarks would be negligible in 2002 and 2012. Cumulative water quality impacts from all motorized vessels would be negligible for all pollutants in 2002 and 2012. No impairment.	Closing most of the unit's bayside waters and some nearshore ocean waters to PWC use would have a beneficial effect on water quality by not disturbing sediments in the shallow bayside and oceanside waters. Water quality impacts from PWC emissions based on ecotoxicological and human health benchmarks would be negligible in 2002 and 2012. Cumulative impacts to water quality would also be negligible for bayside and oceanside waters. No impairment.	As PWC use would be banned from the unit's oceanside waters, this alternative would have a beneficial impact on water quality and associated biota on this side of Sandy Hook. Impacts to water quality in the unit's bayside waters would be somewhat greater than under alternative B because PWC use would be concentrated within approximately 17 acres of surface water within the Shrewsbury River Channel. Currents in this navigational channel are swift, and tide- and wind-driven mixing would rapidly dilute PWC pollutants in this area. Impacts from PWC pollutants under ecotoxicological and human health benchmarks are expected to be negligible in 2002 and 2012. Cumulative impacts from all motorized watercraft emissions would be negligible in all areas in 2002 and 2012. No impairment.	Banning PWC use within the unit would have a beneficial impact on water quality by reducing sediment resuspension and eliminating PWC emission of pollutants in the unit's waters. On a cumulative basis, other motorboats would continue to have negligible adverse impacts on the unit's water quality due to the discharge of organic pollutants. No impairment.
Air Quality				
• Impacts on Human Health (Sandy Hook is in a severe nonattainment area for ozone.)	Continuing PWC use at existing levels would result in negligible adverse impacts from CO and PM emissions in 2002 and 2012. Because the unit is in an ozone nonattainment area, impacts would be moderate adverse from VOC emissions and minor adverse from NO_x throughout the assessment period. Overall, emissions from all boating activities in 2002 and 2012 would result in major adverse impacts from CO and negligible adverse impacts from PM. For ozone precursors, impacts from NO_x would be moderate adverse and from VOC major adverse. No impairment.	Continuing PWC use at existing levels but restricting it to navigational channels and beyond 500 feet from the shore on the oceanside would result in negligible adverse impacts from CO and PM pollutants in 2002 and 2012. For ozone precursors, impacts in 2002 and 2012 from VOC would be moderate adverse and from NO_x minor adverse. Overall, emissions from all boating activities would result in major adverse impacts from CO and negligible adverse impacts from PM in 2002 and 2012. Impacts from NO_x would be moderate adverse, and from VOC major adverse. No impairment.	Restricting PWC use to the Shrewsbury River channel within NPS boundaries would result in negligible adverse impacts from CO and PM emissions. Located in an ozone non-attainment area, the unit would experience minor adverse impacts from NO_x, while impacts from VOC would be moderate in 2002, decreasing to minor by 2012. Overall, emissions from all boating activities would result in moderate adverse impacts from CO and negligible adverse impacts from PM. For ozone precursors, impacts from NO_x would be moderate adverse and from VOC major adverse. No impairment.	The no-action alternative would have beneficial impacts as a result of banning PWC use within unit waters. Cumulative impacts would be decreased due to less PWC operation and cleaner engines, but impacts would still be moderate adverse for CO and negligible adverse for PM. For ozone precursors, impacts from NO_x would be moderate adverse and from VOC major adverse. No impairment.
• Impacts on Air Quality Related Values	PWC annual emissions would result in moderate adverse impacts from ozone exposure and negligible impacts for visibility. There are no perceptible visibility impacts on record	PWC annual emissions would result in moderate adverse impacts from ozone exposure and negligible impacts for visibility, similar to alternative A. There are no perceptible qualitative	PWC annual emissions would result in moderate adverse impacts from ozone exposure and negligible impacts for visibility. There are no perceptible visibility impacts or observed ozone	The no-action alternative would have beneficial impacts on the air quality of Sandy Hook Unit as a result of banning PWC use. Cumulative emissions would result in moderate impacts

Impact Topic	Alternative A —: Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions	Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	No-Action Alternative — No PWC Use
	or observed ozone injury on plants. Cumulative emissions from all motorized boating activities would result in moderate adverse impacts for ozone exposure and negligible impacts on visibility. No impairment.	visibility impacts on record or observed ozone injury on plants. Cumulative emissions would result in moderate adverse impacts for ozone exposure and negligible impacts on visibility. No impairment.	injury on plants. Cumulative emissions would result in moderate adverse impacts for ozone exposure and negligible impacts on visibility. No impairment.	from ozone exposure. Visibility impacts would be negligible. No impairment.
Soundscapes	Noise impacts from PWC use would be negligible, and adverse over the short and long term on both the bayside and the oceanside of Sandy Hook. Cumulative impacts of boating noise, ambient noise levels, and PWC noise would range from negligible to minor adverse, depending on location and time of year, and compared to the natural soundscape. No impairment.	Noise impacts related to PWC use would be negligible and adverse over the short and long term on both the bayside and oceanside of Sandy Hook, although noise levels could be lower on the oceanside due to prohibiting PWC use within 500 feet of the shore. Cumulative impacts of boating noise, ambient noise levels, and PWC noise would range from negligible to minor adverse, depending on location and time of year, and compared to the natural soundscape. Noise levels on the bayside are elevated due to the level of boat traffic within the area. No impairment.	PWC use restrictions would limit the areas of PWC use, with beneficial impacts on both the oceanside and bayside. Noise impacts would be negligible over the short and long term. Cumulative impacts of boating noise, ambient noise levels, and PWC noise would range from negligible to minor adverse, depending on location and time of year, and compared to the natural soundscape. No impairment.	Banning PWC use within the unit would have beneficial impacts by eliminating this noise source within the unit boundary. On a cumulative basis, noise from other motorboats would continue to have negligible to minor adverse impacts, depending on location and time of year, and compared to the natural soundscape. No impairment.
Impacts on Wildlife and Wildlife Habitat	Minor, adverse, direct and indirect impacts to wildlife and habitat over the short and long term are expected because PWC use would be restricted in the most sensitive areas of the Sandy Hook Unit. Requiring PWC users to operate at idle speeds within 50 feet of the shoreline would minimize adverse effects to wildlife in shoreline habitats as a result of rapid approaches and noise. Adverse cumulative effects associated with increased future motorized uses are expected to be minor and indirect over the short and long term because species sensitive to noise and human activity are not expected to regularly occur in high-use areas or immediately adjacent habitats during peak periods. No impairment.	Negligible, adverse direct and indirect impacts to wildlife and habitat over the short and long term are expected because PWC use would be restricted from most of the park waters and all nearshore areas of the Sandy Hook Unit. Cumulative adverse impacts would be minor and indirect over the short and long term because species sensitive to noise and human activity are not expected to regularly occur in high-use areas or immediately adjacent habitats during peak periods, similar to alternative A. No impairment.	Impacts to wildlife and habitat would be negligible and adverse over the short and long term because personal watercraft would be prohibited in all waters except for the Shrewsbury River Channel. Limiting the area exposed to disturbance by PWC use would result in beneficial impacts throughout most of the unit. Adverse cumulative impacts associated with increased future motorized uses are expected to be short and long term, minor, and indirect because species sensitive to noise and human activity are not expected to regularly occur in the high-use areas or immediately adjacent habitats during peak periods, similar to alternative A. No impairment.	Eliminating PWC use within the unit is expected to have beneficial impacts on wildlife species associated with nearshore and shoreline habitats. Eliminating PWC access to shallow water habitats along the unit would also enhance the quality of essential fish habitats in these areas, a beneficial impact. Cumulative impacts are expected to be minor and adverse over the short and long term, similar to alternative A, because conventional watercraft use would continue but species sensitive to noise and human activity are not expected to regularly occur in the high-use areas or immediately adjacent habitats during peak periods. No impairment.
Aquatic Fauna	Alternative A would have minor to moderate, indirect, adverse impacts on aquatic fauna over the short and	Limiting PWC access within the Sandy Hook Unit would have minor, indirect, adverse impacts over the short	Allowing PWC use only in the Shrewsbury River Channel would have minor, indirect, adverse impacts on	Banning PWC use within the Sandy Hook Unit would result in beneficial impacts to aquatic fauna.

Impact Topic	Alternative A —: Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions	Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	No-Action Alternative — No PWC Use
	long term. PWC-generated noise could affect the activities of marine reptiles, mammals, and fish in the area of the unit. Cumulative impacts would be minor to moderate, indirect, and adverse over the short and long term, similar to those discussed for PWC use alone. No impairment.	and long term on marine reptiles, mammals, and fish in localized areas (in and near the navigational channels and within the 0.25-mile NPS oceanside boundary beyond 500 feet from shore). Cumulative impacts would be minor and indirect over the short and long term, similar to alternative A. No impairment.	aquatic fauna in the area over the short and long term. Impacts would be localized to areas in and near the channel. Cumulative impacts would be minor, indirect, and adverse over the short and long term, similar to alternative A. No impairment.	Cumulative impacts would be minor, indirect, and adverse over the short and long term, similar to alternative A. No impairment.
Threatened, Endangered, or Special Concern Species	Threatened, endangered, or special concern species are not likely to be adversely affected by PWC use because use is restricted from the most sensitive areas of the unit. Cumulative impacts are not likely to affect threatened, endangered, or special concern species. No impairment.	Alternative B is not likely to adversely affect special status species, similar to alternative A. Restricting PWC use from all nearshore habitats, except in the two navigational channels, would minimize the potential for adverse impacts in nearshore and shoreline areas. Cumulative impacts are not likely to adversely affect special status species, similar to alternative A. No impairment.	Alternative C is not likely to adversely affect threatened, endangered, or special concern species, similar to alternative A. Restricting PWC use from all nearshore habitats, except the Shrewsbury River Channel, would minimize the potential for adverse impacts. Cumulative impacts are not likely to adversely affect special status species, similar to alternative A. No impairment.	Eliminating PWC use within the unit would have beneficial impacts on threatened, endangered, or special concern species occurring in the unit. No adverse impacts are expected. Cumulative impacts are not likely to adversely affect special status species, similar to alternative A. No impairment.
Shoreline Vegetation and Wetland Habitats	Direct and indirect impacts to shoreline vegetation would be minor and adverse over the short and long term because PWC access to shoreline areas would be limited, and associated foot traffic would be minimal. Cumulative impacts could occur as a result of continued access by PWC and conventional motorized watercraft users. Direct and indirect impacts would be minor and adverse over the short and long term because access to shallow water areas is limited. No impairment.	Impacts as a result of restricting PWC use would be beneficial because closing all shoreline and nearshore areas to personal watercraft would limit visitor access. Cumulative impacts would be minor, direct and indirect, and adverse over the short and long term, similar to alternative A, as a result of continued limited access by conventional motorized watercraft to shallow water habitats and associated foot traffic around landing areas. No impairment.	Impacts would be beneficial because all shoreline and nearshore areas would be closed to PWC use. Minor, direct and indirect, adverse cumulative impacts are expected over the short and long term, similar to alternative A, because of continued, limited access to shallow water areas by conventional motorized watercraft and continued foot traffic around landing areas. No impairment.	Impacts would be beneficial as a result of restricting PWC use and eliminating the potential for adverse impacts associated with their operation. Minor, direct and indirect, adverse cumulative effects are expected over the short and long term, similar to alternative A, as a result of continued access by conventional watercraft and associated foot traffic around landing areas. However, access to shallow water habitats is limited. No impairment.
Visitor Use and Experience	Continued PWC use would result in negligible to minor adverse impacts on visitor experiences, depending on the location and seasonal variations in visitor use. There would be minor adverse impacts between PWC users, swimmers, birdwatchers, and anglers during peak summer months. Alternative A would partially meet the park's strategic goal for improved visitor satisfaction (in the case of PWC users).	Restricting PWC use to certain areas would result in beneficial impacts to most visitor experiences. PWC users would experience negligible to minor adverse impacts with the closure of certain areas to use. Alternative B would partially meet the park's strategic goal for improved visitor satisfaction (in the case of other boaters and non-boating visitors) by restricting PWC use to specific areas of the unit. Cumulative effects of PWC	Alternative C would have beneficial impacts to the experiences of visitors other than PWC users. There would be minor to moderate adverse impacts to PWC users as a consequence of closing most areas of the unit to PWC use other than the Shrewsbury River Channel. Cumulative impacts on all PWC users would be negligible to minor because they might not be aware of the proposed changes, and other areas outside the unit	Impacts on most visitors would be beneficial. Impacts on PWC users would be minor to moderate and adverse over the short and long term. Other areas outside NPS jurisdictional waters would still be available for PWC use. Cumulative impacts on all other boaters and visitors would be similar to alternative A since there would be little noticeable change in overall experiences. Banning PWC use within NPS jurisdictional waters could

Impact Topic	Alternative A —: Continue PWC Use under a Special Regulation	Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions	Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)	No-Action Alternative — No PWC Use
	Cumulative impacts related to all other motorized watercraft and other visitor uses would continue to result in negligible impacts, since there would be little noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences at the Sandy Hook Unit.	and other motorized watercraft uses would be negligible, similar to alternative A, since motorized boats would still be allowed in areas closed to PWC use. Most visitors would continue to be satisfied with their experiences, with a slightly greater benefit for visitors in areas adjacent to where PWC use was restricted.	would remain open to PWC use. Impacts on other boaters, as well as all visitors, would be beneficial within the unit and negligible adverse outside of the unit, with potential for increased congestion on the waterways. Most visitors would continue to be satisfied with their experiences.	force PWC users to other regional areas, where the additional use could affect other recreationists (e.g., other boaters), creating a minor adverse cumulative impact in those areas. Most visitors would continue to be satisfied with their experiences.
Visitor Safety	While the number of PWC users is not expected to increase substantially over the next 10 years, conflicts between PWC users and other water recreationists (swimmers and boaters) would result in negligible to minor adverse impacts as use increased for all activities. On a cumulative basis impacts on visitor safety would be negligible to minor over the next 10 years, depending on the type of water-oriented activity and its location.	Alternative B would eliminate the potential for PWC-related accidents throughout large portions of the unit, resulting in beneficial impacts to swimmers. Within the areas open to PWC use, existing conditions would continue, with minor adverse impacts to visitor safety. Cumulative impacts would be similar to alternative A, with beneficial impacts in areas closed to PWC use and minor impacts in areas remaining open to personal watercraft.	Closing most of the unit's waters to PWC use would have beneficial impacts on swimmers and other boaters. There would be a minor potential for accidents between PWC users and other boaters in the Shrewsbury River Channel. An increased potential for accidents between PWC users and other boaters could occur outside NPS waters. Some beneficial impacts would result from restrictions on PWC use and reduced potential for conflicts and accidents.	Eliminating PWC use within the unit would have a beneficial impact for those visitors who come to the Sandy Hook Unit for swimming, fishing, and traditional boating. Cumulative impacts would be similar to alternative A, with negligible to minor adverse impacts on visitor safety because many other uses at the unit are related to motorized watercraft and water-related activities. Impacts on other boaters operating in adjacent non-NPS waters would be negligible to minor because of the potential of increased safety hazards if PWC activities increased in these areas.
Socio-economic Environment	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.	No measurable impacts are expected on the regional economy or the local communities.
Unit Operations and Management				
• Conflict with State and Local Ordinance	PWC regulations within the unit boundaries would be consistent with New Jersey State regulations. There would be no conflict with state regulations or local ordinances.	PWC regulations within the unit boundaries would be consistent with New Jersey State regulations. There would be no conflict with state regulations or local ordinances, similar to alternative A.	PWC regulations within the unit boundaries would be consistent with New Jersey State regulations. There would be no conflict with state regulations or local ordinances, similar to alternative A.	Similar to alternative A, boating regulations would be the same as those for New Jersey State. There would be no conflict with state regulations or local ordinances.
• Enforcement Needs	Impacts would be short and long term and minor due to needs for additional law enforcement capability within the unit to enforce federal and **Wildlife and Wildlife Habitat** state boating regulations.	Impacts would be short and long term and minor due to needs for additional law enforcement capability within the unit to enforce federal and state boating regulations, similar to alternative A.	Impacts would be short and long term and minor due to needs for additional law enforcement capability within the unit to enforce federal and state boating regulations, similar to alternative A.	The no-action alternative would result in short and long term, negligible to minor impacts resulting from banning PWC use; once the ban was understood and observed by PWC users, impacts would be minor.

THE AFFECTED ENVIRONMENT

On a largely undisturbed peninsula at the northern end of the New Jersey coast, the Sandy Hook Unit encompasses approximately 1,665 land acres, including 7.5 miles of ocean beaches and sheltered bayside coves and hundreds of acres of ecologically significant barrier beach vegetation (NPS 1979). The area features ocean beaches, Sandy Hook Bay, salt marshes, and Sandy Hook lighthouse. At the north end of the unit are the land, facilities, and fortifications of the Fort Hancock complex. Hiking trails lead to dunes, ponds, a maritime holly forest, and some of the richest bird habitat in New Jersey.

Coastal barriers, such as Sandy Hook, provide protection for diverse aquatic habitats and serve as the mainland's first line of defense from the impacts of severe coastal storms and erosion. The dominant physical factors responsible for shaping these coastal landforms are tidal range, wave energy, and sediment supply from rivers and older coastal sand bodies. Relative changes in local sea level also profoundly affect coastal barrier diversity. Six characteristics define coastal barriers:

> They are subject to the impacts of coastal storms and sea level rise.
>
> They buffer the mainland from the impact of storms.
>
> They protect and maintain productive estuarine systems that support the nation's fishing and shellfishing industries.
>
> They consist primarily of unconsolidated sediments.
>
> They are subject to wind, wave, and tidal energies.
>
> They include associated landward aquatic habitats that the non-wetland portion of the coastal barrier protects from direct wave attack (USFWS 2000c).

Together with their adjacent wetland, marsh, estuarine, inlet, and nearshore water habitats, coastal barriers support a tremendous variety of organisms. Fish, shellfish, birds, mammals, and other wildlife depend on barriers and their associated wetlands for vital feeding, spawning, nesting, nursery, and resting habitat.

WATER RESOURCES

Sensitive aquatic systems around the Sandy Hook Unit that may be affected by water quality include, among others, marshes, resident and nonresident nektonic communities (fish, reptiles, and marine mammals), and shellfisheries. The following section describes existing water quality conditions that have a direct impact on these aquatic systems.

SURFACE WATER

Sandy Hook is a coastal barrier beach bordered to the west by Sandy Hook / Raritan Bay and to the east by the New York Bight portion of the Atlantic Ocean. Sandy Hook Bay receives the output of the Shrewsbury River and Navesink River watersheds, resulting in wide fluctuations in salinity. The Sandy Hook Unit's jurisdictional waters extend 0.25 mile offshore, encompassing approximately 2,400 acres of Sandy Hook Bay and New York Bight. The waters of the Sandy Hook Unit are characterized by strong diurnal tidal currents that reach a speed of 4.3 feet per second in the Sandy Hook Channel (NOAA 2002e). The mean tidal range at Sandy Hook is 4.7 feet (NOAA 2002e). A number of marinas in Sandy Hook Bay and the Shrewsbury River accommodate considerable numbers of pleasure craft.

WATER QUALITY

Sandy Hook Bay is subject to wide fluctuations in temperature and dissolved oxygen, largely from anthropogenic causes, in particular, sewage effluent and stormwater runoff. The Middlesex County Utilities Authority operates a wastewater treatment outfall at the convergence of the Raritan River and Arthur Kill, with a permitted discharge of 160 million gallons per day (NJ Department of Environmental Protection [DEP] 1998a). The Monmouth County Bayshore Outfall Authority operates a pipeline system that discharges approximately 30 million gallons per day of secondary treated effluent into the Atlantic Ocean, about 4,000 feet off Sandy Hook (NJ DEP 1998a). Because of these and other permitted surface water discharges around Sandy Hook, fecal coliform levels are often high, particularly after heavy rainfalls, causing beach closures and increased shellfishing restrictions. During summer warmwater periods, low dissolved oxygen in the bay is thought to be responsible for large fish kills. Past and present industrial uses have resulted in the discharge of heavy metals, hydrocarbons, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) into Lower Bay north of the unit. Because of a variety of contaminants in Lower Bay, New Jersey issues regular fish consumption advisories, and shellfishing is either restricted or prohibited in all of the waters surrounding the Sandy Hook Unit.

FEDERAL / STATE REGULATIONS AND STANDARDS

As discussed for the Jamaica Bay Unit, the U.S. Environmental Protection Agency has developed national recommended water quality criteria for priority pollutants in ambient water for the protection of aquatic life and human health. These criteria have been adopted as enforceable standards by most states, and all states must submit a 305(b) report, which characterizes the quality of their waters on a watershed level, and a 303(d) list, which establishes which specific waterbodies do not meet federal or state water quality standards for designated uses.

Once a waterbody is classified, the numeric water quality standards for various chemical, biological, and physical constituents established by the New Jersey Department of Environmental Protection are applied, which may be more stringent than the EPA criteria. These numeric standards determine whether or not a waterbody can support the designated uses. If a waterbody does not meet the numeric standards, it is considered impaired and placed on the 303(d) list. The EPA 303(d) list of impaired waters lists Sandy Hook Bay and northern Monmouth County's ocean waters as impaired due to pathogens (fecal coliform) (US EPA 1998a). Table 51 summarizes the federal and state water classifications for waters within the Sandy Hook Unit.

TABLE 51: WATERBODY CLASSIFICATIONS AT THE SANDY HOOK UNIT

Waterbody	Watershed	Federal Designation: EPA Watershed Category*	State Use Designation**	303(d) Listed Impairment
Sandy Hook Bay	Sandy Hook-Staten Island (02030104)	Category I	Class SE1	Pathogens
Atlantic Ocean	Sandy Hook-Staten Island (02030104)	Category I	Class SC	Pathogens

SOURCES: NJ DEP 1998b; US EPA 1998b.

* Category I — Watershed is in need of restoration and does not meet clean water and natural resource goals.

** Saline waters — Waters having salinities generally greater than 3.5 parts per thousand at mean high tide.

SE1 — the general surface water classification applied to saline waters of estuaries. In all SE1 waters the designated uses are:
1. shellfish harvesting in accordance with NJAC 7:12;
2. maintenance, migration and propagation of the natural and established biota;
3. primary and secondary contact recreation; and
4. any other reasonable uses.

SC — the general surface water classification applied to coastal saline waters. In all SC waters, the designated uses are:
1. shellfish harvesting in accordance with NJAC 7:12;
2. primary and secondary contact recreation;
3. maintenance, migration and propagation of the natural and established biota; and
4. any other reasonable uses.

OTHER WATER QUALITY DATA

Gateway National Recreation Area's water quality program has collected baseline data since 1977 to use in the management of area waters for public health and ecological quality. Six sites in the Sandy Hook Unit (three oceanside, three in Sandy Hook Bay) are tested at the surf zone for total and fecal coliform weekly between late May and early September (NPS 1998a).

Other programs that monitor water quality within and in the vicinity of the Sandy Hook Unit include the National Shellfish Sanitation Program, which requires all coastal states involved in interstate shellfish harvest and sale to classify their coastal waters to safeguard the public health from the consumption of contaminated shellfish. In accordance with this program, the Bureau of Marine Water Monitoring of the New Jersey Department of Environmental Protection conducts regular water quality sampling. Shellfishing is currently prohibited in NPS jurisdictional waters in the Atlantic Ocean, and NPS jurisdictional waters in Sandy Hook Bay are categorized as a "special restricted" shellfish area (NJ DEP 2002a). Shellfish in the "special restricted" area can be harvested for use as bait or purified for human consumption by approved processes.

In addition, the Phytoplankton Monitoring Network Program is a cooperative effort between the New Jersey Department of Environmental Protection and the U.S. Environmental Protection Agency. During summer months 15 stations (2 of which are near the Sandy Hook Unit) are monitored for the presence of organisms that cause paralytic shellfish poison, as required by the National Shellfish Sanitation Program. Patterns and trends in plankton blooms in New Jersey's coastal waters are also monitored.

The Bureau of Marine Water Monitoring initiated an estuarine monitoring program in 1989. Parameters such as oxygen, salinity, nitrogen, phosphorus, Secchi depth, temperature and suspended solids are monitored once each quarter throughout the year. In 1997 chlorophyll a was added to the list of parameters, and through a cooperative effort with the Environmental Protection Agency, the sample collection frequency in the state's ocean waters was increased to once a month during summer. Three sampling stations occur in the waters off the Sandy Hook Unit.

The Cooperative Coastal Monitoring Program is a joint effort between the Monmouth County Department of Health, the New Jersey Department of Environmental Protection, and local health agencies. During the bathing beach season, four stations on Sandy Hook's oceanside beaches are monitored weekly for fecal coliform bacteria. Many of the elevated bacteria levels and subsequent beach closures occur after heavy rainfall. The Water Pollution Control Program under the Monmouth County Department of Health continues to monitor water quality during the off-season.

AIR QUALITY

As described for the Jamaica Bay Unit, the U.S. Environmental Protection Agency has promulgated national ambient air quality standards (NAAQS) and regulations to protect the public health and welfare, allowing for an adequate margin of safety. To date, standards have been established for CO, SO_2, PM_{10}, O_3, NO_2, and Pb. Areas that do not meet national standards are called non-attainment areas.

Each state and locality has the primary responsibility for air pollution prevention and control. Under the Clean Air Act as amended, state and local air pollution control agencies have the authority to adopt and enforce ambient air quality standards that are more stringent than the national standards. New Jersey has adopted specific standards that relate to various classifications of areas. In some cases, these differ from the national ambient air quality standards.

The Sandy Hook Unit is designated as a class II airshed, which means that the unit's air quality is protected by allowing limited increases (i.e., allowable increments) over baseline concentrations for SO_2, NO_x, and PM.

The Sandy Hook Unit is in Monmouth County, within the New York Metropolitan Area and the NY-NJ-CT Air Quality Control Region (40 CFR 81.13, Nov. 6, 1991). The Environmental Protection Agency has designated the Monmouth County area as being in attainment for all criteria pollutants (CO, NO_2, PM_{10}, SO_2, and Pb) except ozone, which is classified as severe-17, requiring the national ambient air quality standards to be met by 2007. Located within the ozone non-attainment area, the proposed actions are subject to the requirements and emission threshold set by the federal conformity rules (40 CFR Part 93), in which the emission threshold set for ozone precursor pollutants — nitrogen oxides (NO_x) or volatile organic compounds (VOC) — is 25 tons/year.

SOUNDSCAPES

One of the natural resources of the Sandy Hook Unit is the natural soundscape, which includes all of the naturally occurring sounds of the seashore, such as calling birds and the surf, as well as the quiet associated with still nights. Table 52 illustrates common sounds and their associated sound levels using the dBA scale (see page 56), and various sound levels that could be expected at Sandy Hook.

TABLE 52: SOUND LEVEL COMPARISON CHART

Decibels	How it Feels	Equivalent Sounds	Sound Levels at Various Locations in Sandy Hook Unit
140–160	Near permanent damage level from short exposure	Large caliber rifles (e.g., .243, 30-06)	
130–140	Pain to ears	.22 caliber weapon	
100	Very loud	Air compressor at 20 feet; garbage trucks and city buses	Banner planes flying overhead
	Conversation stops	Power lawnmower; diesel truck at 25 feet	
90	Intolerable for phone use	Steady flow of freeway traffic; 10 HP outboard motor; garbage disposal	
80		Muffled jet ski at 50 feet; automatic dishwasher; near drilling rig; vacuum cleaner	Standing on the beach on a windy day
70		Drilling rig at 200 feet; window air conditioner outside at 2 feet	Entrance road on a busy day
60	Quiet	Window air conditioner in room; normal conversation	Sitting on the beach at night
50	Sleep interference	Quiet home in evening	Hiking a trail in the Sandy Hook holly forest
		Bird calls	
40		Library	
30		Soft whisper	
20		In a quiet house at midnight; leaves rustling	

Note: Modified from *Final Environmental Impact Statement, Miccosukee 3-1 Exploratory Well, Broward County, Florida* (U.S. Department of the Interior).

Sources of noise within and surrounding the unit include automobiles, motorboats, personal watercraft, motorcycles, all-terrain vehicles, various types of equipment (e.g., tractors, lawn mowers, etc.), power lines and transformers, and aircraft. Most noise sources are generally localized or seasonal in duration.

Background noise at the Sandy Hook Unit can be expected in developed areas, where increased numbers of people access park attractions, compared to the more central sections of the park where there is a more natural landscape. Noise levels are affected in those areas of the unit with higher vehicular densities, such as the New Jersey Highway 36 bridge in the southern section of the unit and areas in the northern section of the unit associated with Fort Hancock and the Sandy Hook lighthouse. Noise levels are also affected by overhead aircraft traffic and watercraft traffic in waters surrounding the unit. The bayside of the island experiences more exposure to noise emanating from watercraft. Various types and sizes of watercraft are present in the Sandy Hook Bay. Smaller boats in this area use outboard engines, similar to PWC engines, with 15 to 130 hp, while larger fishing and performance vessels use both inboard and outboard diesel (compression ignition) of 90 to 660 hp. Altogether, noise related to boating activity and background noise may be very high during the summer. Natural sounds can be heard occasionally; but motorized noise is the primary noise, especially during daylight hours on the bayside of the peninsula.

WILDLIFE AND WILDLIFE HABITAT

MAMMALS

Based on a limited number of inventory studies and observational lists, 15 species of land mammals have been identified on Sandy Hook, including opossum, short-tailed shrew, little brown myotis, red bat, cottontail rabbit, gray squirrel, white-footed mouse, meadow vole, muskrat, house mouse, Norway rat, feral dog, red fox, raccoon, and feral cat. Pelagic marine mammals associated with the ocean and bays include the bottlenose dolphin, harbor seal, and sperm whale (NPS 1989a). There are several harbor seal haulouts on both sides of the peninsula, and harp and ringed seals are regularly sighted (USFWS 1997). The sperm whale and other whale species occur in ocean waters; while not regularly seen from land, individuals occasionally strand on beaches or in shallow waters of the unit (NPS 1989a).

AMPHIBIANS AND REPTILES

Fowler's toad is the only amphibian species known to occur in the unit; previously extirpated, it has been reintroduced. Reptiles documented in the unit include the snapping turtle, eastern box turtle, diamondback terrapin, eastern painted turtle, spotted turtle, northern brown snake, and eastern milk snake. Federally endangered species (Kemp's ridley and Atlantic leatherback sea turtles) or threatened species (Atlantic loggerhead sea turtle) are discussed beginning on page 253.

Diamondback terrapins occur in association with salt marsh areas of the unit. The turtles forage in shallow tidal creeks and tidal flats and feed on marine snails, clams, and worms. Female diamondback terrapins typically come ashore in June to lay eggs in nests located in open sandy habitats. Diamondback terrapin populations were decimated early in the century due to over harvesting but are now recovering, and major nesting areas occur on Sandy Hook (NPS n.d. a).

BIRDS

Shorebirds

The Sandy Hook Unit and surrounding bays and islands provide habitat for a variety of resident and migratory shorebirds. Common terns and black skimmers have recently nested at beach locations. Willets breed on the sandy spit at the northern end of Spermaceti Cove, and American oystercatchers nest on

Skeleton Hill Island, feeding throughout the protected wetlands and shallow waters on the inside of the hook (USFWS 1997).

Waterfowl

Sandy Hook Bay is considered a waterfowl concentration area, with large numbers of ducks spending the winter and late spring in the area. Scaup are the most common, but canvasback and redhead also use the area (Brookdale Community College [BCC] 2002). Other common migratory waterfowl species expected to be found in the bay include the Atlantic brant, American black duck, mallard, bufflehead, oldsquaw, mergansers, common goldeneye, and American wigeon. Waterfowl overwintering in area include the horned grebe, brant, red-breasted merganser, American wigeon, greater scaup, and bufflehead (NYC DOH 2001). The double-crested cormorant is abundant year-round in Sandy Hook Bay. Common waterfowl expected to breed in the area include the mallard, American black duck, and Canada goose. Clapper rail nest in salt marshes associated with Spermaceti Cove. In early spring there are sometimes 30,000 or more ducks on the bay. Most ducks migrate north and west to their breeding grounds by May (BCC 2002).

Raptors

Spring hawk counts at Fort Hancock on Sandy Hook average nearly 5,000 birds between March and May and are dominated by American kestrel and sharp-shinned hawk, with lesser numbers of northern harrier, red-shouldered hawk, merlin, Cooper's hawk, turkey vulture, red-tailed hawk, and osprey (USFWS 1997).

FISHERIES

The Sandy Hook peninsula separates the Atlantic Ocean from the southern section of the New York / New Jersey Harbor Estuary and serves as a dividing line between certain groups of marine, estuarine, and anadromous species. Sandy Hook and Sandy Hook Bay are at the turning point of the primarily east-west oriented coastline of New England and Long Island and the north-south oriented coastline of the Mid-Atlantic coast. This geographic location and configuration acts to concentrate marine and estuarine species migrating between the New York Bight area of the North Atlantic and the Hudson-Raritan Estuary (USFWS 1997).

More than 90 species of fish are reported in the bay complex. The most abundant are some of the estuarine species, such as mummichog, white perch, and hogchoker, that use the lower salinity areas as their permanent habitat. The bay complex supports recreational fisheries for weakfish, bluefish, winter flounder, summer flounder, striped bass, sea bass, tautog, scup, and spot. Scup spawn in the bay from May through August. Commercial pound net, fyke net, and staked shad net fisheries exist in the bay complex for American shad and American eel (USFWS 1997).

As defined by the 1996 Magnuson-Stevens Fishery Conservation and Management Act, essential fish habitat occurs for various life stages of several species of fish in the waters around the Sandy Hook Unit, as described in Table 53.

TABLE 53: ESSENTIAL FISH HABITAT IN THE VICINITY OF SANDY HOOK UNIT

Species	Eggs	Larvae	Juvenile	Adult	Spawning Adult
Atlantic cod (*Gadus morhua*)				x	
Atlantic herring (*Clupea harengus*)		x	x	x	
Monkfish (*Lophius americanus*)	x	x			
Red hake (*Urophycis chuss*)	x (Atlantic Only)	x	x	x (Bays Only)	
Whiting (*Merluccius bilinearis*)	x	x	x	x	
Windowpane flounder (*Scophthalmus aquosus*)	x	x	x	x	x
Winter flounder (*Pleuronectes americanus*)	x	x	x	x	x
Witch flounder (*Glyptocephalus cynoglossus*)		x			
Yellowtail flounder (*Pleuronectes ferruginea*)	x	x			

SOURCE: NOAA 2002b.

SHELLFISH

Several species of shellfish occur in the waters around the Sandy Hook Unit. Although the bays are closed to direct market harvest of shellfish due to pollution, commercial quantities of northern quahog and soft clam are harvested for depuration or relay. There are also blue mussel and eastern oyster beds, as well as Atlantic surf clam beds in the deeper waters north of Sandy Hook. American lobster are landed in pot fisheries, and blue crab and horseshoe crab are taken in a dredge fishery. Horseshoe crabs spawn in shoal water habitats in the spring. Horseshoe crab eggs provide an important food for migrating shorebirds (USFWS 1997).

THREATENED, ENDANGERED, OR SPECIAL CONCERN SPECIES

WILDLIFE

There are 205 listed species or species of special concern in the waters and shorelands of Sandy Hook and Raritan Bay. Federally endangered wildlife species include the Kemp's ridley sea turtle, leatherback sea turtle, northern right whale, humpback whale, and fin whale. Federally threatened wildlife species include the piping plover, loggerhead sea turtle, and northeastern beach tiger beetle.

Loggerhead sea turtles have been observed off the northern tip of Sandy Hook, and Kemp's ridley sea turtles feed in Horseshoe Cove. The leatherback sea turtle, which is the most commonly observed turtle from May through October, utilizes offshore areas and is not found in the estuaries or backbay areas (USFWS 1997).

The northern right whale has been documented in nearshore waters from January through September. Humpback whales feed during the spring, summer, and fall all along the eastern coast of the United States, and fin whales are common in waters of the U.S. exclusive economic zone (NOAA 2002b).

Piping plovers arrive in the Sandy Hook area in March, lay and incubate eggs from April through June, and nurse chicks from May through August. Plovers generally forage on intertidal beaches, but also in dune swales. There are five plover colonies on the ocean beach at Sandy Hook. These colonies averaged 20 pairs from 1985 to 1995. Productivity of piping plovers at Sandy Hook is consistently the highest in

New Jersey, with an average of nearly 1.5 chicks fledged per nesting pair, compared with the statewide average of about 1.0 chick (USFWS 1997).

Historically, the northeastern beach tiger beetle nested at Sandy Hook, inhabiting the intertidal zone of wide, sandy open beaches. Experiments by the U.S. Fish and Wildlife Service and National Park Service have successfully reintroduced the beetle at two locations at the northern tip of Sandy Hook (NYC DOH 2001).

State-listed wildlife species in the vicinity of the Sandy Hook Unit include the endangered piping plover, least tern, and black skimmer, and the threatened osprey (NJ DEP 2002b). The least tern arrives in April and remains through September, with egg laying, incubation, and rearing from May through August. Breeding habitat consists of flat, open sand, gravel, or dredge spoil with little vegetation. Nesting sites are typically associated with piping plover nesting sites. Least terns forage in the bay areas or in the ocean when the water is calm. The most active foraging time is in the early morning. Least terns commonly rest on beaches during and after foraging. They have been documented on Sandy Hook in recent years on beaches near the entrance to the park, at North Beach near the northern tip of the peninsula, and on the beach near the Sandy Hook visitor center (NJ DEP 2002b). Over 600 least terns nested along with piping plovers at five Sandy Hook sites in 1995, the largest number of least terns in New Jersey that year (USFWS 1997).

The New Jersey Natural Heritage Program has designated most of the Sandy Hook Unit as a natural heritage priority site because of extensive beach and undeveloped natural dune communities along the peninsula. The area is considered by the Natural Heritage Program to include excellent populations of globally rare, state-endangered bird species, good stands of two globally rare natural communities, and it is a migratory shorebird concentration site (NJ DEP 2001).

PLANT SPECIES

The federally threatened seabeach amaranth occurs on overwash flats on the accreting ends of barrier islands, on lower foredunes of beaches, and on non-eroding beaches landward of the wrackline. The plant also occurs on blowouts and on dredge spoils. Seabeach amaranth seems to be incapable of competing with other plants and is typically found in areas with little or no vegetation. On Sandy Hook, seabeach amaranth occurs along the coast at various locations from east of Fort Hancock south to Monmouth Beach borough (NJ DEP 2002b).

The state endangered seabeach knotweed occurs in habitats similar to the sea beach amaranth and has been reported in the area of the South Beach parking lot (NJ DEP 2002b).

SHORELINE VEGETATION AND WETLAND HABITATS

Floral surveys in the 1970s on Sandy Hook identified 314 species in 19 plant communities (Stalter et al. 1996). Sandy Hook is extremely narrow at its southern end and gradually widens to about 3,000 feet at the northern end. The southern shoreline on the ocean side is eroding and is reinforced by a seawall and groin field. The beach is accreting at the northern end, and a fairly extensive foredune vegetated with American beachgrass has developed. In less stable areas of the foredune, seaside goldenrod, sea rocket, cocklebur, and seaside spurge also occur. Extensive areas of backdune habitat occur toward the northern end, with dry sandy soils supporting shrubby vegetation dominated by winged sumac, bayberry, beach plum, and tree-of-heaven. There are two distinct maritime forest areas — a dense mixed-deciduous forest of about 225 acres dominated by American holly, black cherry, hackberry, serviceberry, greenbrier, and

poison ivy, and a smaller 60-acre forest on the bayside with a greater dominance of holly mixed with some red cedar.

The backside of the spit consists of extensive tidal mud and sandflats and salt marsh dominated by low marsh cordgrass. Smooth cordgrass is the dominant plant in the salt marshes at Spermaceti and Horseshoe Coves. Other plants in salt marsh habitats include glass wort, suaeda, atriplex, and spike grass. The low cordgrass community is bordered by salt meadow grass in the high marsh areas and by high tide bush in the rarely flooded areas of the salt marsh. A few small inland marsh areas are dominated by common reed. Fort Hancock, at the northern end of the spit, is characterized by maintained lawns and buildings used by the National Park Service, U.S. Coast Guard, and National Marine Fisheries Service (USFWS 1997).

VISITOR USE AND EXPERIENCE

The Sandy Hook Unit features varied coastal habitats, including salt and freshwater marshes, grasslands, scrub thickets, and a unique coastal forest containing the greatest concentration of American holly on the east coast. Park facilities include a visitor center, an observation deck overlooking New York Harbor, hiking trails, the historic Fort Hancock, and the Sandy Hook lighthouse (NJ Audubon Society 2002). The Sandy Hook Unit is accessible by motor vehicle. Direct access to the southern side of the unit is provided from New Jersey State Highway 36. Inside the park unit an interior road system provides access to the northern tip of the peninsula, as well as to various park attractions and facilities.

Sandy Hook Unit is open year-round, with peak visitation from May through September, primarily "day-trippers." There are no entrance fees; however, beach parking fees are collected during the summer, and annual parking passes are available. Anglers are required to purchase a fishing permit. In 2001 the Sandy Hook Unit had 2,088,170 visitors, a 5.8% decrease from 2,209,989 visitors the previous year.

VISITOR ACTIVITIES

The main attractions of Sandy Hook Unit are the lighthouse, Fort Hancock, the museum, the history house, and the holly forest.

Sandy Hook Lighthouse — Built in 1764, the lighthouse is the nation's oldest and was recently restored.

Fort Hancock — Located at the northern end of Sandy Hook, Fort Hancock served as the outermost coastal defense point for New York City until 1974. The museum occupies a building built in 1899 and includes exhibits of military memorabilia. Within the same complex, visitors can tour the history house, a restored home where a lieutenant and his family once lived. "Officers Dow," the collection of yellow-brick houses for officers facing Sandy Hook Bay, was designed by the same architectural firm that designed New York's fabled Pennsylvania Station and Farley Post Office.

Sandy Hook Holly Forest — This delicate wildlife sanctuary has carefully marked trails designed to improve and preserve its wildlife habitats. An observation deck is available for bird watching. Visitors can also wade out to the small islands of Spermaceti Cove — Skeleton Hill Island and South Island.

The Sandy Hook Unit offers a variety of outdoor recreational activities to visitors, including ocean beaches, marshes, historic sites, hiking trails, and an incredible bird habitat. The Sandy Hook campground is in a natural wooded area; camping is only available for organized groups and by reservation only. The

Sandy Hook Unit is an excellent place to study birds, butterflies and coastal ecology. Over 330 species of birds and over 50 species of butterflies have been recorded at the unit. Surf-fishing is popular on Atlantic beaches; common fish include the bluefish, weakfish, blackfish, striped bass, and fluke.

VISITOR SATISFACTION

Since 1998, NPS staff at the Sandy Hook Unit have provided visitors the opportunity to rate services provided at the park, with visitor satisfaction scores of 90% in 2000 and 95% in 2001. The goal of the *Strategic Plan* is to increase overall visitor satisfaction scores by improving customer service and communications in all areas, including providing recreational opportunities and basic visitor needs (Law et al. 2002).

PWC USE

PWC use is currently prohibited in several areas within the Sandy Hook Unit, in accordance with CFR 1.5 (see appendix A). This regulation also prohibits the use of motorized vessels within 500 feet of swimming beaches or within 100 feet of a diver's marker, a downed water-skier, or a swimmer. Also, motorized vehicles cannot land in any harbor or bay beach area unless it is designated for such use.

The "Superintendent' Compendium" for the Sandy Hook Unit restricts PWC use within specific park waters in the interest of public safety and environmental values. Areas that have been restricted to PWC use include all waters in Horseshoe Cove and Spermaceti Cove, and the area between the south end of Skeleton Hill Island and the north end of Plum Island.

NPS staff assume that PWC use in the Sandy Hook Unit is limited due to restrictions that cover large portions of the unit and unfavorable ocean and bay conditions. Occasional fines are given to PWC users who enter restricted areas. According to NPS records, between 2000 and 2001, the Sandy Hook Unit had an annual average of 17,309 watercraft visits, or an average of 108 watercraft per day (for a 160-day season). Of this daily average, 15% (16) were assumed to be personal watercraft.

The heaviest PWC use season is between July and September, when launches take place south of the unit from private and public properties and marinas, also along the area between Sandy Hook and the mainland, where there are prevailing strong currents. The Atlantic Highlands Municipal Harbor is the largest marina in Sandy Hook Bay, and approximately 35% of their use is from PWC users. The marina has its own operating procedures: wave jumping is illegal within 100 feet of another vessel, and water-skiing is not allowed.

VISITOR SAFETY

STATE BOATING REQUIREMENTS

PWC users must abide by the following New Jersey State watercraft laws and regulations when operating inside the boundaries of Sandy Hook Unit. These regulations stipulate the following:

Safety:

- The operator must wear a personal flotation device.
- The operator must have completed a boater safety course.

Age:

- A PWC operator must be 13 years old.

Timing Restrictions:

- No operation from sunset to sunrise.

Restricted Activities:

- No operating in excess of 5 mph within 100 feet of a swimmer or 500 feet of a public beach.
- No operating above idle speed within 50 feet of a bounded bathing beach, the shoreline, or any person in the water.
- No launching from park lands unless otherwise designated.
- No operating in a manner in which the personal watercraft would leave the water completely or otherwise become airborne while crossing the wake of another vessel.

Other:

- Personal watercraft must be operated below 90 dB and below 82 dB at 82 feet.

Enforcement in the Sandy Hook Unit is a responsibility shared by two U.S. Park Police, the state of New Jersey, and the U.S. Coast Guard.

ACCIDENTS AND INJURIES

Increased PWC use in recent years has resulted in more concern about the health and safety of operators, swimmers, snorkelers, divers, and other boaters. A 1998 study revealed that while recreational boating fatalities have been declining, PWC related fatalities have increased (NTSB 1998). Nationwide PWC accident statistics provided by the U.S. Coast Guard support the increase in PWC-related fatalities; however, since a peak of 84 PWC-related fatalities in 1997, accidents, injuries, and fatalities involving personal watercraft have decreased (M. Schmidt, U.S. Coast Guard [USCG], pers. comm., T. Taylor, LBG, Sept. 4, 2001). The U.S. Coast Guard's Office of Boating Safety studied exposure data to assess boating risks. This method allows for a comparison between boat types based on comparable time in the water. PWC use ranked second in boat type for fatalities per million hours of exposure in 1998, with a 0.24 death rate per million exposure hours. PWC-related accidents, fatalities, and injuries in New Jersey during the 1990s are shown in Table 54.

TABLE 54: NEW JERSEY STATE PWC ACCIDENT TRENDS

Year	Accidents	Fatalities	Injuries
1991	54	1	39
1992	51	0	31
1993	94	0	54
1994	83	2	40
1995	152	1	89
1996	89	3	55
1997	69	1	47
1998	56	1	50
1999	60	2	37
2000	51	3	39

SOURCE: Kaiser (New Jersey State Police, Marine Services Unit), pers. comm., L. Choy, LBG, July 22, 2002.

In New Jersey there were 51 accidents in 2000 involving personal watercraft, which resulted in three fatalities and 39 injuries. The National Park Service does not keep watercraft accident statistics for the Sandy Hook Unit because NPS jurisdiction only extends 0.25 mile from shore; however, NPS staff know of no PWC-related accidents that have occurred within the park unit.

SOCIOECONOMIC ENVIRONMENT

A detailed description of the socioeconomic environment affected by PWC use at Gateway National Recreation Area is provided in the report "Economic Analysis of Personal Watercraft Regulations in Gateway National Recreation Area" (Law et al. 2002). PWC use within the Sandy Hook Unit is relatively light because most areas are restricted from use and sea conditions are not optimal in the areas where use is permitted. The largest marina providing services to boaters in general, and to PWC users in particular, is the Atlantic Highlands Municipal Harbor in Sandy Hook Bay, New Jersey. Approximately 35% of the total watercraft at this marina are personal watercraft.

SANDY HOOK UNIT MANAGEMENT AND OPERATIONS

Currently two U.S. Park Police officers are assigned to patrols and enforcement activities. NPS staff have no jurisdiction over the use of private launches along the New Jersey shore. NPS enforcement responsibilities overlap with those of New Jersey and the U.S. Coast Guard. A U.S. Coast Guard station is located on Sandy Hook.

ENVIRONMENTAL CONSEQUENCES

The legal foundation and the methodologies for analyzing environmental consequences are the same as those described for the Jamaica Bay Unit, and they are not repeated in this chapter. Only information specific to the Sandy Hook Unit is discussed below; however, the approaches and methodologies that were previously described also apply to all impact analyses for Sandy Hook (the full description of impact methodologies for Jamaica Bay begins on page 70). Alternative A is the baseline for determining the context, duration, and intensity of resource impacts. For easy reference, impact thresholds for each impact topic are highlighted in text boxes in this chapter.

Definitions of Terms Used in the Impact Analysis

Potential impacts are described in terms of type (Are the effects beneficial or adverse?), context (Are the effects site-specific, local, or even regional?), duration (Are the effects short term or long term?), and intensity (Are the effects negligible, minor, moderate, or major?). Because definitions of intensity (negligible, minor, moderate, or major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this document (see text boxes).

For the purposes of analysis, the following assumptions are used for all impact topics (unless otherwise noted in the analysis, impacts are considered to be adverse; the terms "impact" and "effect" are used interchangeably):

Short-term impacts: Those occurring from PWC use in the immediate future (per trip through a single season of use, usually 1 to 6 months).

Long-term impacts: Those occurring from PWC use over several seasons of use through the next 10 years.

Direct impacts: Those occurring from the direct use or influence of personal watercraft.

Indirect impacts: Those occurring from PWC use that have indirectly altered a resource or condition.

Impact analysis area: Each resource impact is assessed in direct relationship to those resources affected both inside and outside the park, to the extent that the impacts can be substantially traced, linked, or connected to PWC use inside park boundaries. Each impact topic, therefore, has a study area relative to the resource being assessed, and it is further defined in the impact methodology.

Impairment: An impact to any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park; or
- identified as a goal in the park's *General Management Plan* or other relevant NPS planning documents.

PWC AND VISITOR USE TRENDS

According to NPS records, between 2000 and 2001, the Sandy Hook Unit had an average of 17,309 watercraft entering its waters, of which 15% (2,597) are estimated to be personal watercraft (E. Rezetko, U.S. Park Police, pers. comm., T. Shinskey, LBG, July 10, 2002; R. Wilson, NPS, pers. comm., D. Otto, LBG, June 13, 2002). Assuming a 160-day use period, this equates to an average of 19 personal watercraft per day in the Sandy Hook Unit. For personal watercraft, 60% use oceanside waters and 40% bayside waters; for motorboats, the use areas switch, only 30% use oceanside waters, while 70% use bayside waters.

The 1990 "Superintendent's Compendium" restricts PWC use from all waters in Horseshoe Cove, all waters in Spermaceti Cove, the area between the south end of Skeleton Island and the north end of Plum Island, and within 500 feet of swimming beaches or 300 feet of other beaches (see appendix A). PWC use is assumed to be distributed throughout all other waters of the unit.

PWC use trends were identified to determine direct and indirect impacts of PWC management strategies on Sandy Hook Unit resources. Other visitor use trends were identified to help assess cumulative effects. PWC and visitor use trends were determined using data available from the park, and discussions with staff. New Jersey does not collect PWC registration data, so registration data provided by the New York State Office of Parks, Recreation, and Historic Preservation were used, as well as national trends in PWC ownership. New York State does not segregate PWC registrations from other boat types; all vessels less than 16 feet are categorized as class A vessels.

Regional registration trends for class A vessels in Queens, Kings, and Richmond Counties in New York indicate an annual increase of 0.3% when averaging registration data from 1998 through 2001. Registration trends for recreational watercraft in New Jersey showed a 10% decline from 1999 to 2000 and a 0.5% percent increase from 2000 to 2001 (J. Hylton, NJ DMV, pers. comm., T. Taylor, April 2, 2002). It is assumed that PWC use at the Sandy Hook Unit will increase in the future, even though national trends indicate new ownership is on the decline and New Jersey trends are varied. Based on this approach, the analyses in this environmental assessment assume an annual PWC use increase within the Sandy Hook Unit of 0.3% over the next 10 years (see Table 55). A change in national socioeconomic conditions (as well as industry's marketing strategies) could cause this trend to vary one way or the other.

TABLE 55: SANDY HOOK UNIT BOATING AND PWC DAILY USE TRENDS

	Motorized Vessels		Personal Watercraft		Total	
	2002	2012	2002	2012	2002	2012
Sandy Hook Bay	64	66	6	6	70	72
Ocean Waters	28	29	10	11	38	40
Total	**92**	**95**	**16**	**17**	**108**	**112**

SOURCE: Law et al. 2002; E. Rezetko, NPS, pers. comm., July 2002; R. Wilson, NPS, pers. comm., June 2002.

NOTE: Due to the qualitative nature of NPS surveys, the analysis was based on the highest use estimate; therefore, 16 personal watercraft/day was the value used in all estimated projections. It is assumed that all personal watercraft would operate for a total of four hours per day.

WATER QUALITY

GUIDING REGULATIONS AND POLICIES

As stated for the Jamaica Bay Unit, the mission statement for Gateway National Recreation Area is to "maintain, improve, and make [the natural systems, wildlife habitats, historic resources, and recreational opportunities] available to the public." To achieve this, one long-term water quality goal was identified in the park's *Strategic Plan*: By September 30, 2005, Gateway estuarine and ocean waters have unimpaired water quality.

The Sandy Hook Unit does not have quantifiable water quality data for the effects of PWC emissions. To address water quality impacts potentially resulting from continued PWC use, water quality standards were used in the absence of park-specific data to guide the analysis.

METHODOLOGY AND ASSUMPTIONS

To assess the magnitude of water quality impacts to unit waters under the various PWC management alternatives, the following methods and assumptions were used for the impact analysis for the Sandy Hook Unit, in addition to those described for the Jamaica Bay Unit (see page 77):

1. State water quality standards governing the waters of the Sandy Hook Unit were examined; where standards or water quality criteria were not available for pollutants present in PWC emissions, ecotoxicological and human health benchmarks for certain pollutants were acquired from various literature sources. The classification of the Sandy Hook Unit's waters by the state was defined; and the overall sources of water pollutants, both internal and external to the unit's boundary, were identified in relation to the standards and classification.
2. Typical use patterns of motorized watercraft, including numbers and hours used, were determined as explain in the "PWC and Visitor Use Trends" section and are shown in Table 55. While boating activity is distributed over a full day from 4 A.M. to 6 P.M., it peaks between 10 A.M. and 2 P.M. The contaminant loading to water was calculated for one day, assuming a given number of personal watercraft (on average, 16 personal watercraft per hour), each operating for four hours (64 PWC-hours during peak hours), and each discharging 11.34 liters of gasoline per PWC-hour. Boat use was also estimated at four hours per day for the cumulative impact analysis.
3. Sandy Hook is a marine environment, and only limited water quality criteria or standards are available for PWC-related contaminants. In the absence of established marine criteria or standards at the federal or state level, this analysis adopted freshwater ecotoxicological benchmarks for benzo(a)pyrene, naphthalene, and benzene to determine potential water quality impacts; marine benchmarks were used for 1-methyl naphthalene (USFWS 1987) and MTBE (Mancini et al. 2002). Human health benchmarks for benzo(a)pyrene and benzene (NJ DEP 1998) are based on carcinogenic effect-based human health criteria for coastal waters (see Table 56). [Note: The U.S. Environmental Protection Agency (2002a) recently lowered the human health fish ingestion criterion for benzo(a)pyrene from 0.049 µg/L to 0.018 µg/L and for benzene from 71 µg/L to 51 µg/L. While use of these new, lower criteria in place of the New Jersey Department of Environmental Protection standards would increase the threshold volumes for benzo(a)pyrene and benzene, conclusions provided below for the Sandy Hook Unit would not change.]

TABLE 56: TOXICOLOGICAL BENCHMARKS USED IN CALCULATIONS — NEW JERSEY

Chemical	Ecotoxicological Benchmark (µg/L)	Source	Human Health Benchmark (µg/L)	
Benzo(a)pyrene	0.014	Suter & Tsao 1996	0.031*	NJ DEP 1998
Naphthalene	62	Suter & Tsao 1996	--	--
1-methyl naphthalene	19**	USFWS 1987	--	--
Benzene	130	Suter & Tsao 1996	71***	NJ DEP 1998
MTBE	18,000	Mancini et al. 2002	--	--

* Based on the consumption of aquatic organisms. [Note: The U.S. Environmental Protection Agency (2002a) recently lowered the human health fish ingestion criteria for benzo(a)pyrene from 0.049 µg/L to 0.018 µg/L and for benzene from 71µg/L to 51 µg/L. Conclusions regarding water quality impacts presented below based on the 0.031 and 71 µg/L criteria (NJ DEP 1998) would not change as result of the new criteria.)

** Based on LC50 of 1,900 µg/L for dungeness crab.

*** Based on the consumption of aquatic organisms.

4. At the Sandy Hook Unit the area for determining water volumes was established from NOAA nautical chart 12327 (NOAA 2002e) and includes unit jurisdictional waters, as well as those areas used by personal watercraft and that may have a direct or indirect effect on unit waters.
5. To predict the cumulative effects of PWC emissions in the context of all other similar types of emissions, projections of existing use were extrapolated into the future as a percentage of overall

emissions in order to gage the magnitude of potential water quality changes, with and without continued PWC use at the park, and taking into account the reduction in emissions required by the Environmental Protection Agency over the next 10 years (see Table 57 for the dates that these reductions are scheduled to occur).

TABLE 57: ESTIMATED REDUCTIONS IN WATERCRAFT EMISSIONS IN NEW JERSEY

Date	Action
1999	EPA requires production line testing for 75% HC reduction in new outboards and begins to see reductions as newer models are introduced (US EPA 1997).
2000	EPA requires production line testing for 75% HC reduction in new personal watercraft and begins to see reductions as newer models are introduced (US EPA 1997).
2006	EPA fully implements 75% HC reduction in new outboards and personal watercraft (US EPA 1996a).
2010	EPA estimates a 52% reduction in overall HC emissions from outboards and personal watercraft (US EPA 1996a)
2012	Approximately a 50% reduction in HC emissions estimated for this analysis, based on US EPA dates (1996a, 1997)
2015	EPA estimates a 68% reduction in overall HC emissions from outboards and personal watercraft (US EPA 1996a)

Key dates in this chronology begin with 1999, when the U.S. Environmental Protection Agency began to require production line testing for 75% HC reduction in new outboard motors, and 2000, when production line testing for 75% HC reduction in new personal watercraft was required (US EPA 1997). These dates represent a delay in testing implementation that was originally scheduled (US EPA 1996a) for 1998 for both personal watercraft and outboard motors. By 2006 all new personal watercraft and outboards manufactured in the United States must have a 75% reduction in HC emissions (US EPA 1996a). Because the actual reduction in emissions depends on the sale of lower-emitting personal watercraft, the U.S. Environmental Protection Agency estimates that a 52% emission reduction will be achieved by 2011, and a 75% emission reduction by 2031. For the purpose of estimating water quality impacts for the Sandy Hook Unit, overall reductions in HC emissions are conservatively estimated to be 50% in PWC and outboard motors by 2012. This estimate is based on interpolations of the emissions reduction percentages and associated years (2010 and 2015) reported by the U.S. Environmental Protection Agency in 1996 (US EPA 1996a), but with a one-year delay in production line testing (US EPA 1997).

For reduction of carbon monoxide, for which elevations occur during the winter season, the Wintertime Oxygenated Fuels Program (discontinued in New Jersey in 1999) required gasoline containing 15% MTBE. For reduction of ozone precursors, reformulated gasoline containing 11% MTBE continues to be used year-round in New Jersey, as required by the Federal Clean Air Act. There are no plans to phase out the use of MTBE in New Jersey (Sharon Haas, NJ DEP, pers. comm., T. Shinkey, May 16, 2002).

IMPACT ANALYSIS AREA

For purposes of this assessment, the impact analysis area is Sandy Hook Unit's jurisdictional waters, divided into the bayside and oceanside by a line going due north from the northernmost point of Sandy Hook. Bayside jurisdictional water volume is estimated to be 11,080 acre-feet, and oceanside jurisdictional water volume 12,950 acre-feet.

IMPACT TO WATER QUALITY FROM PWC USE

The same impact thresholds that were defined for the Jamaica Bay Unit were used to described the relative changes in water quality under the various alternatives for the Sandy Hook Unit and are highlighted in the text box.

Thresholds for Water Quality Impacts

Negligible: Impacts are chemical, physical, or biological effects that would not be detectable, would be well below water quality standards or criteria, and would be within historical or desired water quality conditions.

Minor: Impacts (chemical, physical, or biological effects) would be detectable but would be well below water quality standards or criteria and within historical or desired water quality conditions.

Moderate: Impacts (chemical, physical, or biological effects) would be detectable but would be at or below water quality standards or criteria; however, historical baseline or desired water quality conditions would be altered on a short-term basis.

Major: Impacts (chemical, physical, or biological effects) would be detectable and would be frequently altered from the historical baseline or desired water quality conditions; and/or chemical, physical, or biological water quality standards or criteria would be locally, slightly and singularly, exceeded on a short-term and temporary basis.

Impairment: Impacts are chemical, physical, or biological effects that would be detectable and would be substantially and frequently altered from the historical baseline or desired water quality conditions and/or water quality standards, or criteria would be exceeded several times on a short-term and temporary basis. In addition, these adverse, major impacts to park resources and values would

- contribute to deterioration of the park's water quality and aquatic resources to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;
- affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or
- affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use under alternative A would continue to be prohibited in Horseshoe and Spermaceti Coves and within 500 feet of swimming beaches and 300 feet of other beaches on the oceanside. New Jersey State boating regulations would continue to be enforced. In 2002 it is assumed there would be an average of 16 personal watercraft in waters around Sandy Hook (10 on the oceanside and 6 on the bayside). Based on a 0.3% per year increase, by 2012 there would be 17 personal watercraft (11 on the oceanside and 6 on the bayside).

Impacts from PWC use on the water resources of the Sandy Hook Unit can be classified as chemical impacts due to the emissions of hydrocarbons directly into the water, and physical impacts associated with the resuspension of sediments and consequent increase in turbidity during PWC operation in shallow waters. Impacts are expected to be reduced in the long term as a result of EPA's emission requirements for marine engines, with a 50% reduction projected in hydrocarbons by 2012. This reduction would be a result of newer models gradually coming into use (US EPA 1997). The results of the water quality analysis for PWC activity under alternative A are shown in Table 58.

TABLE 58: THRESHOLD WATER VOLUMES NEEDED TO DILUTE PWC POLLUTANTS, ALTERNATIVE A — SANDY HOOK UNIT

	Sandy Hook Bay		Ocean Waters	
	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	11,080		12,950	
Permitted PWC use area (ac-ft)	7,565		8,130	
Ecotoxicological Benchmarks*				
Benzo(a)pyrene (fuel and exhaust)	33	17	55	30
Naphthalene	13	7	22	12
1-methyl naphthalene	67	34	110	61
Benzene	31	16	52	29
MTBE	1	0.5	1.7	0.9
Human Health Benchmarks**				
Benzo(a)pyrene (fuel and exhaust)	15	8	25	14
Benzene	58	29	96	53

* Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
** Threshold volumes (ac-ft) below which human health might be impacted.

For all discharged pollutants evaluated, the ecotoxicological threshold volumes estimated for 2002 and 2012 would be well below water volumes available at the Sandy Hook Unit. Threshold volumes would range from 0.4 to 110 acre-feet, while available volumes within the permitted PWC use areas are 7,565 and 8,130 acre-feet. Impacts to aquatic organisms would be negligible for all pollutants evaluated.

Although the waters around Sandy Hook are not used for drinking purposes, visitors to the unit could be affected by an increase in pollutant loadings by ingesting fish and shellfish that have accumulated pollutants. The water volumes accessible to PWC use far exceed the estimated threshold volumes for human health impacts from 2002 through 2012, which range from 8 to 96 acre-feet, while the water volumes within the PWC use areas are 7,565 acre-feet on the bayside and 8,130 acre-feet on the oceanside. Risks to human health would be negligible in 2002 and 2012. By 2012 water quality impacts from PWC emissions would be considerably less due to reduced emissions, and impacts would be negligible.

Cumulative Impacts. Cumulative impacts under alternative A would result from the actions taking place around the Sandy Hook Unit, including motorboats in nearby waters, point and non-point sources of pollutants (urban), and coastal development. Municipal discharges from nearby areas, as well as from local marinas, are also sources of hydrocarbons in surface waters. Marine traffic includes recreational (personal use), commercial (fishing boats, cargo ships, and cruises), and official units (police, Coast Guard, etc.), as well as personal watercraft. Although some of these craft could be using four-stroke engines, data were not available; therefore, it was assumed that the current use of four-stroke engines would be small and it not accounted for in the calculations.

A total of 108 motorized vessels (including 16 personal watercraft) would be present in unit waters in 2002, 70 of which would be in Sandy Hook Bay and 38 in ocean waters. By 2012 there would be 112 vessels, 72 of which would be in Sandy Hook Bay and 40 in ocean waters (see Table 55). For the comparisons of threshold volumes with available water volumes, PWC emissions are compared to the restricted area volumes, and other motorboat emissions are compared to volumes within the unit's jurisdictional waters in each area. Threshold volumes calculated for cumulative impacts are shown in Table 59.

TABLE 59: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE A — SANDY HOOK UNIT

	Sandy Hook Bay		Ocean Waters	
	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	11,080		12,950	
Permitted PWC use area (ac-ft)	7,565		8,130	
Ecotoxicological Benchmarks*				
Benzo(a)pyrene (fuel and exhaust)	380	200	210	110
Naphthalene	150	79	83	44
1-methyl naphthalene	780	700	420	220
Benzene	370	190	200	100
MTBE	12	6	6	3
Human Health Benchmarks**				
Benzo(a)pyrene (fuel and exhaust)	180	90	95	50
Benzene	670	340	360	190

* Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
** Threshold volumes (ac-ft) below which human health might be impacted.

Results of the water quality analysis for all motorized vessels shows that for all discharged pollutants evaluated, the ecotoxicological threshold volumes estimated for 2002 and 2012 would be well below the water volumes available in both areas. Threshold volumes would range from 3 to 780 acre-feet, while available water volumes within NPS jurisdictional boundaries are 11,080 acre-feet on the bayside and 12,950 acre-feet on the oceanside. Cumulative impacts to aquatic organisms would be negligible in 2002 and 2012.

Human health threshold volumes would be well below available water volumes in both areas in 2002 and 2012. Threshold volumes would range from 50 to 670 acre-feet, while available water volumes are 11,080 and 12,950 acre-feet. Cumulative impacts to human health are expected to be negligible in 2002. In 2012, cumulative water quality impacts from all motorized vessels would be considerably less than in 2002, due to reduced emission rates.

Conclusion. Water quality impacts due to PWC emissions of organic pollutants, based on ecotoxicological and human health benchmarks, would be negligible in 2002 and 2012.

Cumulative water quality impacts from all motorized vessels would be negligible for all pollutants in 2002 and 2012.

This alternative would not impair water quality.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions

Analysis. Alternative B would limit PWC use to the Shrewsbury River and Sandy Hook Channels, effectively closing most of the unit's bayside waters to personal watercraft. PWC use in oceanside waters would be prohibited within 500 feet of the entire shoreline but would be allowed out to the 0.25-mile NPS boundary. For the purpose of evaluating impacts to water quality under alternative B, it is assumed that the same number of personal watercraft operating in bayside and oceanside waters under alternative A would be confined to the permitted use areas under alternative B. Other motorboat access to the unit's waters would not be affected under alternative B.

Closing most of the unit's bayside waters and some nearshore ocean waters to PWC use would have a beneficial impact on water quality by not disturbing sediments in the shallow bayside and oceanside

waters. Banning PWC use along the majority of the bayside waters would reduce impacts to water quality in this area. However, this would concentrate PWC emissions in the Sandy Hook Channel and the Shrewsbury River Channel, resulting in more localized effects of pollutants initially before they dispersed. Threshold volumes needed to dilute PWC pollutants in surface water under alternative B are shown in Table 60.

TABLE 60: THRESHOLD WATER VOLUMES NEEDED TO DILUTE PWC POLLUTANTS, ALTERNATIVE B — SANDY HOOK UNIT

	Sandy Hook Bay		Ocean Waters	
	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	11,080		12,950	
Permitted PWC use area (ac-ft)	1,160		8,130	
Ecotoxicological Benchmarks*				
Benzo(a)pyrene (fuel and exhaust)	33	17	55	30
Naphthalene	13	7	22	12
1-methyl naphthalene	67	64	110	61
Benzene	31	16	52	29
MTBE	1	0.5	1.7	0.9
Human Health Benchmarks**				
Benzo(a)pyrene (fuel and exhaust)	15	8	25	14
Benzene	58	29	96	53

NOTE: This alternative would restrict PWC use in Sandy Hook Bay waters to the Shrewsbury River Channel and Sandy Hook Channel. PWC in oceanside waters would be restricted from operating within 500 feet of the entire shoreline.
* Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
** Threshold volumes (ac-ft) below which human health might be impacted.

As in alternative A, none of the threshold volumes of contaminants based on ecotoxicological benchmarks would exceed the volumes of water accessible to PWC users in either the unit's bayside or oceanside waters in 2002 and 2012. Required threshold water volumes would range from 0.5 to 110 acre-feet, compared with 1,160 acre-feet on the bayside and 8,130 acre-feet on the oceanside within permitted PWC use areas. Impacts to aquatic organisms would be negligible in 2002 and 2012.

Threshold volumes for impacts to human health would also be well below water volumes in PWC use areas in 2002 and 2012. Threshold volumes would range from 8 to 96 acre-feet, while available water volumes in the permitted PWC use areas are 1,160 and 8,130 acre-feet. Risks to human health would be negligible in 2002 and 2012.

Cumulative Impacts. While PWC use would be restricted under this alternative to the two navigational channels, other motorized vessels would not be affected by these restrictions and would be allowed throughout the unit. For the comparisons of threshold volumes with available water volumes, PWC emissions are compared to the permitted PWC use area volumes, and other motorboat emissions are compared to volumes within unit jurisdictional waters in each area. As described in the evaluation of impacts for PWC use only, emissions within the limited areas would result in more localized impacts from PWC pollutants.

Estimated threshold volumes for cumulative impacts from all motorized vessels would be higher than for PWC alone (see Table 61). Nevertheless, impacts based on ecotoxicological benchmarks would still be negligible in 2002 and 2012. Estimated threshold volumes would range from 3 to 780 acre-feet, while available water volumes are 11,080 acre-feet on the bayside and 12,950 acre-feet on the oceanside.

Cumulative impacts to human health would be negligible for all areas in both 2002 and 2012. Threshold volumes would range from 50 to 670 acre-feet, while available water volumes within the permitted PWC use areas are 11,080 acre-feet on the bayside and 12,950 acre-feet on the oceanside. These impact evaluations are based on PWC use in the permitted areas only, while other motorized craft would operate

TABLE 61: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE B — SANDY HOOK UNIT

	Sandy Hook Bay			
	2002		2002	2012
NPS jurisdictional waters (ac-ft)	11,080		12,950	
Permitted PWC use area (ac-ft)	1,160		8,130	
Ecotoxicological Benchmarks*				
Benzo(a)pyrene (fuel and exhaust)	390	200	210	110
Naphthalene	150	79	83	44
1-methyl naphthalene	780	400	420	220
Benzene	370	190	200	100
MTBE	12	6	6	3
Human Health Benchmarks**				
Benzo(a)pyrene (fuel and exhaust)	180	90	95	50
Benzene	670	340	360	190

NOTE: This would alternative restrict PWC use to two navigational channels.
*Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
** Threshold volumes (ac-ft) below which human health might be impacted.

throughout NPS jurisdictional waters. Also, existing environmental conditions (e.g., flushing, mixing with adjacent waters), and characteristics of the chemicals of concern (e.g., half-lives in water) would reduce the potential risks to the aquatic environment and human health.

Conclusion. Closing most of the unit's bayside waters and some nearshore ocean waters to PWC use would have a beneficial impact on water quality by not disturbing sediments in the shallow bayside and oceanside waters. Water quality impacts from PWC emissions based on ecotoxicological and human health benchmarks would be negligible in 2002 and 2012.

Cumulative impacts to water quality would also be negligible for bayside and oceanside waters.

This alternative would not impair water quality.

Impacts of Alternative C — Continue PWC Use under a Special Regulation to with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Under alternative C only the portion of the Shrewsbury River Channel within the jurisdiction of the Sandy Hook Unit would be open to PWC use. This portion of the Shrewsbury River Channel consists of approximately 17 acres of surface water with an average depth of over 13 feet, which is slightly deeper than the 8- to 12-foot average depth of the unit's waters overall. This management restriction would contribute to improved water quality by eliminating PWC pollutants and sediment resuspension in shallow water areas of the unit. However, PWC use would be concentrated in a smaller area, resulting in more localized and intensified adverse effects of PWC pollutants before they are dispersed. It is conservatively assumed that the number of personal watercraft using the unit's bayside waters would be the same as in alternatives A and B (see Table 55). Estimated threshold volumes needed to dilute PWC emissions are shown in Table 62.

As PWC use would be banned from the unit's oceanside waters, this alternative would have a beneficial impact on water quality and associated biota on the Atlantic side of Sandy Hook. Impacts to water quality in the unit's bayside waters would be somewhat greater than under alternative B because PWC use would be concentrated within approximately 17 acres of surface water. Ecotoxicological threshold volumes for PWC pollutants in bayside waters would range from less than 1 to 67 acre-feet, while the volume of water available would be 230 acre-feet. Impacts from PWC pollutants under ecotoxicological benchmarks are

TABLE 62: THRESHOLD WATER VOLUMES NEEDED TO DILUTE PWC POLLUTANTS, ALTERNATIVE C — SANDY HOOK UNIT

	Sandy Hook Bay		Ocean Waters	
	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	11,080		12,950	
Permitted PWC use area (ac-ft)	230		0	
Ecotoxicological Benchmarks*				
Benzo(a)pyrene (fuel and exhaust)	33	17	0	0
Naphthalene	13	7	0	0
1-methyl naphthalene	67	34	0	0
Benzene	31	16	0	0
MTBE	1	0.5	0	0
Human Health Benchmarks**				
Benzo(a)pyrene (fuel and exhaust)	15	8	0	0
Benzene	58	29	0	0

NOTE: This alternative would close all of the unit's waters to PWC use except the Shrewsbury River Channel.
* Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
** Threshold volumes (ac-ft) below which human health might be impacted.

expected to be negligible in 2002 and 2012. Impacts under human health benchmarks in bayside waters would also be negligible in 2002 and 2012, with threshold volumes ranging from 8 to 58 acre-feet.

Because the area of permitted PWC use under alternative C (Shrewsbury River Channel) is surrounded by other extensive areas of water (waters within the unit's jurisdiction, as well as the waters of Sandy Hook Bay), the actual mixing/dilution volumes would be substantially greater than what is calculated for the permitted PWC use area.

Cumulative Impacts. While PWC use would be restricted to the Shrewsbury River Channel, other motorized craft would be allowed throughout the unit's waters. PWC emissions are compared primarily to the volume of the PWC use area, and other motorboat emissions are compared to volumes within park jurisdictional waters in each area. Estimated threshold volumes for cumulative impacts under alternative C would be much higher than for personal watercraft alone, as seen in Table 63.

TABLE 63: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM ALL MOTORIZED WATERCRAFT, ALTERNATIVE C — SANDY HOOK UNIT

	Sandy Hook Bay		Ocean Waters	
	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	11,080		12,950	
Permitted PWC use area (ac-ft)	230		0	
Ecotoxicological Benchmarks*				
Benzo(a)pyrene (fuel and exhaust)	380	200	0	0
Naphthalene	150	79	0	0
1-methyl naphthalene	780	400	0	0
Benzene	370	190	0	0
MTBE	12	6	0	0
Human Health Benchmarks**				
Benzo(a)pyrene (fuel and exhaust)	180	90	0	0
Benzene	670	340	0	0

NOTE: This alternative would close all of the unit's waters to PWC use except the Shrewsbury River Channel.
* Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
** Threshold volumes (ac-ft) below which human health might be impacted.

Cumulative impacts to aquatic organisms and human health in the unit's bayside and oceanside waters would be negligible in 2002 and 2012. In bayside waters, threshold volumes based on ecotoxicological benchmarks would range from 6 to 780 acre-feet, and based on human health benchmarks from 90 to 670 acre-feet, while the available water volume is 11,080 acre-feet. In oceanside waters where PWC would be banned, threshold volumes based on ecotoxicological benchmarks would range from 2 to 310 acre-feet,

and based on human health benchmarks from 36 to 270 acre-feet, while the available water volume is 12,950 acre-feet. As described previously, existing environmental conditions (e.g., flushing, mixing), and characteristics of the chemicals of concern (e.g., half-lives in water) would reduce the potential risks to the aquatic environment and human health.

Conclusion. As PWC use would be banned from the unit's oceanside waters, this alternative would have a beneficial impact on water quality and associated biota on this side of Sandy Hook. Impacts to water quality in the unit's bayside waters would be somewhat greater than under alternative B because PWC use would be concentrated within approximately 17 acres of surface water within the Shrewsbury River Channel. Currents in this navigational channel are swift, and tide- and wind-driven mixing would rapidly dilute PWC pollutants in this area. Impacts from PWC pollutants under ecotoxicological and human health benchmarks are expected to be negligible in 2002 and 2012.

Cumulative impacts to aquatic organisms and human health from all motorized watercraft emissions would be negligible in all areas in 2002 and 2012.

This alternative would not impair water quality.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Under this alternative PWC use would be banned from all NPS waters in the Sandy Hook Unit. This alternative would have a beneficial impact on the local water quality and associated biota of Sandy Hook as a result of reduced PWC-related emissions and sediment resuspension in shallow waters.

Cumulative Impacts. PWC use would not contribute to cumulative impacts of other motorized watercraft, which would continue. Threshold volumes under this alternative are shown in Table 64.

TABLE 64: THRESHOLD WATER VOLUMES NEEDED TO DILUTE POLLUTANTS FROM MOTORIZED WATERCRAFT (EXCLUDING PWC), NO-ACTION ALTERNATIVE — SANDY HOOK UNIT

	Sandy Hook Bay		Ocean Waters	
	2002	2012	2002	2012
NPS jurisdictional waters (ac-ft)	11,080		12,950	
Ecotoxicological Benchmarks*				
Benzo(a)pyrene (fuel and exhaust)	350	180	150	80
Naphthalene	140	72	61	32
1-methyl naphthalene	710	370	310	160
Benzene	330	170	150	76
MTBE	11	6	5	2
Human Health Benchmarks**				
Benzo(a)pyrene (fuel and exhaust)	160	82	70	36
Benzene	610	320	270	140

Note: This alternative would discontinue PWC use throughout the Sandy Hook Unit.
*Threshold volumes (ac-ft) below which ecotoxicological effects might occur.
** Threshold volumes (ac-ft) below which human health might be impacted.

Over 80% of the organic pollutants discharged to the water are from other motorized watercraft. Under the no-action alternative water quality impacts based on ecotoxicological and human health benchmarks would be negligible in both areas in 2002 and 2012.

Conclusion. Banning PWC use within the unit would have a beneficial impact on water quality by reducing sediment resuspension and eliminating PWC emission of pollutants in the unit's waters.

On a cumulative basis, other motorboats would continue to have negligible adverse impacts on the unit's water quality due to the discharge of organic pollutants.

This alternative would not impair water quality.

AIR QUALITY

GUIDING REGULATIONS AND POLICIES

Clean Air Act. As described for the Jamaica Bay Unit, the Clean Air Act establishes national ambient air quality standards to protect the public health and welfare from air pollution. The act also establishes the prevention of significant deterioration (PSD) of air quality program to protect the air in relatively clean areas. Sandy Hook Unit is designated a class II area, and only moderate air quality deterioration is allowed. In no case may pollution concentrations violate any of the national ambient air quality standards.

Conformity Requirements. Sandy Hook Unit, located in Monmouth County, New Jersey, is designated by the U.S. Environmental Protection Agency as in severe nonattainment for ozone and as an attainment area for all other criteria pollutants (CO, NO_x, SO_2, PM_{10}, and Pb). The Bureau of Air Quality Planning within the New Jersey State Department of Environmental Protection has included control measures in the State Implementation Plan to ensure that Monmouth County will attain the national air quality standards by 2007. The proposed action and alternatives are subject to federal conformity review but are not predicted to add pollutants not already included in the state plan; therefore, the project is presumed to conform with the state plan, and a conformity determination is not required (40 CFR 93.158).

Applicable PWC Emission Standards. By 2006 PWC manufacturers will be required to meet a corporate average emission standard that is equivalent to a 75% reduction in VOC emissions, in accordance with US EPA emission standards for marine engines. Because the actual reduction in emissions depends on the sale of lower-emitting personal watercraft, the Environmental Protection Agency estimates that a 52% emission reduction will be achieved by 2011 and a 75% reduction by 2031 (US EPA 1996a, 1997).

NPS Management Policies. Under its *Management Policies 2001* the National Park Service will

> seek to perpetuate the best possible air quality in parks to (1) preserve natural resources and systems; (2) preserve cultural resources; and (3) sustain visitor enjoyment, human health, and scenic vistas (NPS 2000c).

The *Management Policies* further state that the National Park Service will assume an aggressive role in promoting and pursuing measures to protect air quality related values from the adverse impacts of air pollution. In cases of doubt as to the impacts of existing or potential air pollution on park resources, the National Park Service "will err on the side of protecting air quality and related values for future generations."

The *Management Policies* apply equally to all areas of the national park system, regardless of its designation under the Clean Air Act. Furthermore, the NPS Organic Act and the *Management Policies* provide additional protection from that afforded by the Clean Air Act's national ambient air quality standards alone because the National Park Service has documented that specific park air quality related values can be adversely affected at levels below the national standards or by pollutants for which no standard exists.

METHODOLOGY AND ASSUMPTIONS

To assess the level of PWC air quality impacts resulting from a given management alternative, the following methods and assumptions specific to the Sandy Hook Unit were used, in addition to those described for the Jamaica Bay Unit (see page 91):

1. Air quality designations for the surrounding area were determined. The Sandy Hook Unit is in attainment for all criteria pollutants except ozone, for which it is in severe non-attainment.
2. Cumulative impacts were analyzed quantitatively for all recreational watercraft. Vehicular access is maintained to the Sandy Hook Unit for cars, trucks, and recreational vehicles; emissions from these vehicles and other local and regional sources of air pollutants were not assessed quantitatively but were considered in the cumulative impact assessment.

Two categories of potential airborne pollution impacts from PWC are analyzed: (1) impacts on human health, and (2) impacts on air quality related values in the park area. Thresholds for each impact category are discussed below.

IMPACT ANALYSIS AREA

The impact analysis area is the Sandy Hook Unit from the southern boundary of Plum Island to north of the U.S. Coast Guard Sandy Hook Station on the bayside and oceanside areas, including South Island, Skeleton Hill Island, the visitor center, holly forest, Fort Hancock, and the Sandy Hook lighthouse.

IMPACT TO HUMAN HEALTH FROM AIRBORNE POLLUTANTS RELATED TO PWC USE

Because the Sandy Hook Unit is in attainment with all national ambient air quality standards except ozone, two sets of thresholds must be considered, as highlighted in the text box.

Thresholds for Impacts to Human Health from Airborne Pollutants

Attainment Pollutants (CO, NO_x, SO_2, PM_{10}, Pb): The following impact thresholds have been defined:

	Activity Analyzed		Current Air Quality
Negligible:	Emission levels would be less than 50 tons/year for each pollutant.	**and**	The first highest 3-year maximum for each pollutant is less than NAAQS.
Minor:	Emission levels would be less than 100 tons/year for each pollutant.	**and**	The first highest 3-year maximum for each pollutant is less than NAAQS.
Moderate:	Emission levels would be greater than or equal to 100 tons/year for any pollutant.	**or**	The first highest 3-year maximum for each pollutant is greater than NAAQS.
Major:	Emission levels would be greater than or equal to 250 tons/year for any pollutant.	**and**	The first highest 3-year maximum for each pollutant is greater than NAAQS.

Non-attainment or maintenance pollutants: The following impact thresholds have been defined for ozone and its precursor pollutants VOC and NO_x:

Negligible: There would be a net decrease in emissions from current levels.

Minor: Emissions would be 0–5 tons/year.

Moderate: Emissions would be greater than 5 tons/year and less than conformity *de minimus** levels (25 tons/year).

Major: Emissions would be equal to or greater than conformity *de minimus* levels (25 tons/year).

Impairment (for both attainment and non-attainment areas): Impacts would have a major adverse effect on park resources and values; and

contribute to deterioration of the park's air quality to the extent the park's purpose could not be fulfilled as established in its enabling legislation; or

affect resources key to the recreation area's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the recreation area's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. Under alternative A PWC use during the peak season would be 16 personal watercraft per hour in 2002, increasing to 17 in 2012 (using highest use estimates as defined in "PWC and Visitor Use Trends," see Table 55). The ambient air quality levels would continue to be in attainment for all national ambient air quality pollutants except ozone. PWC emissions are shown in Table 65.

TABLE 65: PWC EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE A — SANDY HOOK UNIT

	CO		PM		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	45.21	38.22	0.90	0.15	0.21	0.70	20.68	5.01
Impact Level (adverse)	Negligible	Negligible	Negligible	Negligible	Minor	Minor	Moderate	Moderate

Air quality impacts would be negligible adverse from CO and PM emissions, with PWC emission levels of less than 50 tons/year. For ozone precursors in an ozone non-attainment area impacts from NO_x would be minor adverse (less than 5 tons/year) and from VOC moderate adverse (less than 25 tons/year).

Cumulative Impacts. A variety of commercial and recreational marine vessels are found in the waters in and around the Sandy Hook Unit. According to an informal NPS survey, the number of other boats could total 92 boats per peak hour, plus 16 personal watercraft per hour (see Table 55). Considering the average national trend of marine vehicle use and the current and future emission levels generated within the unit, the cumulative emissions and impacts of all boating activities under alternative A are shown in Table 66.

* Conformity *de minimis* levels are levels of emissions below which a federal action in a non-attainment or maintenance area is presumed to conform to a state's implementation plan and not require further review. Actions in attainment areas are presumed to conform and do not require analysis with respect to *de minimis* levels.

TABLE 66: PWC AND MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE A — SANDY HOOK UNIT

	CO		PM_{10}		NO_x		VOC	
	2002		2002	2012	2002	2012	2002	
Annual Emissions (tons/year)	290.47	271.77	4.79	3.19	7.83	10.01	96.67	37.66
Impact Level (adverse)	Major	Major	Negligible	Negligible	Moderate	Moderate	Major	Major

The cumulative CO emission levels would result in major adverse impacts in 2002 and 2012 (emissions more than 250 tons/year), while PM levels would be negligible (less than 5 tons per year). For ozone precursors in an ozone non-attainment area, cumulative impacts would be moderate adverse from NO_x and major adverse from VOC because air emissions would exceed 25 tons/year in 2002 and 2012.

Conclusion. Continuing PWC use at existing levels within the unit boundary would result in negligible adverse impacts from CO and PM emissions in 2002 and 2012. Because the unit is in an ozone non-attainment area, impacts from VOC emissions would be moderate adverse and from NO_x minor adverse throughout the assessment period.

Overall, emissions from all boating activities in 2002 and 2012 would result in major adverse impacts from CO and negligible adverse impacts from PM. For ozone precursors in a non-attainment area, impacts from NO_x would be moderate adverse and from VOC major adverse.

This alternative would not impair air quality resources.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions

Analysis. Alternative B would limit PWC use to the Shrewsbury River and Sandy Hook Channels. PWC use in oceanside waters would be prohibited within 500 feet of the shore. It is assumed that PWC numbers in bayside and oceanside waters would be the same as alternative A, but they would be confined to the PWC use areas.

Banning PWC use along the majority of the bayside waters would reduce impacts to air quality in this area. However, this would concentrate personal watercraft and emissions at the northern end of the Sandy Hook Unit and in the Shrewsbury River Channel area, resulting in more localized effects of PWC pollutants. Nevertheless, overall PWC emission levels would be the same as under alternative A.

National ambient air quality standards would continue to be met for all pollutants except ozone (see Table 67). Impacts would be negligible adverse for CO and PM, with emission levels of less than 50 tons/year. For ozone precursors in a non-attainment area, impacts from NO_x would be minor adverse (less than 5 tons/year), and impacts from VOC would be moderate adverse (less than 25 tons/year).

TABLE 67: PWC EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE B — SANDY HOOK UNIT

	CO		PM		No_x		VOC	
		2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	45.21	38.22	0.90	0.15	0.21	0.70	20.68	5.01
Impact Level (adverse)	Negligible	Negligible	Negligible	Negligible	Minor	Minor	Moderate	Moderate

Cumulative Impacts. While PWC use would be restricted throughout much of the unit, other motorboats would be allowed throughout the unit. As described above, PWC emissions within limited areas would result in more localized air quality impacts.

TABLE 68: PWC AND MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE B — SANDY HOOK UNIT

	CO		PM_{10}		NO_x		VOC	
	2002	2012		2012	2002	2012	2002	2012
Annual Emissions (tons/year)	290.47	271.77	4.79	3.19	7.83	10.01	96.67	37.66
Impact Level (adverse)	Major	Major	Negligible	Negligible	Moderate	Moderate	Major	Major

Under alternative B the cumulative emission levels of CO would result in major adverse impacts in 2002 and 2012 (more than 250 tons/year), while impacts from PM would be negligible adverse (less than 5 tons/year). Cumulative NO_x emissions would be moderate adverse (less than 25 tons/year), and VOC emissions would be major adverse (more than 25 tons/year) throughout the assessment period for an ozone non-attainment area.

Conclusion. Continuing PWC use at existing levels but restricting it to navigational channels and beyond 500 feet from the shore on the oceanside would result in negligible adverse impacts from CO and PM pollutants in 2002 and 2012. For ozone precursors in a non-attainment area, impacts in 2002 and 2012 from VOC emissions would be moderate adverse and from NO_x minor adverse.

Overall, emissions from all boating activities under this alternative from 2002 through 2012 would result in major adverse impacts from CO and negligible adverse impacts from PM. For ozone precursors, impacts from NO_x would be moderate adverse and from VOC major adverse.

This alternative would not impair air quality resources.

Impacts of Alternative C — Continue PWC Use under a Special Regulation to with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use would be less than under alternative A or B because only the Shrewsbury River

TABLE 69: PWC EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE C — SANDY HOOK UNIT

	CO		PM_{10}		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	16.95	13.49	0.34	0.05	0.08	0.25	7.76	1.77
Impact Level (adverse)	Negligible	Negligible	Negligible	Negligible	Minor	Minor	Moderate	Minor

Channel would be open to PWC use. PWC emissions are shown in Table 69.

Impacts from CO and PM would be negligible adverse, with emissions less than 50 tons/year in 2002 and 2012. Impacts from NO_x would be minor (less than 5 tons/year), while impacts from VOC would be moderate in 2002 (less than 25 tons/year), decreasing to minor by 2012 (less than 5 tons/year).

Cumulative Impacts. As described above, emissions within the limited PWC use areas would result in more localized impacts from PWC-emitted pollutants.

TABLE 70: PWC AND MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, ALTERNATIVE C — SANDY HOOK UNIT

	CO		PM_{10}		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	245.26	233.55	4.28	3.10	7.70	9.56	83.75	34.42

Impact Level (adverse)	Moderate	Moderate	Negligible	Negligible	Moderate	Moderate	Major	Major

Under alternative C cumulative CO emissions would result in moderate adverse impacts (less than 250 tons/year) in 2002 and 2012; while impacts from PM would be negligible (less than 5 tons/year). The cumulative NO_x emissions would be moderate (less than 25 tons/year) and VOC emissions major (more than 25 tons/year) for an ozone non-attainment area.

Conclusion. Restricting PWC use to the Shrewsbury River Channel within NPS boundaries would result in negligible adverse impacts from CO and PM emissions. Located in an ozone non-attainment area, there would be minor adverse impacts from NO_x, while impacts from VOC would be moderate in 2002, decreasing to minor by 2012.

Overall, emissions from all boating activities would result in moderate adverse impacts from CO and negligible adverse impacts from PM. For ozone precursors in a non-attainment area, impacts from NO_x would be moderate adverse and from VOC major adverse.

This alternative would not impair air quality resources.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Under the no-action alternative there would be no further emissions from PWC use within the unit, resulting in beneficial impacts.

Cumulative Impacts. The cumulative air quality impacts of all marine vehicles and boating activities under the no-action alternative are shown in Table 71. Under the no-action alternative emissions within the unit would result only from boat activity since PWC would no longer be allowed.

TABLE 71: MOTORIZED BOAT EMISSIONS AND HUMAN HEALTH IMPACT LEVELS, NO-ACTION ALTERNATIVE — SANDY HOOK UNIT

	CO		PM		NO_x		VOC	
	2002	2012	2002	2012	2002	2012	2002	2012
Annual Emissions (tons/year)	245.26	233.55	4.31	3.32	7.62	9.31	75.99	32.65
Impact Level (adverse)	Moderate	Moderate	Negligible	Negligible	Moderate	Moderate	Major	Major

Overall, the 2002 cumulative CO emission levels would result in moderate adverse impacts (less than 250 tons/year), and PM levels would result in negligible adverse impacts (less than 50 tons/year). For ozone precursors, NO_x levels would be moderate adverse (less than 25 tons/year) and VOC levels major adverse (more than 25 tons/year) for an ozone nonattainment area.

Conclusion. The no-action alternative would have beneficial impacts as a result of banning PWC use within unit waters.

Cumulative impacts from all boating activities would be decreased due to less PWC operation and cleaner engine emissions, but impacts would still be moderate adverse for CO and negligible adverse for PM. For ozone precursors, impacts would be major adverse for VOC and moderate adverse for NO_x.

This alternative would not impair air quality resources.

IMPACT TO AIR QUALITY RELATED VALUES FROM PWC POLLUTANTS

Impacts to air quality related values include effects on visibility and biological resources (specifically ozone effects on plants) from airborne pollutants related to PWC use. As described for the Jamaica Bay Unit, to assess the impacts of ozone on plants, the existing area average ozone index values (represented as SUM06 values as compiled by the NPS Air Resources Division) were used. Based on the five-year average data provided by National Park Service, the SUM06 for the study area is within a range of 19–25 ppm-hrs based on urban site data. $PM_{2.5}$ as a fraction of particulate matter is evaluated for visibility impairment. The impact thresholds are highlighted in the text box.

Thresholds for Impacts to Air Quality Related Values

	Activity Analyzed		Current Air Quality
Negligible:	Emissions would be less than 50 tons/year for each pollutant.	**and**	There are no perceptible visibility impacts (photos or anecdotal evidence). **and** There is no observed ozone injury on plants. **and** SUM06 ozone is less than 12 ppm-hours.
Minor:	Emissions would be less than 100 tons/year for each pollutant.	**and**	SUM06 ozone is less than 15 ppm-hour.
Moderate:	Emissions would be greater than 100 tons/year for any pollutant. **or** Visibility impacts from cumulative PWC emissions would be likely (based on past visual observations).	**or**	Ozone injury symptoms are identifiable on plants. **and** SUM06 ozone is less than 25 ppm-hours.
Major:	Emissions would be equal to or greater than 250 tons/year for any pollutant. **or** Visibility impacts from cumulative PWC emissions would be likely (based on modeling or monitoring).	**and**	Ozone injury symptoms are identifiable on plants. **or** SUM06 ozone is greater than 25 ppm-hours.

Impairment: Impacts would have a major adverse effect on park resources and values; and

contribute to deterioration of the park's air quality to the extent that the park's purpose could not be fulfilled as established in its enabling legislation; or

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or

affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use would be allowed in those areas of the unit identified in the "Superintendent's Compendium." Table 72 presents the annual PWC emission loads and their estimated impact levels for 2002 and 2012.

TABLE 72: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS, ALTERNATIVE A — SANDY HOOK UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	0.83	0.14	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

Impacts related to ozone injury would be moderate adverse, based on the SUM06 ozone level for the park. Visibility impacts ($PM_{2.5}$) would be negligible (substantially below 50 tons/year).

Cumulative Impacts. The cumulative emissions and impacts of all marine recreational boating activities are shown in Table 73.

TABLE 73: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, ALTERNATIVE A — SANDY HOOK UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	4.79	3.19	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

Cumulative impacts would be moderate adverse for ozone effects on vegetation. Visibility impacts would be negligible for $PM_{2.5}$ levels (substantially below 50 tons/year).

Conclusion. PWC annual emissions under alternative A would result in moderate adverse impacts for ozone exposure and negligible impacts for visibility. There are no perceptible visibility impacts on record or observed ozone injury on plants.

Cumulative emissions from all motorized boating activities would result in moderate adverse impacts for ozone exposure and negligible impacts on visibility.

This alternative would not impair air quality related values.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. PWC emission levels are projected to be slightly lower than under alternative A due to PWC use restrictions. Under this alternative there would be no perceptible qualitative visibility impacts or observed ozone injury on plants. Table 74 presents the annual PWC emission loads and their impact levels for 2002 and 2012. Ozone exposure would be moderate, again based on a SUM06 ozone level of 19–25 ppm-hrs. Emission levels for $PM_{2.5}$ would result in a negligible impact on visibility (substantially below 50 tons/year).

TABLE 74: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS, ALTERNATIVE B — SANDY HOOK UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	0.83	0.14	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

Cumulative Impacts. Cumulative emissions and impacts of all motorized watercraft under alternative B are summarized in Table 75.

TABLE 75: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, ALTERNATIVE B — SANDY HOOK UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	4.79	3.19	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

The impact levels from air emissions of all activities would be moderate adverse for ozone exposure. Visibility impacts would be negligible (substantially below 50 tons/year).

Conclusion. PWC annual emissions would result in moderate adverse impacts for ozone exposure and negligible impacts to visibility, similar to alternative A. There are no perceptible qualitative visibility impacts on record or observed ozone injury on plants.

Cumulative emissions from all PWC and other motorized boating activities would result in moderate adverse impacts related to ozone exposure and negligible impacts on visibility.

This alternative would not impair air quality related values.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC users would operate only within the Shrewsbury River Channel, with no PWC use in oceanside waters; therefore, impacts would be less than under alternative A or B. Table 76 presents the annual PWC emission loads and their impact levels for 2002 and 2012.

Impacts related to ozone exposure would be moderate adverse, based on the SUM06 ozone level for the unit. Emission levels for $PM_{2.5}$ would result in a negligible impact on visibility (substantially below 50 tons/year).

TABLE 76: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS, ALTERNATIVE C — SANDY HOOK UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	0.31	0.05	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

Cumulative Impacts. Cumulative emissions and impacts from all motorized watercraft under alternative C are summarized in Table 77.

TABLE 77: AIR QUALITY RELATED IMPACTS FROM PWC EMISSIONS AND MOTORIZED BOATS, ALTERNATIVE C — SANDY HOOK UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	4.28	3.10	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

The impact levels from air emissions of all activities would be moderate adverse for ozone (vegetation damage) and negligible for $PM_{2.5}$ (visibility).

Conclusion. PWC annual emissions would result in moderate adverse impacts for ozone exposure and negligible impacts for visibility. There are no perceptible visibility impacts or ozone injury on plants.

Cumulative emissions from all PWC and other motorized boating activities would result in moderate adverse impacts related to ozone exposure and negligible impacts for visibility.

This alternative would not impair air quality related values.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Under the no-action alternative PWC use within the unit would be banned, and there would be no contribution from this pollution source within the unit. Impacts would be beneficial due to reduced PWC-related ozone precursors and $PM_{2.5}$ pollutants.

Cumulative Impacts. While PWC use would no longer be allowed within the unit, other motorized boat use would continue at the same levels within and adjacent to the unit. The total cumulative emission loads and impact levels are shown in Table 78.

The cumulative impact levels from air emissions of all other motorized boating activities would be moderate for ozone exposure. Visibility impacts would be negligible. Future emission levels would decrease due to controlled engine emission regulations.

TABLE 78: AIR QUALITY RELATED IMPACTS FROM MOTORIZED BOATS, NO-ACTION ALTERNATIVE — SANDY HOOK UNIT

Air Quality Related Value (indicator)	Emission Level (tons/year)/ Local Ozone Data		Visibility Threshold / SUM06 Index Value*		Impact Level	
	2002	2012	2002	2012	2002	2012
Visibility ($PM_{2.5}$)	3.97	3.05	No perceptible visibility impacts	No perceptible visibility impacts	Negligible	Negligible
Ozone injury to plants (injury symptoms and ozone monitoring data)	No park specific effects documented	No park specific effects anticipated	SUM06 index value: 19–25 ppm-hrs (urban site data)	SUM06 index value: 19–25 ppm-hrs (urban site data)	Moderate	Moderate

* NPS Air Resources Division.

Conclusion. The no-action alternative would have beneficial impacts on the air quality of Sandy Hook Unit as a result of banning PWC use.

Cumulative emissions would result in moderate impacts for ozone exposure. Visibility impacts would be negligible.

This alternative would not impair air quality related values.

SOUNDSCAPES

As described for the Jamaica Bay Unit, personal watercraft must meet the NPS watercraft noise regulation of 82 dB at 82 feet at full acceleration. The noise from personal watercraft may be more noticeable and therefore more annoying to people than other motorcraft due to quick changes in acceleration and direction, and jumping into the air, causing rapid increases in the noise level and changes in sound frequency distribution. Human-generated noise sources at the Sandy Hook Unit include personal watercraft and other types of watercraft, vehicular traffic, and air traffic.

GUIDING REGULATIONS AND POLICIES

As previously described, NPS policy requires that degraded soundscapes be restored to the natural condition whenever possible, and that natural soundscapes be protected from degradation due to undesirable human-caused sound (*Management Policies 2001,* sec. 4.9). The National Park Service is specifically directed to "take action to prevent or minimize all noise that, through frequency, magnitude, or duration, adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified as being acceptable to, or appropriate for, visitor uses at the sites being monitored" (*Management Policies 2001,* sec. 4.9). Overriding all of this is the fundamental purpose of the national park system — to conserve park resources and values (16 USC 1 et seq.; *Management Policies 2001,* sec. 1.4.3). NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values (*Management Policies 2001,* sec 1.4.3).

METHODOLOGY AND ASSUMPTIONS

Potential sound-related impacts at the Sandy Hook Unit were evaluated based on existing sound levels. This evaluation is a qualitative assessment based on the general trends of existing and future PWC use in the unit and best professional judgment. While specific background noise studies are not available for Sandy Hook, certain conditions have been taken into account, given the number of PWC users in the identified impact analysis area and surrounding land uses. For example, it is assumed that the soundscape

throughout the majority of unit is that of a natural seashore area in an active urban location. Impacts to wildlife from noise are addressed separately under "Wildlife and Wildlife Habitat."

Context: The Sandy Hook Unit includes areas characterized by intense motorized boat activity (Shrewsbury River Channel) and more natural areas (e.g., the Sandy Hook holly forest) with opportunities for birdwatching, canoeing, hiking, and camping.

Time Factor: PWC use occurs during all seasons except winter. PWC use occurs during daylight hours as mandated under New Jersey State boating regulations. Use generally stops during periods of inclement weather (e.g., cold, thunderstorms).

In areas of concentrated boat use, such as the Shrewsbury River Channel, noise from personal watercraft and other motorboats can be virtually constant from sunrise to sunset. In other areas such noise can be intermittent, lasting a few minutes when present.

Intensity: The levels of sound generated by watercraft using the area is expected to affect recreational users differently. For example, visitors participating in less sound-intrusive activities such as birdwatching or hiking would likely be more adversely affected by PWC noise than would another PWC or motorboat user. Therefore, impacts to soundscape must take into account the effect of noise levels on different types of recreational users within the impact analysis area. The following is a list of other considerations for evaluating sound impacts:

The maximum number of personal watercraft operating per hour in the Sandy Hook Unit would increase from 16 in 2002 to 17 in 2012. This maximum number would be during midday in the peak season.

Ambient noise levels include natural sounds, other visitors, automobile traffic, and boats.

The methodology used to assess impacts for the Sandy Hook Unit is the same as that used for the Jamaica Bay Unit (see page 103).* For the Sandy Hook Unit the noise levels calculated for the impact analysis area, based on average PWC numbers per hour, would be

Oceanside — 6 PWC / hour = 90 dB

Bayside — 10 PWC / hour = 92 dB

At 500 feet from shore (the distance from bathing beaches that PWC users must maintain under New Jersey State boating regulations), the following noise levels were calculated:

Oceanside — 6 PWC / hour = 54 dB

Bayside — 10 PWC / hour = 56 dB

IMPACT ANALYSIS AREA

For purposes of this review, the impact analysis area is Sandy Hook Unit's jurisdictional waters, divided into bayside and oceanside by a line going due north from the northernmost point of Sandy Hook.

* In this assessment the noise of two or more personal watercraft operating at the same time (when one unit produces 82 dB), and at a distance of 82 feet from the source, was shown to be 85 dB. To calculate the noise level at 500 feet, the equation used was $10 \times \log((10^{82/10}) + (10^{82/10})) = 85$ dB. The equation used was $20 \times \log(D1/D2)$, where D1 = the location to be calculated, and D2 = the distance of the known noise source.

IMPACT TO VISITORS FROM PWC NOISE

The impact thresholds for soundscapes would be the same as for the Jamaica Bay Unit and are highlighted below.

Thresholds for Impacts to Visitors from PWC Noise

Negligible: Natural sounds would prevail; motorized noise would be very infrequent or absent, mostly immeasurable.

Minor: Natural sounds would be predominant in areas where management objectives call for natural processes to predominate, with motorized noise infrequent at low levels. In areas where motorized noise is consistent with park purpose and objectives, motorized noise could be heard frequently throughout the day at moderate levels, or infrequently at higher levels, and natural sounds could be heard occasionally.

Moderate: In areas where management objectives call for natural processes to predominate, natural sounds would predominate, but motorized noise could occasionally be present at low to moderate levels. In areas where motorized noise is consistent with park purpose and objectives, motorized noise would predominate during daylight hours and would not be overly disruptive to noise-sensitive visitor activities in the area; in such areas, natural sounds could still be heard occasionally.

Major: In areas where management objectives call for natural processes to predominate, natural sounds would be impacted by human noise sources frequently or for extended periods of time at moderate intensity levels (but no more than occasionally at high levels), and in a minority of the area. In areas where motorized noise is consistent with park purpose and zoning, the natural soundscape would be impacted most of the day by motorized noise at low to moderate intensity levels, or more than occasionally at high levels; motorized noise would disrupt conversation for long periods of time and/or make enjoyment of other activities in the area difficult; natural sounds would rarely be heard during the day.

Impairment: The level of noise associated with PWC use would be heard consistently and would be readily perceived by other visitors throughout the day, especially in areas where such noise would potentially conflict with the intended use of that area. In addition, these adverse, major impacts (described above) to park resources and values would:

- contribute to deterioration of the park's soundscape to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;
- affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or
- affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. On a typical summer day during peak operating hours, approximately 6 personal watercraft would be present on the bayside of Sandy Hook and 10 on the oceanside. Personal watercraft and boats are required to maintain a distance of 500 feet from any marked bathing beaches and are restricted from Spermaceti and Horseshoe Coves.

As previously stated, noise limits established by the National Park Service are 82 dB at 82 feet. On average more than 20 personal watercraft are present at any point within the park boundary. Two personal watercraft that emit 82 dB of sound would result in a noise level of 85 dB at 82 feet. Noise levels generated by six personal watercraft would reach the island shoreline at 54 dB when traveling greater than 500 feet from bathing beaches, as mandated by New Jersey State regulations. At 100 feet, noise levels would reach 90 dB for six personal watercraft.

The ambient noise levels vary on the oceanside and bayside of Sandy Hook. Ambient levels are higher on the bayside, where there is more recreational boat traffic within the navigational channels. Due to the

level of human activity and geographic restrictions on PWC use on the bayside, PWC use would result in negligible adverse impacts to other visitors and the natural soundscapes.

Ambient noise levels may be assumed to be lower on the oceanside. PWC noise would have negligible adverse impacts to visitors onshore, however, due to restrictions to PWC and watercraft access to nearshore environments.

Overall, PWC noise levels are expected to have negligible adverse impacts at certain locations within the unit. Due to current boat and PWC traffic in the navigational channels of the bayside, PWC noise generated within the unit would be consistent with ambient noise levels. Overall, this alternative would result in negligible adverse impacts on the soundscape of the Sandy Hook Unit. Impacts would occur over the short and long term. Potential reduction in noise emissions (as forecasted by the industry) could contribute to a reduction of adverse impacts to park visitors.

Cumulative Impacts. Other noise sources present at the Sandy Hook Unit include waves, ocean breezes, tourist activity, other watercraft, and automobile traffic. Other boating activities within the unit generate noise levels similar to that from personal watercraft. On both sides of Sandy Hook, boats outnumber personal watercraft by six to one, and on the bayside noise levels are elevated due to the volume of boat traffic. The cumulative impacts of boating noise, ambient noise levels, and PWC noise would range from negligible to minor, depending on the location within the unit and the time of year and compared to the natural soundscape.

Other park users contribute to the soundscape of the Sandy Hook Unit, including beach users, hikers, surfers, birdwatchers, and anglers. However, visitors consider these sounds compatible with typical uses. Visitor noise has a negligible adverse impact on the soundscape at the Sandy Hook Unit over the short and long term.

Conclusion. Noise impacts from PWC use would be negligible and adverse over the short and long term on the bayside and the oceanside of the Sandy Hook Unit.

Cumulative impacts of boating noise, ambient noise levels, and PWC noise would range from negligible to minor adverse over the short and long term, depending on location and time of year and compared to the natural soundscape.

This alternative would not impair any soundscape-related values.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. Alternative B would limit PWC use to the Sandy Hook and Shrewsbury River Channels, effectively closing most of the bayside waters to PWC use. Use of PWC in oceanside waters would be prohibited within 500 feet of the shore. For the purpose of evaluating impacts to soundscapes under alternative B, it is assumed that the number of personal watercraft operating in bayside and oceanside waters would be the same as alternative A (see Table 55). Other motorboat access to the unit's waters would not be affected under alternative B.

Ambient levels are higher on the bayside and would remain consistent with those described under alternative A. Due to the level of human activity and use restrictions on the bayside, PWC use would result in negligible adverse impacts to other visitors and the natural soundscapes.

Ambient noise levels could be lower on the oceanside. PWC noise would have negligible adverse impacts to visitors onshore due to use restrictions. Overall, PWC noise levels are expected to have negligible adverse impacts at certain locations within the unit, similar to alternative A.

Cumulative Impacts. The cumulative impacts of boating noise, ambient noise levels, and PWC noise would range from negligible to minor, depending on the location within the unit and the time of year, and compared to the natural soundscape. Noise levels on the bayside are elevated due to the level of boat traffic within the area.

Conclusion. Noise impacts related to PWC use would be negligible and adverse over the short and long term on both the bayside and oceanside of Sandy Hook, although noise levels could be lower on the oceanside due to prohibiting PWC use within 500 feet of the shore.

Cumulative impacts of boating noise, ambient noise levels, and PWC noise would range from negligible to minor adverse, depending on location and time of year, and compared to the natural soundscape. Noise levels on the bayside are elevated due to the level of boat traffic within the area.

This alternative would not impair any soundscape-related values.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Only the Shrewsbury River Channel would be open to PWC use under alternative C, essentially eliminating all PWC on the oceanside and bayside of the unit. Other motor boat access to the unit's waters would not be affected under alternative C.

PWC-related noise impacts would be negligible over the short and long term due to continued use outside unit boundaries. Ambient levels are higher on the bayside and would be slightly reduced from those described under alternative A as a result of restricting PWC use to the Shrewsbury River Channel. Due to the level of human activity and use restrictions, PWC use would result in negligible adverse impacts to other visitors and the natural soundscapes.

Prohibiting PWC use on the oceanside of the unit would have a beneficial impact, reducing noise levels from PWC use.

Cumulative Impacts. Cumulative impacts would be the same as for alternative B. Cumulative adverse impacts of boating noise, ambient noise levels, and PWC use (outside unit boundaries) would continue to range from negligible to minor, depending on the location of visitors and time of year and compared to the natural soundscape.

Conclusion. PWC use restrictions would limit the areas of PWC use, with beneficial impacts on both the oceanside and bayside. Noise impacts would be negligible over the short and long term.

Cumulative impacts of boating noise, ambient noise levels, and PWC noise would range from negligible to minor adverse, depending on location and time of year and compared to the natural soundscape.

This alternative would not impair any soundscape-related values.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Over the short and long term, banning PWC use within the unit would have a beneficial impact by reducing noise generated by PWC use.

Cumulative Impacts. Other boating activities within the unit would continue to generate noise levels equivalent to those described under alternative A. Although PWC-generated noise would be eliminated within the unit, other boating activity would continue, resulting in negligible to minor, adverse impacts over the short and long term within unit boundaries during daylight hours.

Conclusion. Banning PWC use within the unit would have beneficial impacts by eliminating this noise source within the unit boundary.

On a cumulative basis, noise from other motorboats would continue to have negligible to minor adverse impacts, depending on location and time of year and compared to the natural soundscape.

This alternative would not impair any soundscape-related values.

WILDLIFE AND WILDLIFE HABITAT

As described for the Jamaica Bay Unit (see page 109), PWC use may impact wildlife by interrupting normal activities, causing alarm or flight, causing animals to avoid habitat, displacing habitat, and affecting reproductive success. PWC use may have a greater impact on waterfowl and nesting birds. Disturbance may force nesting birds to abandon eggs during crucial embryo development stages and flush other waterfowl from habitat, causing stress and behavioral changes. Collisions may also be a concern.

GUIDING REGULATIONS AND POLICIES

Guiding regulations and policies for assessing impacts on wildlife and wildlife habitat would be the same as those described for the Jamaica Bay Unit (see page 111).

METHODOLOGY AND ASSUMPTIONS

Information on avian species likely to occur in areas accessible by personal watercraft was considered in the analysis. The analysis of potential impacts to non-avian species was based on the potential for wildlife species that are likely to occur in habitats to be affected by the alternatives being considered.

A similar methodology was used to determine the relative magnitude of impacts from PWC-generated noise to avian species. Studies indicate that flushing distances for avian species vary based on whether the bird is incubating, its location, and by individual birds. Studies conducted on piping plovers indicate that flushing distances vary widely (USFWS 2000b). No specific monitoring data are available at the park to quantify impacts; therefore, personal observations of NPS staff were used to determine areas of concern (nesting areas, critical habitat, etc.). These areas were identified and impacts were assessed relative to the number and proximity of PWC users potentially traveling during critical seasons and by the type of species present in those sensitive areas (state, federally listed, species of concern, etc.).

IMPACT ANALYSIS AREA

The impact analysis area includes the immediate locations of PWC use and the surrounding nearshore environment where wildlife and wildlife habitat may occur.

IMPACT OF PWC USE ON WILDLIFE AND WILDLIFE HABITAT

The thresholds used to determine the magnitude of effects on wildlife and wildlife habitat are the same as those used for the Jamaica Bay Unit and are highlighted in the accompanying text box. (For special status species, see "Threatened, Endangered, or Special Concern Species," beginning on page 294.)

Thresholds for Impacts on Wildlife and Wildlife Habitat

Negligible: There would be no observable or measurable impacts to native species, their habitats, or the natural processes sustaining them. Impacts would be of short duration and well within natural fluctuations.

Minor: Impacts would be detectable, but they are not expected to be outside the natural range of variability and to have any long-term effects on native species, their habitats, or the natural processes sustaining them. Population numbers, population structure, genetic variability, and other demographic factors for species might have small, short-term changes, but long-term characteristics would remain stable and viable. Occasional responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, or other factors affecting population levels. Key ecosystem processes might have short-term disruptions that would be within natural variation. Sufficient habitat would remain functional to maintain viability of all species. Impacts would be outside critical reproduction periods for sensitive native species.

Moderate: Breeding animals of concern are present; animals are present during particularly vulnerable life-stages, such as migration or juvenile stages; mortality or interference with activities necessary for survival can be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the unit. Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they could be outside the natural range of variability for short periods of time. Population numbers, population structure, genetic variability, and other demographic factors for species might have short-term changes, but would be expected to rebound to pre-impact numbers and to remain stable and viable in the long term. Frequent responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors affecting short-term population levels. Key ecosystem processes might have short-term disruptions that would be outside natural variation (but would soon return to natural conditions). Sufficient habitat would remain functional to maintain viability of all native species. Some impacts might occur during critical periods of reproduction or in key habitat for sensitive native species.

Major: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be outside the natural range of variability for long periods of time or be permanent. Population numbers, population structure, genetic variability, and other demographic factors for species might have large, short-term declines, with long-term population numbers significantly depressed. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a long-term decrease in population levels. Breeding colonies of native species might relocate to other portions of the park. Key ecosystem processes might be disrupted in the long term or permanently. Loss of habitat might affect the viability of at least some native species.

Impairment: Some of the major impacts described above might be an impairment of park resources if their severity, duration, and timing resulted in the elimination of a native species or significant population declines in a native species. In addition, these adverse, major impacts to park resources and values would

- contribute to deterioration of the park's wildlife resources and values to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;
- affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or
- affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use would continue in all waters designated in the "Superintendent's Compendium," and sensitive areas would remain closed to use. Personal watercraft would be managed in accordance with all state regulatory requirements.

Noise levels and the ability of PWC users to rapidly approach the shore in areas where access is allowed could adversely affect terrestrial wildlife, such as shorebirds and waterfowl, by causing alarm or flight. PWC use in these areas could also adversely affect waterfowl and other aquatic wildlife, such as terrapins using shallow water habitats, as a result of collision. Requirements for PWC users to operate at idle speed within 50 feet of the shoreline would help minimize adverse effects to wildlife in shoreline habitats as a result of rapid approaches and noise.

Noise from personal watercraft has the potential to affect birds and wildlife in certain areas, particularly in the marsh areas along the bayside of Sandy Hook. Restricting PWC access from most such areas (for example, Spermaceti and Horseshoe Coves) would minimize the potential for adverse effects.

Bird species must maximize their foraging when certain invertebrate prey species are available. For birds raising offspring or building up fat reserves for migration, being chased from feeding areas can affect their potential for survival, especially when these disturbances continue for several days. For terns, which rest on beaches when not feeding, repeated disturbance could lead to exhaustion, potentially affecting the bird's potential for survival. Short-term, minor, adverse impacts resulting from disturbance of waterfowl and shorebirds in mud and sand flats and marshes in areas open to PWC use on the bay side of Sandy Hook are expected. Adherence to New Jersey boating laws, which restrict PWC and other watercraft to idle speeds within 50 feet of shore, would help reduce potential adverse effects to avian species and other wildlife associated with rapid shoreline approaches and noise from PWC users.

Diamondback terrapins use habitats on the bayside of Sandy Hook to feed and nest. Terrapin activity is predominantly associated with salt marshes and mudflats in the area, with turtles foraging in shallow tidal creeks and tidal flats. High-speed PWC use in areas used by terrapins could result in direct adverse effects to the species as a result of collisions. Adverse effects are expected to be minor because PWC users tend to avoid shallow water areas because of the risk of damage to their craft. Requirements for PWC users to operate at idle speed within 50 feet of the shoreline would also reduce the potential for adverse effects.

Porpoises and seals can be directly affected by collisions; however, porpoises occur in limited numbers in the immediate vicinity of the Sandy Hook Unit, and seals only use the area in winter months, which limits the potential for them to be adversely affected as a result of PWC use. (Indirect impacts caused by noise generated underwater are discussed separately beginning on page 290.)

Minor, direct and indirect adverse effects to fish species in nearshore habitats are expected over the short and long term. Essential fish habitat established under the Magnuson-Stevens Fishery Conservation and Management Act occurs for several fish species in waters around the Sandy Hook Unit. Species common to the shallow waters, such as mummichog and several species of flounder, could be disrupted from normal feeding behavior as a result of PWC use in nearshore areas. Continuous PWC use in areas providing essential fish habitat functions, particularly in shallow water areas, could adversely affect suitability of these areas to meet life-cycle requirements. Because PWC access to most nearshore habitats of the Sandy Hook Unit would be restricted, the potential for adverse impacts to fish species or essential fish habitats would be minimized.

Minor, adverse, direct and indirect impacts to wildlife and habitat over the short and long term could occur. As a result of PWC access restrictions and poor sea conditions in most areas where access is

allowed, impacts to wildlife and habitat as a result of human activity and noise levels associated with PWC use over most of the unit are expected to be relatively low.

Cumulative Impacts. PWC access is currently restricted in sensitive areas of the Sandy Hook Unit; however, future increases in other motorized watercraft uses could increase the potential for adverse effects to wildlife and habitat in the unit from access by conventional watercraft to areas restricted to PWC access. Adverse cumulative effects associated with increased future motorized uses are expected to be minor, adverse, and indirect over the short and long term because species sensitive to noise and human activity are not expected to regularly occur in the high-use areas or immediately adjacent habitats during peak periods.

Conclusion. Minor, adverse, direct and indirect impacts to wildlife and habitat over the short and long term are expected under alternative A because PWC use would be restricted in the most sensitive areas of the Sandy Hook Unit. Requiring PWC users to operate at idle speeds within 50 feet of the shoreline would minimize adverse effects to wildlife in shoreline habitats as a result of rapid approaches and noise.

Adverse cumulative effects associated with increased future motorized watercraft uses are expected to be minor and indirect over the short and long term because species sensitive to noise and human activity are not expected to regularly occur in high-use areas or immediately adjacent habitats during peak periods.

This alternative would not impair wildlife or wildlife habitat.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. Alternative B would limit PWC use in Sandy Hook Bay to the navigational channels, effectively closing most of the unit's bayside waters to PWC users. In oceanside waters use would be prohibited within 500 feet of the shore, although use would be allowed out to the NPS 0.25-mile jurisdictional boundary. It is assumed that the same number of PWC users would be operating in bayside and oceanside waters as under alternative A, except they would be confined to smaller areas. Other watercraft access to the unit's waters would not be affected under alternative B.

Negligible, adverse impacts over the short and long term could result from the disturbance of waterfowl and other wildlife using open water and mud and sand flats on the bayside. Closing all ocean beaches to PWC use within 500 feet of the shoreline would minimize the potential for disturbance of shorebird nesting, foraging, or resting along the ocean beaches. Observations indicate that some species of shorebirds and waterfowl are disturbed by PWC use within 200 to 300 feet of their location. A minimum 500-foot buffer area along the oceanside would minimize the potential for disturbance to avian species and other wildlife using shoreline habitats.

PWC-generated noise has the potential to affect birds and wildlife in certain areas, particularly in marshes facing Sandy Hook Bay. Restricting PWC access in areas such as Spermaceti and Horseshoe Coves would minimize the potential for adverse effects to wildlife in these areas.

Negligible, adverse, direct and indirect impacts to wildlife and habitat are expected under alternative B over the short and long term. Restricting PWC use from all nearshore habitats would minimize the potential for adverse impacts to wildlife and habitat within NPS jurisdictional boundaries. The type of impacts would be similar to those discussed in alternative A.

Cumulative Impacts. While alternative B would restrict PWC use in all shore areas of the Sandy Hook Unit, increases in other watercraft use would increase the potential for adverse effects to wildlife and habitat because conventional watercraft would still have access to all unit waters. Cumulative impacts to wildlife and habitat would be similar to those discussed under alternative A. Adverse cumulative impacts are expected to be minor, adverse, and indirect over the short and long term because species sensitive to noise and human activity are not expected to regularly occur in the high-use areas or immediately adjacent habitats during peak periods.

Conclusion. Negligible, adverse direct and indirect impacts to wildlife and habitat over the short and long term are expected because PWC use would be restricted from most of the park waters and all nearshore areas of the Sandy Hook Unit.

Cumulative adverse impacts would be minor and indirect over the short and long term, similar to alternative A, because species sensitive to noise and human activity are not expected to regularly occur in high-use areas or immediately adjacent habitats during peak periods.

This alternative would not impair wildlife or wildlife habitat.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Only the Shrewsbury River Channel would be open to PWC use. Restricting PWC use from all areas within the unit would further minimize the potential for adverse impacts to wildlife and habitat, resulting in a beneficial impact. Negligible, adverse impacts over the short and long term could result from disturbing waterfowl and other wildlife in open water near the Shrewsbury River Channel.

Cumulative Impacts. Future increases in PWC use are likely around the Sandy Hook Unit, along with increases in other motorized watercraft use in and adjacent to the unit, with a greater potential for adverse effects to wildlife and habitat in the unit. Cumulative impacts to wildlife and habitat would be similar to those discussed under alternative A. The intensity of adverse impacts would be minor and indirect over the short and long term because species sensitive to noise and human activity are not expected to regularly occur in high-use areas or immediately adjacent habitats during peak periods.

Conclusion. Impacts to wildlife and habitat would be negligible and adverse over the short and long term because personal watercraft would be prohibited in all waters except for the Shrewsbury River Channel. Limiting the area exposed to disturbance by PWC use would result in beneficial impacts throughout most of the unit.

Cumulative effects associated with increased future motorized uses are expected to be minor, indirect, and adverse over the short and long term, similar to alternative A, because species sensitive to noise and human activity are not expected to regularly occur in high-use areas or immediately adjacent habitats during peak periods.

This alternative would not impair wildlife or wildlife habitat.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Banning PWC use within the Sandy Hook Unit would result in beneficial impacts on wildlife and wildlife habitat. Terrestrial and nearshore wildlife and habitats would be buffered from the adverse

effects of PWC use occurring beyond NPS boundaries, a beneficial impact. Restricting PWC access from shallow water habitat along the shore would also enhance the quality of essential fish habitats in these areas, a beneficial impact.

Cumulative Impacts. Cumulative impacts would be minor and adverse over the short and long term, similar to those described under alternative A, except there would be no contribution to these impacts from PWC use within the unit. Noise levels and activity associated with all motorized watercraft in high-use areas would likely adversely affect terrestrial wildlife, such as shorebirds and waterfowl, by causing alarm or flight responses. Species sensitive to noise and human activity are not expected to regularly occur in the high-use areas or immediately adjacent habitats during high-use periods.

Conclusion. Eliminating PWC use within the unit is expected to have beneficial impacts on wildlife species associated with nearshore and shoreline habitats. Eliminating PWC access to shallow water habitats along the unit would also enhance the quality of essential fish habitats in these areas, a beneficial impact.

Cumulative impacts are expected to be minor and adverse over the short and long term, similar to alternative A, because conventional watercraft use would continue but species sensitive to noise and human activity are not expected to regularly occur in the high-use areas or immediately adjacent habitats during peak periods.

This alternative would not impair wildlife or wildlife habitat.

AQUATIC FAUNA

BACKGROUND

As described for the Jamaica Bay Unit (see page 117), the full impact noise has on marine mammals is not completely understood, and the increase in human-made underwater noises could be a serious problem to their survival to the extent that it interferes with their methods of communication and hunting strategy (CCU 1998). Aquatic wildlife react to high levels of underwater noise in various ways, depending on the species, exposure period, intensities, and frequencies. PWC motors produce noise levels in the range of 70–102 dB per unit. Because of the way the craft are used, noise is usually produced at various intensities, and this continual change in loudness during normal use makes PWC-caused noise much more disturbing than the constant sounds of conventional motorboats (Bluewater Network 2001).

Recent studies have found that some mammals have stopped feeding and resting and became overly alert around increased human noise sources. Temporary noise disturbances may alter the swimming path, heart rate, or breathing of a marine mammal, while long-term noise disturbances may inhibit mammals from accessing critical feeding, nesting, and mating habitat (Acoustical Society of America 2000).

METHODOLOGY AND ASSUMPTIONS

Data on PWC-related noise effects on various species of marine mammals, reptiles, and fish are limited, and no specific monitoring has been done at the Sandy Hook Unit to quantify impacts. Therefore, personal observations of park staff were used to determine areas of concern. These areas were identified and assessed relative to the number of personal watercraft being used, their proximity during critical seasons of use, and the types of species present in sensitive areas.

Marine mammals that can be affected by increased noise levels around the Sandy Hook Unit include dolphins and seals. Kemp's ridley and loggerhead sea turtles have potential to occur in unit waters, primarily as juveniles, and diamondback terrapins are abundant in areas of the unit. In addition, more than 90 species of fish can be found in the waters around Sandy Hook Unit, and essential fish habitat occurs for several fish species.

Sound produced in air behaves differently than when produced underwater. The measurement scales for sound in water and in air have a difference of 63 dB between them. That is, a PWC engine producing 100 dB in air would produce 163 dB underwater (Cornell University n.d.). Also, sound travels 4.5 times faster in water than it does in air, and low frequency sounds travel farther underwater than high frequency sounds.

In this assessment the surface noise of two or more personal watercraft operating at the same time (when one unit produces 82 dB), and at a distance of 82 feet from the source, was calculated to be 85 dB (see discussion beginning on page 103). Underwater noise from the same source at a distance of 82 feet would be approximately 148 dB. The air and underwater noise calculated for the bayside and oceanside, based on PWC average numbers per hour estimated in the "PWC and Visitor Use Trends" section, is as follows:

Oceanside — 6 PWC / hour = 90 dB in the air and 153 dB underwater

Bayside — 10 PWC / hour = 92 dB in the air and 155 dB underwater

At 500 feet from PWC users (the distance from bathing beaches that PWC users must maintain under New Jersey State boating regulations) the following noise levels were calculated: *

Oceanside — 6 PWC / hour = 54 dB in the air and 117 dB underwater

Bayside — 10 PWC / hour = 56 dB in the air and 119 dB underwater

IMPACT ANALYSIS AREA

The impact analysis area for aquatic fauna includes the immediate locations of PWC use and the adjacent near shore environment where threatened, endangered, or sensitive species or habitat may occur. For purposes of this review, the impact analysis area is the entire Sandy Hook Unit.

IMPACT OF PWC NOISE ON AQUATIC FAUNA

The same impact thresholds as defined for wildlife and wildlife habitat (see page 286) were used for aquatic fauna.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use would continue in all waters designated in the "Superintendent's Compendium" and would be managed in accordance with all state regulatory requirements.

PWC-generated noise could affect the activities of marine reptiles, mammals, and fish in the unit. While these impacts might not cause mortality, they could adversely affect how marine organisms are

* The equation used was 20 × log (D1/D2), where D1 = the location to be calculated, and D2 = the distance of the known noise source.

distributed. Long-term effects under this alternative could include a reduction in species diversity in shallow water habitats of the unit. However, current PWC access restrictions and low levels of use would minimize the potential adverse effects associated with underwater noise. Potential future reductions in noise emissions (Sea-Doo 2001b; Yamaha Motor 2001) would also reduce adverse effects. Impacts to aquatic fauna are expected to be minor to moderate, indirect, and adverse over the short and long term.

Cumulative Impacts. Future increases in PWC use in and around the unit are expected; however, PWC access would continue to be restricted from the most sensitive areas of the unit. Future increases in PWC use, combined with probable increases in the use of other types of motorized watercraft, would increase the potential for adverse effects to marine fauna in the vicinity. However, conventional watercraft do not typically enter shallow water areas that are accessible to personal watercraft. New technologies are expected to help reduce noise from new personal watercraft and other conventional watercraft over time. However, an overall increase in the use of both new technology craft and existing watercraft would minimize the beneficial effects of new quieter craft. The types of impacts to aquatic fauna would be similar to those discussed for PWC use above. The intensity of adverse impacts would be minor to moderate and adverse over the short and long term.

Conclusion. Alternative A would have minor to moderate, indirect, adverse impacts on aquatic fauna in the Sandy Hook Unit over the short and long term. PWC-generated noise could affect the activities of marine reptiles, mammals, and fish in the area of the unit.

Cumulative impacts to wildlife and habitat would be minor to moderate, indirect, and adverse over the short and long term, similar to those discussed for PWC use alone.

This alternative would not impair aquatic fauna.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. PWC use would be restricted to two navigational channels around the Sandy Hook Unit and within 500 feet of the oceanside shoreline. As described for alternative A, PWC-generated noise could affect the activities of marine reptiles, mammals, and fish in the area, especially in and near the channels where PWC use was allowed. Fish populations could be impacted to the extent that the health of local populations could be affected or they could be displaced. While these conditions might not cause mortality, they could adversely affect how marine organisms are distributed. Restricting PWC use to the navigational channels and beyond 500 feet from the oceanside shore would reduce noise impacts in many other areas of the unit, a beneficial impact.

Increased PWC access restrictions, compared to alternative A, and low use in the vicinity of the unit would minimize the potential for adverse effects associated with underwater noise. Predicted future reductions in noise emissions from new marine watercraft could also reduce adverse effects. Impacts to aquatic fauna under alternative B would be minor, indirect, and adverse over the short and long term.

Cumulative Impacts. While PWC access would be restricted in most areas of the Sandy Hook Unit, future increases in PWC use adjacent to the unit, along with probable increases in the use of other types of motorized watercraft, could increase the potential for adverse effects to aquatic fauna. While new technologies could contribute to reduced noise emissions over time, an overall increase in the use of both new technology craft and existing watercraft would minimize the beneficial effects of new quieter craft. Impacts to aquatic fauna would be similar to those discussed under alternative A. The intensity of adverse impacts would be minor, indirect, and adverse over the short and long term.

Conclusion. Limiting PWC access within the Sandy Hook Unit would have minor, indirect, adverse impacts over the short and long term on marine reptiles, mammals, and fish in localized areas (in and near the navigational channels and within the 0.25-mile NPS oceanside boundary beyond 500 feet from shore).

Cumulative impacts to wildlife and habitat would be minor and indirect over the short and long term, similar to those discussed under alternative A.

This alternative would not impair aquatic fauna.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use would only be allowed in the Shrewsbury River Channel. PWC-generated noise could affect the activities of marine reptiles, mammals, and fish, especially in and near the navigational channel. While these conditions might not cause mortality, they could adversely affect how marine organisms are distributed. Fish populations could be affected to the extent that the health of local populations could be affected or they could be displaced. Restricting PWC use to the Shrewsbury River Channel would reduce noise impacts in many other areas of the unit, a beneficial impact.

Increased PWC access restrictions compared to alternative A and low use in the unit vicinity would minimize the potential for adverse effects associated with underwater noise. Potential future reductions in noise emissions could also reduce adverse impacts. Impacts to aquatic fauna under alternative C would be minor, indirect, and adverse over the short and long term, similar to alternative B.

Cumulative Impacts. While PWC access would be restricted to the Shrewsbury River Channel within the Sandy Hook Unit, future increases in PWC and other motorized watercraft uses would increase the potential for adverse effects to marine fauna in the area of the unit, similar to alternative A. New technologies could contribute to reduced noise emissions from new marine engines over time; however, an overall increase in use of both new technology craft and existing watercraft would minimize the beneficial effects of new quieter craft. Impacts would be minor and indirect over the short and long term.

Conclusion. Allowing PWC use only in the Shrewsbury River Channel would have minor, indirect, adverse impacts on aquatic fauna over the short and long term. Impacts would be localized to areas in and near the channel.

Cumulative impacts to wildlife and habitat would be minor, indirect, and adverse over the short and long term, similar to alternative A.

This alternative would not impair aquatic fauna.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Banning PWC use within the unit would result in beneficial impacts to marine reptiles, mammals, and fish throughout unit waters. Aquatic fauna would also benefit from having protected habitat away from nearby PWC use areas outside the unit.

Cumulative Impacts. Continued PWC use outside the unit, combined with probable increases in the use of other types of motorized watercraft, could increase the potential for adverse effects to aquatic fauna in

and near the Sandy Hook Unit. Cumulative impacts would be minor, indirect, and adverse over the short and long term, similar to alternative A.

Conclusion. Banning PWC use within the Sandy Hook Unit would result in beneficial impacts to aquatic fauna.

Cumulative impacts would be minor, indirect, and adverse over the short and long term, similar to alternative A.

This alternative would not impair aquatic fauna.

THREATENED, ENDANGERED, OR SPECIAL CONCERN SPECIES

GUIDING REGULATIONS AND POLICIES

Guiding regulations and policies would be the same as for the Jamaica Bay Unit (see page 121). An analysis of the potential impacts to each species listed with the potential to occur in the area of the Sandy Hook Unit is included in this section. This environmental assessment will be submitted to the U.S. Fish and Wildlife Service and the National Marine Fisheries Service for review. If no species is likely to be adversely affected, and if the agencies concur with such findings, no further consultation will be required.

The NPS *Management Policies 2001* state that potential effects of agency actions will also be considered on state or locally listed species. The National Park Service is required to control access to critical habitat of such species, and to perpetuate the natural distribution and abundance of these species and the ecosystems upon which they depend.

Informal consultation was initiated with the U.S. Fish and Wildlife Service, New Jersey Field Office, and with the National Marine Fisheries Service during the internal scoping period for this project. A list of species that are known to occur or may occur within or adjacent to PWC use areas within the boundaries of the Sandy Hook Unit was requested. Responses from the agencies are included in appendix B.

METHODOLOGIES AND ASSUMPTIONS

The same methodologies and assumptions used for the Jamaica Bay Unit were used for the Sandy Hook Unit (see page 122). Identification of state and federally listed species was accomplished through discussions with park staff, and informal consultation with U.S. Fish and Wildlife Service, New Jersey Field Office, the National Marine Fisheries Service, and the New Jersey Natural Heritage Program (see appendix B).

Documentation of the occurrence and locations of federal and state rare, threatened and endangered species at the Sandy Hook Unit was provided by the National Park Service through several studies and surveys that have been conducted. Determination of the potential for adverse effects to rare, threatened, or endangered species was based on the locations of sensitive species with respect to PWC use and the potential for adverse effects. All known federally listed species that occur in the unit are discussed in the analysis. Only state-listed species that occur in the vicinity of the PWC use areas, or that have potential to be affected by PWC use, are discussed in the analysis.

Federally endangered wildlife species documented to occur in the area include the Kemp's ridley sea turtle, leatherback sea turtle, northern right whale, humpback whale, and fin whale. Federally listed

threatened wildlife species documented to occur in the area include the piping plover, loggerhead sea turtle, and northeastern beach tiger beetle.

IMPACT ANALYSIS AREA

The impact analysis area includes the immediate locations of PWC use and the adjacent nearshore environment where threatened, endangered, or sensitive species or habitat may occur.

IMPACT OF PWC USE ON SUCH SPECIES

Impact thresholds are the same as those defined for the Jamaica Bay Unit and are highlighted below.

Thresholds for Impacts on Threatened, Endangered, or Special Concern Species

No effect: A proposed action would not affect a listed species or designated critical habitat.

May affect / not likely to adversely affect: Effects on special status species would be discountable (i.e., extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated) or completely beneficial.

May affect / likely to adversely affect: When an adverse effect to a listed species might occur as a direct or indirect result of proposed actions and the effect would either not be discountable or completely beneficial.

Is likely to jeopardize proposed species / adversely modify proposed critical habitat (impairment): The appropriate conclusion when the National Park Service, U.S. Fish and Wildlife Service, or the National Marine Fisheries Service identifies situations in which PWC use could jeopardize the continued existence of a proposed species or adversely modify critical habitat to a species within or outside park boundaries.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use would continue in all waters designated in the "Superintendent's Compendium" and would be managed in accordance with all state regulatory requirements.

Piping plovers occur in five beach-nesting colonies on the ocean beach at Sandy Hook. Observations indicate that piping plovers and other shorebirds can show disturbance behavior and may be displaced when personal watercraft come within 200–300 feet of the shore. Piping plovers and other bird species must maximize their foraging when certain invertebrate prey species are available. For birds raising offspring or building up fat reserves for migration, being chased from feeding areas can affect their potential for survival, especially when these disturbances continue over several days. For terns, which rest on beaches when not feeding, repeated disturbance could lead to exhaustion, potentially affecting the bird's ability to survive.

PWC access restrictions from within 300 feet of the ocean shoreline would minimize the potential for adverse effects to piping plovers and other sensitive shorebirds in beach habitats. Alternative A is not likely to adversely affect piping plover or other sensitive avian species that use the unit.

The state endangered least tern and black skimmer both nest in nearshore habitats associated with the Sandy Hook Unit. Least terns occur in association with piping plovers in the five beach bird-nesting sites. Black skimmers have been documented by the New Jersey Natural Heritage Program to occur at one location in the unit in recent years. Both species forage in the ocean and backbay areas and use beach areas for resting. Impacts similar to those discussed for piping plovers could affect least terns and black

skimmers using the Sandy Hook Unit. Restricting PWC access within 300 feet of the ocean shoreline would minimize the potential for adverse impacts to least terns or black skimmers in the vicinity. Limited access for PWC users to nearshore habitats on the bayside could adversely affect foraging activities of least terns or black skimmers in backbay areas. Impacts are not expected to adversely affect the species due to limited PWC use in these areas.

The state threatened osprey also occurs on the Sandy Hook Unit and has been documented by the New Jersey Natural Heritage Program to nest at locations in Spermaceti Cove. PWC access restrictions to Spermaceti Cove and much of the rest of the backbay shoreline areas would minimize the potential for adverse effects to ospreys associated with noise or rapid approaches. PWC use in backbay areas of the unit has the potential to adversely affect foraging activities of osprey in these areas. Impacts are not expected to adversely affect the species due to limited PWC use in these areas.

Three species of sea turtles have been documented in the area around the Sandy Hook Unit. Potential for direct impacts to Kemp's ridley and loggerhead sea turtles are expected to be minor because of limited PWC access and use. Sea turtles are expected to avoid areas where PWC use occurs due to underwater noise and disturbance. Restricted PWC access to Horseshoe Cove would minimize the potential for impacts to young Kemp's ridley sea turtles that feed in the area. Leatherback sea turtles are not likely to be adversely affected by PWC use because the turtle does not occur in estuaries or backbay areas. Alternative A is not likely to adversely affect federally listed sea turtles documented to occur in the area.

Federally protected whales documented to occur off the coast of New York and New Jersey, including the endangered northern right whale, humpback whale, and fin whale, are not expected to be affected by PWC use at the Sandy Hook Unit. The whales occur in areas outside the NPS jurisdictional boundary.

Northeastern tiger beetles occur at a few locations on the Sandy Hook Unit. The U.S. Fish and Wildlife Service and National Park Service are experimenting with reintroducing the northeastern tiger beetle at two locations at the northern tip of Sandy Hook. Primary threats to the beetle include habitat disturbance and destruction from development, beach stabilization activities, and beach recreational activities, including pedestrian traffic, all of which have potential to impact larvae. Other impacts may occur associated with spills of oil or other contaminants. Potential impacts from PWC use would be associated primarily with foot traffic in areas where PWC users access shore areas. However, PWC-associated foot traffic would not be expected to affect the northeastern tiger beetles due to the PWC use restrictions along Sandy Hook shorelines.

Because of restricted access to shorelines, a relative minor degree of disturbance caused by foot traffic, and the minor extent of ground covered, it is unlikely that overland traffic associated with PWC landings would impact the seabeach amaranth. Limited PWC access to shorelines would minimize the potential for related impacts. The state endangered seabeach knotweed, which occurs in habitats similar to the sea beach amaranth, is also not expected to be adversely affected as a result of PWC use.

In summary, alternative A is not likely to adversely affect federally or state listed threatened or endangered species in the Sandy Hook Unit.

Cumulative Impacts. PWC access is currently restricted from most areas of the Sandy Hook Unit. Future PWC use increases in and adjacent to the unit, combined with probable increases in other types of motorized watercraft, could increase the potential for adverse effects to sensitive species. Conventional motorized watercraft would still have access to areas restricted to PWC use. Noise levels and activity associated with conventional motorized watercraft in nearshore areas could affect sensitive species, such as listed shorebirds using the areas by causing alarm or flight responses or avoidance responses. However, restricted access and no-wake speed limits in nearshore areas and limited access of conventional motor-

ized watercraft to shallow and nearshore areas would minimize the potential for adverse cumulative effects to sensitive species. Cumulative impacts would be similar to those discussed for PWC use alone. Cumulative impacts under alternative A are not likely to adversely affect special status species.

Conclusion. Threatened, endangered, or special concern species in the area of Sandy Hook Unit are not likely to be adversely affected by PWC use under alternative A because use is restricted from the most sensitive areas of the unit.

Cumulative impacts are not likely to affect threatened, endangered, or special concern species.

This alternative would not impair threatened, endangered, or sensitive species.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. PWC use would only be allowed in the Shrewsbury River and Sandy Hook Channels and beyond 500 feet along the oceanside shoreline. These restrictions would minimize the potential for adverse impacts to special status species, and beneficial effects would occur for species in many of the nearshore and shoreline habitats, which would be buffered from PWC use. Any adverse effects would be similar to those discussed for alternative A, but chances of disturbances would be reduced.

Closing all ocean beaches to PWC use would minimize the potential for disturbance of special status shorebirds nesting, foraging, or resting in these areas. Restricting PWC access from shallow water habitat would also enhance the quality of habitat for sea turtles. Alternative B is not likely to adversely affect special status species that occur in the unit.

Cumulative Impacts. Future increases in PWC use in the area are expected, together with probable increases in other types of motorized watercraft, which would be expected to increase the potential for adverse effects to special status species. Cumulative impacts would be similar to those discussed under alternative A. Threatened, endangered, or special concern species are not likely to be adversely affected.

Conclusion. Alternative B is not likely to adversely affect special status species that occur in the Sandy Hook Unit. Any adverse effects that occurred would be similar to those discussed in alternative A. Restricting PWC use from all nearshore habitats, except in the two navigational channels, would minimize the potential for adverse impacts in nearshore and shoreline areas.

Cumulative impacts are expected to be similar to those discussed under alternative A and are not likely to adversely affect special status species.

This alternative would not impair threatened, endangered, or sensitive species.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use would only be allowed in the Shrewsbury River Channel, which would minimize the potential for adverse impacts to special status species occurring in the unit. Impacts to species in nearshore and shoreline areas would be beneficial since most of these areas would be unaffected by PWC use. Any adverse effects that occurred would be similar to those discussed for alternative A, but there would be fewer chances of disturbance under alternative C.

Closing all ocean beaches to PWC use within the unit would minimize the potential for disturbance of special status shorebirds nesting, foraging, or resting along the ocean beaches. Restricting PWC access from shallow water habitat would also enhance the quality habitat for sea turtles that may occur in the area. Alternative C is not likely to adversely affect special status species that occur in the Sandy Hook Unit.

Cumulative Impacts. Future PWC use increases in adjacent areas, along with probable increases in other types of motorized watercraft use, would increase the potential for adverse effects to special status species. Cumulative impacts are expected to be similar to those discussed under alternative A and are not likely to adversely affect special status species.

Conclusion. Alternative C is not likely to adversely affect threatened, endangered, or special concern species that occur in the Sandy Hook Unit. Restricting PWC use from all nearshore habitats of the unit, excluding the Shrewsbury River Channel, would minimize the potential for adverse impacts to special status species.

Cumulative impacts are expected to be similar to those discussed under alternative A and are not likely to adversely affect special status species.

This alternative would not impair threatened, endangered, or sensitive species.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Banning PWC use within the unit would result in beneficial impacts on special status species because terrestrial and nearshore wildlife and habitats would be buffered from the adverse effects of PWC use occurring outside NPS boundaries. Restricting PWC access from shallow water habitat would also enhance the quality of habitat for sea turtles that may occur in the area. No adverse impacts are expected on threatened, endangered, or special concern species.

Cumulative Impacts. Cumulative impacts to special status species are expected to be similar to those discussed under alternative A and are not likely to adversely affect threatened, endangered, or special concern species. There would be no contribution to potential impacts from PWC use within the Sandy Hook Unit.

Conclusion. Eliminating PWC use within the unit would have beneficial impacts on threatened, endangered, or special concern species occurring in the unit. No adverse impacts are expected on threatened, endangered, or special concern species.

Cumulative impacts are expected to be similar to those discussed under alternative A and are not likely to adversely affect special status species.

This alternative would not impair threatened, endangered, or sensitive species.

SHORELINE VEGETATION AND WETLAND HABITATS

METHODOLOGY AND ASSUMPTIONS

Personal watercraft have the potential to impact shoreline vegetation as a result of operating in shallow waters or adjacent to wetland habitats. Direct impacts resulting from collision or mechanical removal can

occur. Potential indirect impacts include the deposition of suspended sediments on aquatic vegetation or the modification of substrates. Impacts to shoreline vegetation associated with foot traffic adjacent to landing areas can also occur.

As described for the Jamaica Bay Unit, primary steps in assessing impacts were to determine (1) the occurrence and location of vegetation in areas likely to be affected by management actions, (2) current and future use and distribution of personal watercraft by alternative, (3) habitat impact or alteration caused by the alternatives, and (4) disturbance potential of the actions and the potential to affect shoreline vegetation as a result of PWC use. The information in this analysis was obtained through best professional judgment of park staff and experts in the field, and by conducting a literature review.

IMPACT ANALYSIS AREA

The impact analysis area includes the immediate locations of PWC use and the adjacent nearshore environment of the Sandy Hook Unit.

IMPACTS ON SHORELINE VEGETATION AND WETLAND HABITATS FROM PWC USE

The same impact thresholds as defined for the Jamaica Bay Unit were used, as highlighted in the text box.

Thresholds for Impacts on Shoreline Vegetation and Wetland Habitats

Negligible: No shoreline vegetation or wetland habitats are present in areas likely to be accessed by personal watercraft; no impacts or impacts with only temporary effects are expected.

Minor: Shoreline vegetation or wetland habitats are present, but only in low numbers. Occasional impacts to species or communities are expected, but with no impacts or limited impacts on the continued existence of the species or viable, functioning communities within the unit.

Moderate: Shoreline vegetation or wetland habitats are present in areas accessible by personal watercraft. Direct loss of vegetation or other effects are expected on an occasional basis, but are not expected to threaten the continued existence of the species or viable, functioning communities in the unit.

Major: Shoreline vegetation or wetland habitats are present in relatively high numbers in areas accessible by personal watercraft. Direct loss of vegetation or other effects are expected on a regular basis and could threaten the continued survival of species or communities of species in the park.

Impairment: PWC use would contribute substantially to the deterioration of shoreline vegetation or wetland habitats to the extent that the park's shoreline would no longer function as a natural system. In addition, these adverse major impacts to park resources and values would

- contribute to deterioration of these resources to the extent that the park's purpose could not be fulfilled as established in its enabling legislation;
- affect resources key to the park's natural or cultural integrity or opportunities for enjoyment; or
- affect the resource whose conservation is identified as a goal in the park's *General Management Plan* or other park planning documents.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use would continue in all waters designated in the "Superintendent's Compendium" and would be managed in accordance with all state regulatory requirements. Direct impacts to shoreline vegetation could occur around landing areas as a result of trampling by foot traffic. Impacts would be

minor over the short and long term because of limited access by PWC users to shoreline areas in the Sandy Hook Unit. Direct impacts to wetland habitats could be expected in areas where PWC users did access shallow water habitats fringed by marsh habitats in backbay areas. Shoreline vegetation associated with low salt marsh habitats could be affected by PWC users accessing shallow inter-tidal zones, causing plants to be removed or damaged by collision. Indirect impacts due to the modification of substrates (i.e., scouring) associated with PWC operation in shallow water habitats could also occur. However, PWC users tend to avoid shallow water areas to prevent damage to their craft. Adverse effects are expected to be minor and adverse over the short and long term due to limited PWC access in nearshore habitats in the Sandy Hook Unit.

Cumulative Impacts. Future increases in PWC use around the Sandy Hook Unit, combined with probable increases in the use of other types of watercraft, could increase the potential for adverse effects to shoreline vegetation and wetland habitats as a result of conventional motorized watercraft access to areas closed to personal watercraft. However, impacts are expected to be minor because access by most conventional watercraft to shallow water areas is limited.

Conclusion. Direct and indirect impacts to shoreline vegetation and wetland habitats would be minor and adverse over the short and long term because PWC access to shoreline areas would be limited, and associated foot traffic would be minimal.

Cumulative impacts to shoreline vegetation and wetland habitats could occur as a result of continued access by PWC and conventional motorized watercraft users. Direct and indirect impacts would be minor and adverse over the short and long term because access to shallow water areas is limited.

This alternative would not impair shoreline vegetation or wetland habitats.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. PWC use would be restricted to the navigational channels around Sandy Hook and within 500 feet of the shoreline on the oceanside. Adverse impacts to shoreline and tidal wetland vegetation and habitats are not expected under alternative B. Closing all shoreline and nearshore areas in the unit to PWC use would minimize the potential for adverse effects, resulting in beneficial impacts.

Cumulative Impacts. Similar to alternative A, future increases in access by conventional motorized watercraft to shoreline vegetation and wetland habitats areas could result in adverse effects; access to these areas by PWC users would be restricted. Cumulative impacts would be minor and adverse over the short and long term due to the limited access by conventional watercraft to shallow water areas.

Conclusion. Impacts to shoreline vegetation and wetland habitats as a result of restricting PWC use would be beneficial because closing all shoreline and nearshore areas to personal watercraft would limit visitor access.

Cumulative impacts would be minor, direct and indirect, and adverse over the short and long term, similar to alternative A, as a result of continued limited access by conventional motorized watercraft to shallow water habitats and associated foot traffic around landing areas.

This alternative would not impair shoreline vegetation or wetland habitats.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use would be restricted to the Shrewsbury River Channel. Adverse impacts to shoreline vegetation and wetland habitats would be similar to those for alternative B. Closing all shoreline and nearshore areas to PWC use would minimize the potential for adverse effects, thus affording these areas greater protection. Impacts would be beneficial.

Cumulative Impacts. Cumulative impacts would be similar to those described for alternative A because conventional watercraft would continue to have access to all nearshore areas closed to personal watercraft. Increases in other watercraft use would be expected. Potential impacts would be minor because conventional watercraft tend to avoid shallow water areas.

Conclusion. Impacts to shoreline and tidal wetland vegetation and habitats would be beneficial because all shoreline and nearshore areas would be closed to PWC use.

Cumulative impacts would be minor, direct and indirect, and adverse over the short and long term, similar to alternative A, because of continued, limited access to shallow water areas by conventional motorized watercraft and continued foot traffic around landing areas.

This alternative would not impair shoreline vegetation or wetland habitats.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Discontinuing all PWC use in the Sandy Hook Unit would result in beneficial impacts to shoreline vegetation and wetland habitats because the potential for adverse effects associated with PWC use would be eliminated.

Cumulative Impacts. While PWC use would be banned within the unit, use by other motorized watercraft is projected to increase, with a greater potential for adverse effects to shoreline vegetation and wetland habitats. Impacts are expected to be minor due to limited access by conventional watercraft to shallow water areas, similar to alternative A.

Conclusion. Impacts to shoreline vegetation and wetland habitats would be beneficial as a result of restricting PWC use and eliminating the potential for adverse impacts associated with their operation.

Minor, direct and indirect, adverse cumulative impacts to shoreline vegetation and wetland habitats are expected over the short and long term, similar to alternative A, as a result of continued access by conventional watercraft and associated foot traffic around landing areas. However, access to shallow water habitats is limited.

This alternative would not impair shoreline vegetation or wetland habitats.

VISITOR USE AND EXPERIENCE

GUIDING REGULATIONS AND POLICIES

Guiding regulations and policies for visitor use and experience would be the same as described for the Jamaica Bay Unit. Forms of enjoyment should be uniquely suited and appropriate to the natural and cultural resources found in the unit. The broader spectrum of recreational needs and demands should be met by local, state, and other federal agencies; private industry; and nongovernmental organizations.

Unless mandated by statute, the National Park Service will not allow visitors to conduct activities that would impair park resources or values, create an unsafe or unhealthful environment for other visitors or employees, or be contrary to the purposes for which the park was established. Furthermore, activities should not unreasonably interfere with the atmosphere of peace and tranquility; the natural soundscape in natural locations within the park; NPS interpretive, visitor service, administrative, or other activities; NPS concessioner or contractor operations or services; or other existing, appropriate park uses.

Part of the purpose of the Sandy Hook Unit is to offer opportunities for public access, use, and enjoyment. One of the recreation area's goals is to ensure that "visitors safely enjoy and are satisfied with the availability, accessibility, diversity, and quality of park facilities, services, and appropriate recreational opportunities." To achieve this, the following long-term goal was identified in the recreation area's *Strategic Plan*:

> *Visitor Satisfaction* — By September 30, 2005, 88% of visitors to Gateway National Recreation Area are satisfied with appropriate park facilities, services and recreational opportunities.

METHODOLOGIES AND ASSUMPTIONS

The purpose of this impact analysis is to determine if PWC use at the Sandy Hook Unit is compatible or in conflict with the purposes of the park, visitor experience goals, and the direction provided by the NPS *Management Policies*. Thus, these policies and goals were integrated into the impact thresholds.

As described for the Jamaica Bay Unit, impacts were determined based on the current level of PWC use throughout the unit, other recreational activities, and the types of visitor experiences that are proposed in these locations. Visitor surveys (if available) and staff observations were also evaluated to determine visitor attitudes and satisfaction in areas where personal watercraft are encountered.

Data suggest that the vast majority of visitors are satisfied with their current experiences. The potential for change in visitor experiences was evaluated by identifying projected increases or decreases in both PWC and other visitor uses, and by determining whether these projected changes would affect the desired visitor experience and result in greater safety concerns or additional user conflicts.

IMPACT ANALYSIS AREA

The impact analysis area is the Sandy Hook Unit's jurisdictional waters and nearshore areas.

IMPACT OF PWC USE ON VISITOR EXPERIENCE GOALS

The same thresholds as defined for the Jamaica Bay Unit were used, as highlighted in the text box.

Thresholds for Impacts on Visitor Experience Goals

Negligible: Visitors would not likely be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources.

Minor: Visitors would likely be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources; however, the changes in visitor uses and experiences would be slight and likely short term. Other areas in the park would remain available for similar visitor experiences and uses without derogation of park resources and values.

Moderate: Visitors would be aware of the effects associated with changes proposed for visitor use and enjoyment of park resources. Changes in visitor uses and experiences would be readily apparent and likely long term. Other areas in the park would remain available for similar visitor experiences and uses without derogation of park resources and values, but visitor satisfaction could be measurably affected (either beneficially or adversely). Some visitors who desire to continue their use and enjoyment of the activity/visitor experience would be required to pursue their choices in other available local or regional areas.

Major: Visitors would be highly aware of the effects associated with changes proposed for visitor use and enjoyment of park resources. Changes in visitor uses and experiences would be readily apparent and long term. The proposed change in visitor use and experience would preclude future generations of some visitors to enjoy park resources and values. Some visitors who desire to continue their use and enjoyment of the activity/visitor experience would be required to pursue their choice in other available local or regional areas.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use would continue to be prohibited in Horseshoe and Spermaceti Coves and within 300 feet of the oceanside shoreline (and 500 feet in the vicinity of swimming beaches). The New Jersey State boating regulations would continue to be enforced.

Impacts on PWC Users — The continuation of PWC use would have little or no noticeable change in the experiences of these visitors or their level of satisfaction since access to unit jurisdictional waters would still exist, and PWC activity inside the park boundary would remain unchanged from its current level. Impacts would be negligible.

Impacts on Other Boaters — Other boaters at the Sandy Hook Unit would continue to interact with PWC operators the same as they do now. Alternative A would have little adverse effect on the experiences of other boaters.

Impacts on Other Visitors — The visitor population at the Sandy Hook Unit is dispersed throughout the park, and use is varied. The number of personal watercraft in the unit is expected to increase between 2002 and 2012 by only one. The increased amount of contact would not be noticeable when compared to existing conditions. Effects to park visitors would be negligible during the off-season or nonpeak hours (weekdays) because of reduced PWC use; in addition, impacts to visitor experiences would remain negligible to minor adverse due to the limited access by PWC users.

Based on this analysis, PWC activity under alternative A would have negligible to minor adverse impacts on the experience of swimmers, hikers, and other visitors to the Sandy Hook Unit, depending on seasonal variations in visitor activity.

Cumulative Impacts. The location and number of other motorized boats and their proximity to other visitors would continue to affect experiences. No change to other unit visitors and activities would result under this alternative, and no other actions are currently planned that would affect PWC use or visitor experiences within the unit. Some conflicts between PWC users and anglers and other boaters could

occur. Cumulative impacts would be negligible, with little noticeable change from existing conditions. Most visitors would continue to be satisfied with their experiences at the Sandy Hook Unit.

Conclusion. Continued PWC use at the Sandy Hook Unit would result in negligible to minor adverse impacts on visitor experiences, depending on the location and seasonal variations in visitor use. There would be minor adverse impacts between PWC users, swimmers, birdwatchers, and anglers during peak summer months. Alternative A would partially meet the park's strategic goal for improved visitor satisfaction (in the case of PWC users).

Cumulative impacts related to all other motorized watercraft and other visitor uses would continue to result in negligible impacts, since there would be little noticeable change in visitor experiences. Most visitors would continue to be satisfied with their experiences at the Sandy Hook Unit.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. This alternative would implement geographic restrictions on PWC use in the unit, permitting use only in the Shrewsbury River and Sandy Hook Channels, and beyond 500 feet from the oceanside shoreline. The New Jersey State boating regulations would continue to be enforced.

Impacts on PWC Users — Due to existing PWC use restrictions, operators would notice little or no change in their experiences or level of satisfaction, since restrictions would allow for continued access to certain areas, and PWC activity outside the NPS boundary would remain unchanged. PWC users would experience negligible to minor adverse impacts with the closure of certain areas to personal watercraft.

Impacts on Other Boaters — Other boaters at the Sandy Hook Unit would continue to interact with PWC users, who would be limited to the navigational channels in the unit. Due to existing restrictions on PWC use in the Sandy Hook Unit, other boaters would notice little or no change in their experiences or level of satisfaction because the few PWC users who currently use the park would primarily use the channels. Alternative B would have little adverse effect on the experiences of other boaters.

Impacts on Other Visitors — Other visitors would continue to interact with PWC operators; however, interactions would be limited. The effects on park visitors would be beneficial, restricting PWC use away from any land-based activities within the unit.

Based on this analysis, PWC activity as defined under alternative B would have a negligible adverse impact on the experience of PWC users but beneficial impacts to other boaters and visitors to Sandy Hook Unit.

Cumulative Impacts. Cumulative impacts would be similar to those described for alternative A except that the potential for PWC use to affect visitors would be reduced in large areas, although motorized boats would continue to operate within the unit boundary. Cumulative impacts on visitor experiences would be negligible because motorized boats would still be allowed in areas closed to PWC use. Most visitors would continue to be satisfied with their experiences at Sandy Hook Unit.

Conclusion. Restricting PWC use to certain areas would result in beneficial impacts to most visitor experiences. PWC users would experience negligible to minor adverse impacts with the closure of certain areas to use. Alternative B would partially meet the park's strategic goal for improved visitor satisfaction (in the case of other boaters and non-boating visitors) by restricting PWC use to specific areas of the unit.

Cumulative impacts would be similar to those described for alternative A, with little noticeable change in overall experiences. Most visitors would continue to be satisfied with their experiences at the unit, with a slightly greater benefit for visitors in areas adjacent to where PWC use was restricted.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. This alternative would be the same as alternative B except that PWC use would only be allowed in the Shrewsbury River Channel.

Impacts on PWC Users — Impacts to PWC users would be similar to alternative B except personal watercraft would only be allowed in the Shrewsbury River Channel. Impacts would be short and long term and minor to moderate because there are numerous other opportunities to enjoy the unit; also, other areas would remain available to PWC users outside NPS boundaries.

Impacts on Other Boaters — Interactions between other boaters and PWC operators would continue on a limited basis within the Shrewsbury River Channel, but potential impacts to visitor experiences would be reduced because of restrictions in other use areas. Based on this analysis, alternative C would have negligible adverse impacts in the Shrewsbury River Channel and beneficial impacts elsewhere.

Impacts on Other Visitors — Other visitors would have limited contact with PWC operators. The effects on park visitors would be beneficial because PWC users would be restricted from landing.

Based on this analysis, PWC activity as defined under alternative C would have minor to moderate adverse impacts on the experiences of PWC users but beneficial impacts to other boaters and visitors.

Cumulative Impacts. Cumulative impacts would be similar to those described for alternative A, with little noticeable change in overall experiences. The location and number of other motorized watercraft and their proximity to other visitors would affect visitor experiences within the unit; however, the potential for PWC use to affect visitor experiences would be limited. Cumulative impacts on all PWC users would be negligible to minor because they might not be aware of the proposed changes, and other areas outside the unit would remain open to PWC use. Impacts on other boaters, as well as all visitors, would be beneficial within the unit and negligible adverse outside the unit, with the potential for increased congestion in the waterways. Most visitors would continue to be satisfied with their experiences at the Sandy Hook Unit.

Conclusion. Alternative C would have beneficial impacts to the experiences of visitors other than PWC users. There would be minor to moderate adverse impacts to PWC users as a consequence of closing most areas of the unit to PWC use other than the Shrewsbury River Channel.

Cumulative impacts would be similar to those described for alternative A, with little noticeable change in overall experiences. Cumulative impacts on all PWC users would be negligible to minor because they might not be aware of the proposed changes, and other areas outside the unit would remain open to PWC use. Impacts on other boaters, as well as other visitors onshore, would be beneficial within the unit and negligible adverse outside of the unit, with potential for increased congestion in the waterways. Most visitors would continue to be satisfied with their experiences at the Sandy Hook Unit.

Impacts of the No-Action Alternative — No PWC Use

Analysis. PWC use would be discontinued within the unit.

Impacts on PWC Users — Because there are numerous other opportunities for visitors to enjoy the unit and other areas are still available to PWC use outside NPS boundaries, impacts would be minor to moderate and adverse. Changes to visitor experiences would be long term, but visitors would have opportunities to pursue this activity in other areas outside the unit.

Impacts on Other Boaters — Interactions between other boaters and PWC operators would be eliminated within the unit, resulting in a beneficial impact.

Impacts on Other Visitors — Other visitors would have limited contact with PWC operators. The effects on park visitors would be beneficial.

Cumulative Impacts. Cumulative impacts would be similar to those described for alternative A. The location and number of other motorized boats and their proximity to other visitors would continue to affect visitor experiences within the unit; however, the potential for PWC use to affect visitor experiences would be eliminated. Cumulative impacts on all PWC users would be negligible to minor because they might not be aware of the proposed changes, and other areas outside the unit would remain open to PWC use. Impacts on other boaters, as well as all visitors, would be beneficial within the unit and negligible adverse outside of the unit, with potential increases in congestion on the waterways. Most visitors would continue to be satisfied with their experiences at the Sandy Hook Unit.

Conclusion. Impacts on most visitors would be beneficial. Impacts on PWC users would be minor to moderate and adverse over the short and long term. Other areas outside NPS jurisdictional waters would still be available for PWC use.

Impacts on all other boaters and visitors would be similar to alternative A since there would be little noticeable change in overall visitor experiences. Banning PWC use within NPS jurisdictional waters could force PWC users to other regional areas, where the additional use could affect other recreationists (e.g., other boaters), creating a minor adverse cumulative impact in those areas. Most visitors would continue to be satisfied with their experiences at the unit.

VISITOR SAFETY

GUIDING REGULATIONS AND POLICIES

As described for the Jamaica Bay Unit, the NPS *Management Policies 2001* state, "While recognizing that there are limitations on its capability to totally eliminate all hazards, the Service and its concessioners, contractors, and cooperators will seek to provide a safe and healthful environment for visitors and employees" (sec. 8.2.5.1). Further, the National Park Service will strive to protect human life and provide for injury-free visits (sec. 8.2.5). *Director's Order #9: Law Enforcement Program* (NPS 2000d), in conjunction with *Reference Manual #9: Law Enforcement*, establishes and defines standards and procedures for NPS law enforcement.

In New Jersey, PWC users are required to comply with all federal boating laws and regulations. In addition, the owner/operator is required to comply with additional regulations and/or laws specific to the state (see "Affected Environment," page 256). The National Park Service, within the boundaries of the Sandy Hook Unit, has jurisdiction over state waters. Based on concurrent jurisdiction agreements, the U.S. Park Police enforce boating regulations within the unit.

Part of the purpose of the Sandy Hook Unit is to offer opportunities for public access, use, and enjoyment. The following long-term goal for visitor safety is defined in the park's *Strategic Plan:*

Visitor Safety — By September 30, 2005, the Gateway National Recreation Area visitor accident/incident rate will be reduced from the FY1992–FY1996 baseline of 5.53 per 100,000 visitor days to at or below 4.0 per 100,000 visitor days (a 28% reduction).

METHODOLOGY AND ASSUMPTIONS

The methodology for assessing impacts on visitor safety is similar to that described under "Visitor Use and Experience." The potential visitor-related impacts attributable to personal watercraft — a higher rate of accidents than other watercraft and conflicts with other park users — could potentially affect the mandate to provide for injury-free visits. As described in "The Affected Environment," New Jersey State PWC regulations are enforced within the unit. These regulations govern PWC activities near the shore, the timing of PWC use, and the age and educational requirements of operators.

IMPACT ANALYSIS AREA

The impact analysis area is the Sandy Hook Unit's jurisdictional waters, divided into bayside and oceanside by a line going due north from the northernmost point of Sandy Hook

IMPACT TO VISITOR SAFETY FROM PWC USE

The impact intensities for visitor safety are highlighted below. As described for the Jamaica Bay Unit, at the point where impacts to visitor safety became moderate, it is assumed that current visitor satisfaction and safety levels would begin to decline and that some of the recreation area's long-term visitor goals would not be achieved.

Thresholds for Impacts to Visitor Safety

Negligible: The impact to visitor safety would not be measurable or perceptible.

Minor: The impact to visitor safety would be measurable or perceptible, but it would be limited to a relatively small number of visitors at localized areas. Impacts to visitor safety might be realized through a minor increase in the potential for visitor conflicts in current accident areas.

Moderate: The impact to visitor safety would be sufficient to cause a change in accident rates at existing low accident locations or to create the potential for additional visitor conflicts in areas that currently do not exhibit noticeable accident trends.

Major: The impact to visitor safety would be substantial. Accident rates in areas usually limited to low accident potential are expected to substantially increase in the short and long term.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use would continue as defined in the "Superintendent's Compendium." The New Jersey State boating regulations would continue to be enforced. The capability of NPS staff to enforce boating laws is directly dependent on the presence of patrols in use areas.

Conflicts between PWC Users and Swimmers — Potential accidents involving PWC users and swimmers could occur in nearshore waters; however, most swimmers do not venture farther than 200 feet from

shore, and New Jersey State boating regulations prohibit PWC use within 500 feet of bathing beaches. With projected future increases in both visitors and PWC use, the potential adverse impacts to swimmers would be negligible.

Conflicts between Personal Watercraft and Other Boaters — There would be potential for PWC users to have accidents with other boaters (canoeists, kayakers, sailboaters, and motorboaters). The high-speed capabilities of personal watercraft pose threats to the safety of PWC operators and to boaters in vessels that are slower to turn, such as sailboats, canoes, and kayaks. Because of the degree of use in waters around Sandy Hook, the potential for accidents with boaters is considered minor, and this potential would increase with greater use.

Cumulative Impacts. Depending on the type of water-oriented activity and its location, impacts to visitor safety could range from negligible to minor. As the number of motorized watercraft increased, the potential for accidents would also escalate over the next 10 years as congestion increased.

Conclusion. While the number of PWC users is not expected to increase substantially over the next 10 years, conflicts between PWC users and other water recreationists (swimmers and boaters) would result in negligible to minor adverse impacts as use increased for all activities.

On a cumulative basis impacts on visitor safety would be negligible to minor over the next 10 years, depending on the type of water-oriented activity and its location.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. Alternative B would result in impacts similar to those described under alternative A, but the potential for impacts to visitor safety resulting from PWC use would be eliminated in large portions of the unit's waters.

Conflicts between PWC Users and Swimmers — Swimmers would continue to benefit from restrictions on PWC use.

Conflicts between PWC Users and Other Boaters — The potential for PWC users to have accidents with other boaters (canoeists, kayakers, sailboaters, and motorboaters) would be restricted to navigational channels and beyond 500 feet from the oceanside shoreline. Because of the degree of use in waters around Sandy Hook, the potential for accidents with boaters is considered minor, and this potential would increase with greater use.

Cumulative Impacts. Cumulative impacts would be similar to those described for alternative A, but with beneficial impacts related to restricting PWC use to certain areas. Depending on the type of activity and its location, potential impacts to visitor safety could range from negligible to minor.

Minor adverse impacts in areas outside unit waters are likely to increase to the extent that PWC users concentrated their activities in these areas as a consequence of unit closures.

Conclusion. Alternative B would eliminate the potential for PWC-related accidents throughout large portions of the unit, resulting in beneficial impacts to swimmers. Within the areas open to PWC use, existing conditions would continue, with minor adverse impacts to visitor safety.

Cumulative impacts would be similar to alternative A, with beneficial impacts in areas closed to PWC use and minor impacts in areas remaining open to personal watercraft.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. Alternative C would allow PWC use only within the Shrewsbury River Channel.

Conflicts between PWC Users and Swimmers — Swimmers would continue to benefit from restrictions on PWC use.

Conflicts between PWC Users and Other Boaters — The potential for PWC users to have accidents with other boaters (canoeists, kayakers, sailboaters, and motorboaters) would be restricted to the Shrewsbury River Channel. Because of the degree of use in waters around Sandy Hook, the potential for accidents with boaters is considered minor, although this potential could increase with greater use.

Cumulative Impacts. Depending on the type of activity and its location, potential cumulative impacts to visitor safety would be negligible to minor, similar to alternative A. Boaters utilizing waters outside the unit could be adversely affected to the extent that increased PWC use in these waters would conflict with their activities. Some beneficial impacts would result from restricted PWC use and reduced potential for conflicts and accidents.

Conclusion. Closing most of the unit's waters to PWC use would have beneficial impacts on swimmers and other boaters. There would be a minor potential for accidents between PWC users and other boaters in the Shrewsbury River Channel.

Cumulative impacts would be similar to alternative A. An increased potential for accidents between PWC users and other boaters could occur outside NPS waters. Some beneficial impacts would result from restrictions on PWC use and reduced potential for conflicts and accidents.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Impacts on visitor safety associated with PWC use within the unit would be eliminated.

Conflicts between PWC Users and Swimmers — Swimmers would benefit from the absence of any possible conflicts with PWC users.

Conflicts between PWC Users and Other Boaters — The potential for PWC users to have accidents with other boaters (canoeists, kayakers, sailboaters, and motorboaters) would be eliminated within unit waters, a beneficial impact.

Cumulative Impacts. While some beneficial impacts would result from eliminating PWC use and the potential for conflicts and accidents within the unit, other recreational activities in the unit would continue to have the potential to affect visitor safety. Depending on the type of activity and its location, potential impacts to visitor safety could range from negligible to minor, similar to alternative A. Closing the Sandy Hook Unit to PWC use would likely force PWC users to go to other areas in the region for recreation. This would increase cumulative impacts to safety (the potential for accidents with other boaters) in those waters.

Conclusion. Eliminating PWC use within the unit would have a beneficial impact for those visitors who come to Sandy Hook Unit for swimming, fishing, and traditional boating.

Cumulative impacts would be similar to alternative A, with negligible to minor adverse impacts on visitor safety because many other uses at the unit are related to motorized watercraft and water-related activities. Impacts on other boaters operating in adjacent non-NPS waters would be negligible to minor because of the potential of increased safety hazards if PWC activities increased in these areas.

SOCIOECONOMIC EFFECTS

The socioeconomic effects of implementing PWC regulations at Gateway National Recreation Area were based on a study for all areas of Gateway National Recreation Area (Law Engineering et al. 2002). The following briefly summarizes the predicted effects specific to the Sandy Hook Unit, as extrapolated from the existing information.

BENEFIT-COST ANALYSIS

As described for the Jamaica Bay Unit, the purpose of the benefit-cost analysis is to determine whether a management alternative would promote an efficient allocation of resources. That is, whether the proposed action would generate more benefits than costs. These costs and benefits accrue directly to households that use personal watercraft, and indirectly to those who are affected by PWC use (e.g., those who benefit from reduced noise). The resulting changes in PWC use could also impose costs on those who own or work for PWC-related businesses.

Under alternative A there would is no change for any users relative to current conditions because PWC use would continue to be allowed.

Alternative B would benefit all groups except PWC users and PWC dealerships. Because PWC use would be restricted to the navigational channels around Sandy Hook, park users who do not use personal watercraft, local residents, and the general public could benefit. In addition, if there were more visitors interested in activities other than PWC use, then providers of these activities would likely experience increased sales. One possible exception to the increase in welfare for non-PWC users is boaters. Although the impact on boaters is expected to be positive, it is somewhat ambiguous because of an increased potential for accidents between boaters and PWC users outside park waters. Reducing the number of PWC users in the park should have beneficial impacts on other boaters; however, increased congestion in non-NPS waters and the risk of accidents might actually increase overall in the area.

Alternative C would benefit all visitors except PWC users and dealerships, although to a somewhat larger degree than under alternative B because personal watercraft would only be allowed in the Shrewsbury River Channel. As outlined above, the impact on boaters would likely be beneficial, but the potential for congestion outside of park waters could adversely affect boaters.

The no-action alternative would have beneficial effects for all visitors except PWC users and dealerships. The magnitude of the change would be larger than under alternative B or C. The impact on boaters would most likely be beneficial but would be somewhat ambiguous because of the potential for increased congestion in waters outside the Sandy Hook Unit. Adverse impacts of PWC use on swimmers, canoeists, and other users within the unit would be greatly reduced, a beneficial impact.

COSTS TO PWC USERS

Two groups of PWC riders could be affected by the management alternatives: riders who currently ride in the Sandy Hook Unit and those who ride in other regional areas.

For PWC users who currently ride in the Sandy Hook Unit or who wanted to ride there in the future, prohibiting or restricting PWC use could adversely affect them. To the extent that individuals consider other nearby PWC use areas to be close substitutes, impacts associated with restricting PWC use in the park would be lower.

PWC users who currently ride in nearby areas where displaced riders from the Sandy Hook Unit could come would be adversely affected if these areas became more crowded due to PWC use restrictions in Gateway National Recreation Area. Although no studies were available that examined the impact of congestion on the value of a PWC trip, other recreation demand studies find that congestion lowers the value of a recreational experience.

Under alternative A there would be no change in PWC use. Alternatives B and C would have negligible impacts on PWC users since use would be restricted to the navigational channels.

The no-action alternative would result in a total ban on PWC use in the unit, so PWC users in Gateway National Recreation Area would be adversely affected.

COSTS TO LOCAL AREA BUSINESSES

Based on the information currently available, the magnitude of impacts that PWC restrictions would have cannot be quantified. If PWC riding decreased as a result of regulations, then the suppliers of PWC sales and rental services could be adversely affected. Lodging establishments, restaurants, gas stations, and other businesses that serve PWC riders are unlikely to experience a substantial reduction in business from any proposed regulation because PWC users at Sandy Hook are believed to be primarily local residents on day trips and because PWC users account for a very small share of total visitation to the area.

MANAGEMENT AND OPERATIONS

CONFLICT WITH STATE AND LOCAL ORDINANCES AND POLICIES REGARDING PWC USE

As described for the Jamaica Bay Unit, consistency with state and local plans must be evaluated in accordance with the National Environmental Policy Act. Impacts related to conflicts with state and local ordinances have been analyzed qualitatively using professional judgment to define impact thresholds.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use would continue in all waters designated in the "Superintendent's Compendium" and would be managed in accordance with all New Jersey State regulations. PWC use regulations within the unit would not conflict with state regulations or local ordinances and policies.

Cumulative Impacts. Management of PWC use would be consistent with New Jersey State regulations.

Conclusion. PWC regulations within the unit boundaries would be consistent with New Jersey State regulations. Sandy Hook Unit regulations would have no effect on state regulations or local ordinances.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. Like alternative A, PWC use within the unit would continue to be managed under New Jersey State regulations. PWC users would be limited to navigational channels and more than 500 feet from the ocean shoreline. PWC use restrictions within the unit would not conflict with state regulations or local ordinances and policies regarding use.

Cumulative Impacts. As described for alternative A, management of PWC use would be consistent with New Jersey State regulations.

Conclusion. As described for alternative A, PWC regulations would be consistent with New Jersey State regulations. There would be no conflict with state regulations or local ordinances.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use would be limited to the Shrewsbury River Channel. The management of PWC use within the unit would continue to be consistent with New Jersey State regulations where PWC use was allowed.

Cumulative Impacts. Management of PWC use would continue to be consistent with New Jersey State regulations.

Conclusion. As described for alternative A, PWC regulations would be consistent with New Jersey State regulations. There would be no conflict with state regulations or local ordinances.

Impacts of the No-Action Alternative — No PWC Use

Analysis. Banning PWC use within the national recreation area would not affect the enforcement of other New Jersey State boating regulations within the unit.

Cumulative Impacts. The management of other motorized watercraft would continue to be consistent with New Jersey State boating regulations.

Conclusion. Similar to alternative A, boating regulations would be the same as those for New Jersey State. NPS regulations would be no conflict with state regulations or local ordinances.

IMPACT TO UNIT OPERATIONS FROM INCREASED ENFORCEMENT NEEDS

The U.S. Park Police are responsible for ensuring the safety of visitors, for protecting resources, and for enforcing PWC use regulations within the at the Sandy Hook Unit. The New Jersey State Police Marine Unit and the U.S. Coast Guard also have jurisdiction within NPS waters. Standards and procedures for NPS law enforcement are defined in *Director's Order #9: Law Enforcement* and its accompanying reference manual. Impacts to park operations from increased enforcement needs have been analyzed qualitatively, using best professional judgment.

Impacts of Alternative A — Continue PWC Use under a Special Regulation

Analysis. PWC use would continue in all waters designated in the "Superintendent's Compendium" and would be managed in accordance with all state regulations.

There would be a continuing need for enforcement actions related to accidents and visitor safety conflicts with PWC users. The National Park Service could have difficulty maintaining an adequate number of enforcement personnel on the water to ensure compliance with regulations.

Cumulative Impacts. The U.S. Park Police, the New Jersey State Police Marine Unit, and the U.S. Coast Guard would continue to have jurisdiction within unit waters. U.S. Park Police officers would continue to provide assistance to the various user groups, both to resolve conflicts and to ensure safety.

Conclusion. Impacts under alternative A would be short and long term and minor due to needs for additional law enforcement capability within the unit to enforce federal and state boating regulations.

Impacts of Alternative B — Continue PWC Use under a Special Regulation with Geographic Restrictions

Analysis. PWC use would continue only in navigational channels and beyond 500 feet from the ocean-side shoreline and would be managed in accordance with all state regulations. Enforcement would relate to use restrictions, accidents, and visitor safety conflicts among users. U.S. Park Police would continue to enforce New Jersey State boating regulations, with more emphasis on patrolling areas where PWC use would be restricted. The National Park Service could have difficulty maintaining an adequate number of enforcement personnel on the water to ensure compliance with regulations, similar to alternative A.

Cumulative Impacts. The U.S. Park Police, the New Jersey State Police Marine Unit, and the U.S. Coast Guard would continue to have jurisdiction within unit waters. U.S. Park Police would continue to provide assistance to various user groups to the park, both to resolve conflicts and to ensure safety.

Conclusion. Impacts under alternative B would be short and long term and minor due to needs for additional law enforcement capability to enforce federal and state boating regulations.

Impacts of Alternative C — Continue PWC Use under a Special Regulation with Additional Geographic Restrictions (Preferred Alternative)

Analysis. PWC use would continue only in the Shrewsbury River Channel. Enforcement would relate to use restrictions, accidents, and visitor safety conflicts among users. U.S. Park Police would continue to enforce New Jersey State boating regulations, with more emphasis on patrolling areas where PWC use would be restricted. The National Park Service could have difficulty maintaining an adequate number of enforcement personnel on the water to ensure compliance with regulations.

Cumulative Impacts. The U.S. Park Police, the New Jersey State Police Marine Unit, and the U.S. Coast Guard would continue to have jurisdiction within unit waters. U.S. Park Police would continue to provide assistance to various user groups to the park, both to resolve conflicts and to ensure safety.

Conclusion. Impacts under alternative C would be short and long term and minor due to needs for additional law enforcement capability within the unit to enforce federal and state boating regulations.

Impacts of the No-Action Alternative — No PWC Use

Analysis. The no-action alternative would require additional enforcement to ensure that PWC use restrictions within the unit boundary were observed. U.S. Park Police would be required to enforce these restrictions. Removing personal watercraft, however, would reduce the number of complaints related to user conflicts. Park staff would continue to make reasonable efforts to provide for the protection, safety, and security of all park visitors, employees, concessioners, as well as public and private property, and to protect the natural and cultural resources entrusted to its care. Eliminating PWC use would decrease the potential for accidents, but more rangers and boats would be required to enforce the regulations.

Cumulative Impacts. Other visitor activities in the unit besides PWC use would require the presence of enforcement personnel. If visitation numbers increased over time, the need for additional commissioned park rangers would also increase. Depending on park visitation and the ability of the park to hire additional personnel, potential impacts to enforcement needs in the unit would be short and long term and could range from negligible to minor.

Conclusion. The no-action alternative would result in short and long term, negligible to minor impacts on the enforcement needs of the park resulting from banning PWC use; once the ban was understood and observed by PWC users, impacts would be minor.

UNAVOIDABLE ADVERSE IMPACTS

As described for the Jamaica Bay Unit, under all alternatives there would be adverse cumulative impacts if emissions reduced water or air quality.

Continuing PWC use throughout the Sandy Hook Unit under alternative A would adversely impact soundscapes, affecting wildlife and visitor experiences. Visitor experiences would continue to be compromised, with the potential for conflict between boaters and PWC users remaining high.

Under alternatives B and C the potential for similar impacts would exist, but at greatly reduced levels. Prohibiting PWC use along the oceanside of the unit would reduce the potential for visitor conflicts with shoreside visitors. Prohibiting PWC use in the Sandy Hook Channel under alternative C would further reduce the potential for visitor conflicts within NPS boundaries. However, the potential for conflicts would be increased outside unit boundaries to the extent that PWC users used adjacent waters and congestion increased.

The no-action alternative would adversely impact PWC users who use the Sandy Hook Unit for recreation.

LOSS IN LONG-TERM AVAILABILITY OR PRODUCTIVITY TO ACHIEVE SHORT TERM GAIN

As noted above, some resources could be degraded through implementation of alternative A, B, or C. None of these resources would be impacted to the degree of impairment or long-term permanent loss. Enforcement of existing federal and state laws, and park regulations by unit staff, would likely result in a long-term protection of these resources. These conditions could only be achieved by an increase in rangers and resources (boats) made available to the park.

IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irretrievable commitments of resources are those that can be reversed, that is, the commitment of a renewable resource or the short-term commitment of any resource. These include the commitment of water quality and air quality by allowing all mobile sources desiring to do so, including personal watercraft, to continue using the unit under alternatives A, B, and C. The use of fossil fuels to power personal watercraft would be an irretrievable commitment of this resource; however, this use is minor.

Coordination and Consultation

Coordination and consultation efforts for this planning process focused on the means or processes to be used to include the public; the major interest groups; and local public entities. Based on past experience, park staff place a high priority on meeting the intent of public involvement in the NEPA process and giving the public an opportunity to comment on proposed actions.

Informational brochures about the PWC planning process were sent out from the Jamaica Bay, Staten Island, and Sandy Hook Units in September 2002. Approximately 60 comments were received, most of which supported PWC use in the park.

The following agencies, groups, and organizations have been identified as having an interest in this issue as the NEPA process moves forward:

Congressional Delegation (New Jersey)
Senator Robert Torricelli
Senator Jon Corzine
Representative Frank Pallone, Jr.

Congressional Delegation (New York)
Senator Hillary Clinton
Senator Charles Schumer
Representative Vito Fossella
Representative Anthony Weiner

Federal Agencies
U.S. Army Corps of Engineers
U.S. Coast Guard
U.S. Coast Guard Auxiliary
U.S. Fish and Wildlife Service
U.S. Geological Survey
U.S. Oceanic and Atmospheric Administration
National Marine Fisheries Service

State Agencies
New York State Department of Environmental Conservation
New York State Department of State, Division of Coastal Resources
New York State Office of Parks, Recreation and Historic Preservation
Bureau of Marine and Recreational Vehicles
New York State Sea Grant Institute

Local Agencies
Hamilton Beach Community (Jamaica Bay Unit)
Nassau County Police Marine Bureau
New Jersey's Governor's Recreation Travel Committee
New York City Board of Education
New York City Department of Environmental Protection
New York City Department of Parks and Recreation

Businesses and Organizations
American Littoral Society
American Watercraft Association
Animal Protection Institute
Biodiversity Legal Foundation
Bluewater Network
Brooklyn Bird Club
Brooklyn Center for the Urban Environment
Brooklyn Friends of Clearwater
Coalition of Parents and Families for Personal Watercraft Safety
Conservancy for Historic Battery Park
Council on the Environment of New York City
Earth Justice
Eco Watch and Littoral Society
Educators for Gateway
Environmental Defense
Friends of Gateway / The Neighborhood Open Space Coalition
Greenpeace
Izaak Walton League
Jamaica Bay Environmental Coalition
Jamaica Bay Task Force
Linnean Society
Littoral Society
Marine Academy of Science and Technology
National Parks and Conservation Association
Natural Resources Defense Council
Natural Trails and Waters Coalition

New York City Audubon Society
New York Marine Trade Association
New York Sportfishing Federation
Noise Pollution Clearinghouse
Ocean Conservancy – formerly Center for Marine Conservation]
PWIA – Personal Watercraft Industry Association
Queens Country Club
Rockaway Music and Arts Council
Sandy Hook Audubon Society
Sandy Hook Foundation
Sierra Club
Staten Island Federation of Sports Fishermen
Staten Island Natural Resources Protection Association
Rockaway Yacht Club
Wilderness Society

Appendixes / Glossary / Selected Bibliography / List of Preparers

APPENDIX A: SUPERINTENDENT'S COMPENDIUM — SECTIONS RELATING TO PERSONAL WATERCRAFT

JAMAICA BAY UNIT

TITLE 36 CODE OF FEDERAL REGULATIONS

Part 1

Closures and Public Use Limits

1.5 Schedule of Visiting Hours, Public Use Limits, and Closures of Specific Areas

(a) (1) All Day Use Areas with the exception of Jacob Riis Park (see below), North Channel Bridge, Canarsie Pier, Frank Charles Park and Hamilton Beach are closed from Sunset to Sunrise daily, except by permit.

Visitation to Spring Creek is open to pedestrian traffic only and restricted to establish roads and trails.

* * *

The primary dune systems along the ocean shoreline are closed to the public except at designated crossings.

* * *

The ocean side of the Breezy Point Tip is the only designated off-road route in the Unit. Permit required September 1 through March 14 to access beach. Beach closed to vehicles during the remainder of the year. Permit required at Tip sand parking lot all year.

1.6 (f) Compilation of Activities Requiring a Permit

18. 36 CFR 3.6. Launching Vessels at Designated Launch Sites.

Part 2

Resource Protection, Public Use and Recreation Designations, Conditions, Restrictions, and Procedures Applicable

2.3 Fishing

(a) Fishing is prohibited at all lifeguard protected beaches from 8:00 am to 8:00 pm.

(b) Net, spear, or weapon fishing shall be in accordance with applicable state law.

2.11 Picnicking

Is permitted except in closed areas (see Part 1.5). Use of charcoal grills including gas grills and artificial coals is prohibited except at the following locations:

Designated group picnic areas in Fort Tilden and Floyd Bennett Field (by permit only)

At Riis Park in areas north of the boardwalk with the exception of: ballfields, garden areas and specifically posted "no barbecuing" areas.

Canarsie Pier picnic areas.

North Channel Bridge lawn areas.

Frank Charles Park lawn areas (excluding ball fields)

Part 3

Boating and Water Use Activities

3.3 Permits

(a) Permits are not required for the use and operation of private and commercial vessels.

3.6 Prohibited Operation

(h) There are no designated locations to launch or recover vessels by trailer within the Breezy Point/Jamaica Bay Unit.

(i) There are no designated locations to launch or recover vessels propelled by machinery. Launching or recovering vessels propelled by machinery is prohibited (including jet skis). *NOTE: vessels not propelled by machinery (i.e., windsurfing boards, kayaks, etc.) may be hand carried from parking areas. Stopping on park roads to unload or launch vessels is prohibited.

3.20 Water Skiing

(a) There are no designated waters for water skiing within the Breezy Point/Jamaica Bay Unit.

3.21 Swimming

(a) (1) All waters within Jamaica Bay are closed to swimming.

(2) Swimming from vessels to oceanside beaches or swimming from oceanside beaches to vessels is prohibited.

(3) The only designated swimming beach in the Unit is Jacob Riis Park during periods of summer operation when surfguards are on duty. The remainder of the ocean beaches at Fort Tilden, West Beach and the Breezy Point Tip are unguarded.

3.22 Surfing

Jacob Riis Park contains the only designated swimming beach in the Unit. Surfboards and similar rigid devices are prohibited from swimming beaches at all times.

3.23 Scuba and Snorkeling

There are no designated Scuba and snorkeling areas within the Breezy Point/Jamaica Bay Unit.

Compendium Appendix G
August 21, 1991

Determination regarding area closed to the public for the purpose of resource protection and visitor safety.

The authority of Section 1.5 of Title 36, Code of Federal Regulations, is being used to designate certain park areas as closed to public use for the protection of natural and cultural resources and for the maintenance of public safety.

The Final Environmental Statement (General Management Plan) of August 1979 for Gateway National Recreation Area has identified several natural features and communities as sensitive to development or excessive use. These areas have been zoned Protection Zones and designated as closed to the public. Unique natural features include a Wildlife Refuge, saltwater marshes, and well developed primary dunes. It is due to the locally unique characteristics, the wildlife habitat value, and the sensitivity to development and visitor use that these areas are closed to the public.

In addition to the park natural resources, visitors will encounter numerous cultural and historic resources associated with the Fort Tilden Historic District. Section 2.1(a) (5) of Title 36, Code of Federal Regulations, prohibits "walking on, climbing, entering, ascending, descending or traversing an archeological or cultural resource, monument or statue except in designated areas and under conditions established by the Superintendent."

It has been determined that due to the large number of structures, the current condition of the structures, and the sensitivity of the structures to excessive visitor use, these bunkers, magazines and gun batteries will be closed to the public.

By viewing these structures from the exterior, stopping at wayside exhibits, and visiting Fort Tilden, Visitor Center, visitors will be able to appreciate the significance of Breezy Point/Jamaica Bay Unit cultural resources. It is felt that these restrictions will not appreciably detract from the park visitors experience at Breezy Point/Jamaica Bay Unit and that public safety and the protection of these resources will be greatly increased.

Compendium Appendix H

August 21, 1991

Determination regarding hours of park visitation.

A reasonable schedule of visiting hours has been established for the Breezy Point/Jamaica Bay Unit consistent with applicable legislation and Federal administrative policies. Restriction of day use visitation and activities from sunset to sunrise are necessary for the maintenance of public health and safety, and the protection of natural and cultural resources found within the park.

It has been determined that the public's use of this area is not appreciably diminished by park closure at night and that the public safety and protection of the resources is significantly improved by the exclusion of visitors during these hours. This has been demonstrated by past and potential after hours incidents in illegal activities such as underage consumption of alcohol, littering, maintaining open fires, driving off established roadways, vandalism of park property, and other violations.

A valid night-time recreational need has been addressed and established for the sport of surf fishing within the park. A permit is required to fish after normal visiting hours and may be obtained at the Breezy Point District Office and the Jamaica Bay District Office. It is felt that this activity, at the present time, does not adversely impact upon the protection of natural or cultural resources or upon the public safety of park users.

Compendium Appendix J
36 CFR 2.3
August 21, 1991

Designated Locations and Conditions for Fishing

Permit Requirements

1. Permits are required to park in designated parking areas for the purpose of fishing sunset to sunrise year round.
2. From April 15th through September 15th, permits are required to park in designated parking areas for fishing.
3. The only designated off-road driving area in the unit is at the Breezy Point Tip. Off-road driving/parking permits are required year round for the purpose of fishing. The Breezy Point Tip beach is closed to off-road vehicles from March 15th through August 31st.

* * *

Compendium Appendix L
January 1992

Determination regarding the closure of ocean beaches to the launching or landing of vessels.

Ocean beaches of the Jamaica Bay/Breezy Point Unit are presently dedicated to a variety of uses involving different recreational activities and threatened/endangered species protection. The addition of boat launching and landing areas on ocean beaches would give rise to direct conflicts with the existing visitor uses and resource management practices. In addition, many locations are unsuitable for safe launching or landing due to hazardous currents, surf conditions and submerged obstructions.

The following is an explanation of the types of activities currently existing on ocean beaches and the conflicts between these activities and those associated with boat launching and landing.

Designated Swimming Beaches (Lifeguarded Beaches)

Visitor use activities on these beaches are varied, but they are largely centered on water use recreation. High numbers of visitors swim, bath or wade in the surf from the shoreline out to as far as the lifeguards will permit. Many more visitors set up their blankets and chairs right next to the water and allow their children to play at the water's edge. The high concentration of visitors on these beaches effectively creates a wall of people extending the length of the guarded area.

36 CFR 3.6e prohibits "Operating a vessel not propelled by hand within 500 feet of a location designated as a swimming beach."

Shorebird Nesting Areas

The Breezy Point Tip (Oceanside and Bayside) and West Beach Area of the Jamaica Bay/Breezy Point Unit are utilized by Piping Plovers (*Charadrius melodus*) as nesting areas. The Piping Plover is a federally threatened and state endangered species and, as such, is protected by law.

Nesting generally takes place above the high tide line throughout the dune system and the primary feeding area for these birds is the intertidal zone. Piping Plovers are particularly sensitive to human disturbance and even low levels of visitor use near feeding or nesting areas often results in nest failure. Activities associated with the launching and landing of boats would only serve to increase the number of potential disturbances to these birds.

The boundaries of the nesting areas and the associated feeding areas are dynamic and can therefore change from year to year. This results in the need for both management and protection practices to be equally dynamic by not allowing potentially conflicting visitor use activities to occur in close proximity to areas used by these birds in past years.

Visitor Use Conflicts

Certain ocean beach areas of Jamaica Bay/Breezy Point have historically been used for specific purposes by park visitors. These historic uses can be expected to continue in future years

a) Fort Tilden Beach: Used by fishermen throughout the year with periods of peak use from early spring to late fall. Launching and landing of boats would create a hazard to fishermen wading in the surf and standing at the water's edge. Fishermen casting their lines would create a hazard to the boaters.

Compendium Appendix M
January 1992

Designations and conditions for the launching of vessels within the Breezy Point/Jamaica Bay Unit (Car Top Boating Program)

The Breezy Point/Jamaica Bay Unit of Gateway National Recreation Area has recognized the need to establish a designated "Car-Top" boating area. This need is based on numerous visitor inquiries as to designated locations for launching and recovering vessels for the purpose of recreational access to the waters of Jamaica Bay.

The car top boating program will be conducted on an experimental basis and subject to periodic review. The National Park Service will insure that this program is not detrimental to environmental or scenic values, natural or cultural resources, and that launching activities do not compromise visitor safety and health or create conflicts among other visitor use activities. Based upon this review, the program and policy can be amended or terminated by the superintendent at any time.

Applicable Regulations

36 CFR 3.3 Authorizes the superintendent to require a permit for use of a vessel within a park area.

36 CFR 3.6(h) Prohibits the launching of a vessel by trailer except at designated launch sites.

36 CFR 3.6(i) Prohibits launching vessels propelled by machinery except at designated launch sites.

It is the purpose of this document to identify a launch site and set forth a policy and permit conditions for launching vessels within the Sandy Hook Unit.

Definition

For boats to qualify under the title of a "car-top" boater they must meet the following conditions. Any vessels which do not meet this criteria may not be launched at any location within the Jamaica Say/Breezy Point Unit.

Conditions for "Car Top" Classification

1. Vessels propelled by machinery must be 16 feet or less in length.
2. Sailboats must be 16 feet or less in length.
3. Maximum horsepower may not exceed 25.
4. The vessel and equipment must be able to be hand carried. Pneumatic rollers may be used to guide boats to the water.
5. The vessel is not defined as personal watercraft. (Jet Ski)

Designated Location

Seaplane ramp east of Hangar B on Floyd Bennett Field.

Procedures and Regulations

1. Access to the launch site is by permit only.

   - Permits may be obtained at the Ryan Visitor Center.

   - Boaters must register in the log book and provide departure and return times, and the number of persons on board. (Float Plan)

   - A daily use pass will be issued to each vehicle.

   - No more than 5 passes will be issued at anyone time.

2. Launching of Jet Skis is prohibited.
3. Vessels must be transported to the launch site on top of a vehicle.
4. All vessels and equipment must be hand carried from the parking area to the water and from the water to the parking area upon returning.
5. Backing trailers into the water to launch or recover vessels is strictly prohibited.
6. Boaters must launch and recover vessels in the designated launch zone.
7. Boaters are expected to exercise caution and safety while operating vessels, and to follow all applicable state and federal laws pertaining to operation and equipment. Applicable laws include:

   Title 36 CFR part 3
   Title 33 CFR
   Title 46 CFR
   Title 49 CFR
   Title 7 NJSA
   Title 12 NJSA

   Vessels may be inspected by Park Rangers and U. S. Park Police to insure compliance at any time.

8. Boat launching and recovering activities must be conducted between sunrise and sunset.
9. The boat launch areas may be closed at any time by the on-duty supervising ranger based on severe weather conditions, water pollution incidents, or other hazardous conditions.

STATEN ISLAND UNIT

TITLE 36 CODE OF FEDERAL REGULATIONS

Part 1

Closures and Public Use Limits

1.5 Schedule of Visiting Hours. Public Use Limits, and Closures of Specific Areas

(a) (1)

- At Miller Field and Great Kills Park, all visitor use areas and activities with the exception of the designated fishing, boating, launching and nature study and their related parking areas are closed from 10:00 p.m. to sunrise daily, except by special permit.

- Once the site is opened to the public, Fort Wadsworth Historic Zones are closed at dusk.

- All marshes and Hoffman and Swinburne Islands are closed to the public, except by permit.

- The primary dune systems along the entire shoreline are closed to the public.

- Parking for boat launching and retrieval activities within the Great Kills Park public boat launch facility are by permit only.

- Excepting the designated swimming beach at Great Kills Park, all other waters at Fort Wadsworth, Miller Field and Great Kills Park are closed to public bathing.

- Operating vessels within 500 feet of swimming beaches is prohibited. Landing or beaching vessels in any harbor or bay beach area is prohibited except in emergencies.

- Daytime fishing is prohibited at Great Kills swimming beach from Memorial Day through Labor Day; fishing may occur from 8:00 a.m.-8:00 p.m.

- Private vehicles are not allowed on the beaches, sand dunes, grassland/shrub areas and historic zones throughout the unit unless specifically authorized by permit.

Part 2

Resource Protection, Public Use and Recreation Designations, Conditions, Restrictions, and Procedures Applicable

2.11 Picnicking

Is permitted except in closed areas (see Part 1.5). Use of charcoal grills including gas grills and artificial coals is prohibited except in existing receptacles provided by the park at the following locations: Designated Group Picnic Areas at Miller Field, and individual picnic area at Great Kills Park. (Note: latter to be provided summer 1997)

Part 3

Boating and Water Use Activities

3.3 Permits

(a) Permits are not required for the use and operation of private and commercial vessels. Permits are required for transient and guest parking at the Great Kills marina. Permits may be obtained from the Nichols Marina office between 8 a.m. and 4:30 p.m. daily.

3.6 Prohibited Operations

(h) The only designated location to launch or recover vessels by trailer within the Staten Island Unit is the boat launch ramp at Great Kills Park. Launching or recovering vessels by trailer in other locations is prohibited.

(i) Excepting the public boat launch at Great Kills Park, there are no designated locations to launch or recover vessels propelled by machinery. Launching or recovering vessels propelled by machinery in other park areas is prohibited (includes jet skis).

*NOTE: vessels not propelled by machinery (i.e., windsurfing boards, kayaks, etc.) may be hand carried from parking areas. Stopping on park roads to unload or launch vessels is prohibited.

3.20 Water Skiing

(a) There are no designated areas for water skiing within the Staten Island Unit.

3.21 Swimming

(a) (1) The following locations are designated as closed to swimming:

All NPS waters within Great Kills Harbor.

Unguarded beaches within the Staten Island Unit.

The Great Kills Park swimming beach when lifeguards are not on duty.

(b) The following activities are prohibited on park swimming beaches:

Fishing on lifeguard protected beaches Memorial Day weekend through Labor Day weekend except after 8 p.m., and before 8 a.m.

3.22 Surfing

There are no designated surfing areas within the Staten Island Unit.

Surfboards and similar rigid devices are prohibited from guarded beaches at all times.

3.23 Scuba and Snorkeling

There are no designated Scuba and snorkeling areas within the Staten Island Unit.

Compendium Appendix F
August 1997

Determination regarding area closed to the public for the purpose of resource protection and visitor safety.

The authority of Section 1.5 of Title 36, Code of Federal Regulations, is being used to designate certain park areas as closed to public use for the protection of natural and cultural resources and for the maintenance of public safety.

The Final Environmental Statement (General Management Plan) of August 1979 for Gateway National Recreation Area has identified l several natural features and communities as sensitive to development or excessive use. These areas have been zoned Protection Zones and designated as closed to the public. Unique natural features include, saltwater marshes, and well developed primary dunes. It is due to the locally unique characteristics, the wildlife habitat value, and the sensitivity to development and visitor use that these areas are closed to the public.

In addition to the park natural resources, visitors will encounter numerous cultural and historic resources associated with the Fort Wadsworth Historic Zone. Section 2.1(a) (5) of Title 36, Code of Federal Regulations, prohibits "walking on, climbing, entering, ascending, descending or traversing an archeological or cultural resource, monument or statue except in designated areas and under conditions established by the Superintendent."

It has been determined that due to the large number of structures, the current condition of the structures, and the sensitivity of the structures to excessive visitor use, bunkers, magazines and gun batteries at Fort Wadsworth will be closed to the public except by ranger led tour. By viewing these structures from the exterior, stopping at wayside exhibits, and visiting the Fort Wadsworth Visitor Center, visitors will be able to appreciate the significance of the Staten Island Unit cultural resources.

It is felt that these restrictions will not appreciably detract from the park visitors experience at the Staten Island Unit and that public safety and the protection of these resources will be greatly increased.

SANDY HOOK UNIT

TITLE 36 CODE OF FEDERAL REGULATIONS

Part 1

Closures and Public Use Limits

1.5 Schedule of Visiting Hours, Public Use Limits, and Closures of Specific Areas

(a)(1) - All Day Use Areas are closed from Sunset to Sunrise Daily, except:
a) By permit.
b) Area D Parking Lot and concession facility from sunset until midnight.

- The Holly Forest is closed to the public, except by reservation or guided tour.

- The primary dune systems along the entire ocean shoreline are closed to the public except at designated dune crossings.

- The extensive beach grass dune area adjacent to the U.S. Coast Guard boundary at the northern tip of Sandy Hook is closed to the public

- The freshwater marshes adjacent to Guardian Park and the freshwater marsh north of the Nike Missile Site are closed to the public.

- The low salt water marshes on the bayside, including the beach/dune/marsh areas of Spermaceti Cove and the marsh area on Skeleton Hill Island are closed to the public.

- The low salt water marsh on the bayside at Horseshoe Cove is closed to the public.

- Area C (bayside) is designated as a windsurfing area only, Memorial Day through Labor Day.

- Operating vessels within 500 feet of swimming beaches is prohibited. Landing or beaching vessels in any ocean beach area is prohibited except in emergencies.

- Intertidal Zones may be closed for the protection of piping plovers between March 1 and Sept. 30 based on determinations outlined in Appendix U.

Part 2

Resource Protection, Public Use and Recreation Designations, Conditions, Restrictions, and Procedures Applicable

2.3 Fishing

(a) Fishing is prohibited at all lifeguard protected beaches (while lifeguards are on duty).

2.10 Camping and Food Storage

(10)(a) Camping allowed by permit only. Camping is permitted only at designated Youth Group Campground or areas specifically identified in a Special Use Permit. Conditions at Youth Campground. Youth Group Campground is available to organized youth groups whose members are under the age of 21 and for volunteer groups actively participating in park activities.

2.11 Picnicking

Is permitted except in closed areas (see Part 1.5).

Part 3

Boating and Water Use Activities

3.3 Permits

(a) Permits are required for the use and operation of commercial vessels.

Permits are not required for the use and operation of private vessels.

3.6 Prohibited Operations

(h) There are no designated locations to launch or recover vessels by trailer within the Sandy Hook Unit. Launching or recovering vessels by trailer is prohibited.

(i) Launching and/or recovering of vessels propelled by machinery, except personal watercraft (i.e. jet skis), is permitted on the bayside between Batteries Kingman and Mills only.

NOTE: Sail boards used in the sport of windsurfing may be hand carried from Parking Areas B, C and areas north of the Ranger Station to adjacent bayside waters. Stopping on park roads to unload or launch vessels is prohibited.

3.20 Water Skiing

(a) There are no designated waters for water skiing within the Sandy Hook Unit. The towing of persons by vessels is prohibited.

3.21 Swimming

(a) (l) The following locations are designated as closed to swimming:

North of North Beach
Unguarded Area between Gunnison and North Beach

(2) Swimming from vessels to oceanside beaches or swimming from oceanside beaches to vessels is prohibited.

3.22 Surfing

The following areas are designated as swimming beaches:

Parking areas C, D, E, G, I, and J

Surfboards and similar rigid devices are prohibited from swimming beaches except, at the discretion of Park Staff at Lot C. Surfboards must be equipped with shockcords.

Area C (bayside) is a designated windsurfing area Memorial Day through Labor Day- (See Section 1.5)

3.23 SCUBA and Snorkeling

Snorkeling and SCUBA diving is permitted in accordance with the following conditions:

Snorkeling and Certified SCUBA Divers are permitted in the following areas:

All bayside waters except Spermaceti Cove.

All ocean beaches, except designated swimming beaches, Memorial Day through Labor Day.

Special Use Permits will be considered for issuance by the Superintendent's Office on a case by case basis for diving in restricted areas.

SCUBA divers are required to file a Diving Permit/Float Plan at the Ranger Station. When filing a plan, divers will be required to show certification, give name and address and emergency contact information. Divers shall specify the number *of* divers, the dive location, times *of* the dive and purpose of the dive. Permits will not be issued to solo divers. Divers are to post a standard divers flag while diving and shall check out of the park at the Ranger Station.

Compendium Appendix C
36 CFR 2.10 (A)
June 25. 1990

Designated sites or areas and conditions for camping within the Sandy Hook Unit of Gateway NRA.

Policy

It has been determined that organized youth group camping is a legitimate visitor use and recreational activity. The need for specific guidelines regarding camping at the Sandy Hook Unit has been addressed due to the number and frequency of public inquiries on this subject. The following policy outlines the definition, determination and guidelines for camping activities conducted within the Sandy Hook Unit of Gateway National Recreation Area.

Definition

Title 36, Code of Federal Regulations Section 2.10(a) states: "The Superintendent may require permits, designate sites or areas, and establish conditions for camping."

Determination

The authority of Section 1.5 (Closures and Public Use Limits) of Title 36, Code of Federal Regulations, was used to establish designated areas and to specify permit conditions for camping within the Unit. The determination was made to give priority for use of the established sites to organized youth groups in order to provide environmental education and recreational experiences in an urban area in keeping with the National Park Service camping policy (Gateway NRA General Management Plan, Section ii. 101). Non-Youth Groups are approved in only the rarest cases, but may apply for camping activities within the Unit under a Special Use Permit. The Superintendent will consider the application and make a determination based on the compatibility of the camping activity with other established recreational uses of the park. Organized Youth Groups will receive priority at the Group Campground.

Designated Areas

The present group campground, located adjacent to Horseshoe Cove, is the only designated area for camping within the Unit. Camping is prohibited in all other areas except in accordance with special use permits issued by the Superintendent.

Compendium Appendix O
June 1990

Determination regarding hours of park visitation.

A reasonable schedule of visiting hours has been established for the Sandy Hook Unit consistent with applicable legislation and Federal administrative policies. Restriction of day use visitation and activities from sunset to sunrise are necessary for the maintenance of public health and safety, and the protection of natural and cultural resources found within the park.

It has been determined that the public's use of this area is not appreciably diminished by park closure at night and that the public safety and protection of the resources is significantly improved by the exclusion of visitors during these hours. This has been demonstrated by past and potential after hours incidents in illegal activities such as underage consumption of alcohol, littering, maintaining open fires, driving off established roadways, vandalism of park property, and other violations.

A valid night-time recreational need has been addressed and established for the sport of surf fishing within the park. A permit is required to fish after normal visiting hours and may be obtained at the Sandy Hook Ranger

Station. It is felt that this activity, at the present time, does not adversely impact upon the protection of natural or cultural resources or upon the public safety of park users.

Compendium Appendix P
June 1990

Determination regarding the use of jet skis.

The Superintendent of the Sandy Hook Unit of Gateway National Recreation Area, under the authority outlined in Title 36 Code of Federal Regulations, Section 1.5, has determined that the use of "jet skis" within specific park waters will be restricted in the interest of public safety and environmental values. In addition to all applicable state and federal regulations governing the use of motorized watercraft, the following areas will be closed to jet skis:

1. All waters in Horseshoe Cove North of a line which runs from the end of the sand spit 120' ESE to the shoreline of Sandy Hook.
2. All waters within Spermaceti Cove.
3. All waters East of a line from the South end of Skeleton Island to the North End of Plum Island.

Closure of Horseshoe Cove to jet skis is based primarily on concerns for visitor safety. This area has traditionally been and continues to be utilized for safe anchorage for recreational boating and associated aquatics activities such as swimming, wadding, and net fishing. Title 36, Code of Federal Regulations prohibits operation of motorized watercraft in excess of 5 mph within 100 ft. of a swimmer. New Jersey State law (NJSA 7:6-9.3(d» prohibits operation of a jet ski above idle speed within 50 ft. of another vessel. NJSA 7:6-9.3(g) prohibits operation of jet skis above idle speed within 50 ft. of the shoreline or 50 ft. from a person in the water. Given the limited area of Horseshoe Cove, density of anchored boats, existing state and federal law and existing visitor use, Jet Skis can not be operated safely in the manner which they are intended by their design to be operated.

Spermaceti Cove has been designated as closed to all motorized watercraft in the interest of natural resource protection. Water related recreation is permitted along most of the bayside waters of Sandy Hook. Ecologically sensitive saltmarshes, use by waterfowl, and other migratory birds, and existing osprey nests make the area incompatible for active recreation. Additionally, shallow waters and submerged pilings may create hazards to all types of motorized watercraft including jet skis.

Bayside waters between Plum Island and Skeleton Island (Area opposite Parking Area C) is ideally suited to sailboarding or windsurfing. This area is currently one of the most popular windsurfing locations in the area and is utilized extensively. In order to provide equitable allocation and use of recreation facilities and to avoid conflict among visitor use activities these waters are closed to jet ski operation.

Title 36, Code of Federal Regulations, Section 3.6(i) prohibits launching motorized watercraft within park areas except at designated locations. The Sandy Hook Unit does not have facilities available to launch or recover motorized watercraft including jet skis at this time.

It is felt that these restrictions will not cause an excessive inconvenience to park visitors as jet ski operation is permitted on other tidal waters of the Sandy Hook Unit (in accordance with state and federal law). Public and private boat launching facilities in areas adjacent to the park will provide safe and convenient access for jet ski users.

Compendium Appendix S
January 1992

Determination regarding the closure of ocean beaches to the launching or landing of vessels.

Ocean beaches of the Sandy Hook Unit are presently dedicated to a variety of uses involving different recreational activities and threatened/endangered species protection. The addition of boat launching and landing areas on ocean beaches would give rise to direct conflicts with the existing visitor uses and resource management practices. In addition, many locations are unsuitable for safe launching or landing due to hazardous currents, surf conditions and submerged obstructions.

The following is an explanation of the types of activities currently existing on ocean beaches and the conflicts between these activities and those associated with boat launching and landing.

Designated Swimming Beaches (Lifeguarded Beaches)

There are five different designated, lifeguard protected swimming beaches at Sandy Hook. These are located adjacent to parking lots C, D, E, G and I. The protected beaches at lots D and E are so close together that they effectively comprise one large swimming/bathing beach.

Visitor use activities on these beaches are varied, but they are largely centered on water use recreation. High numbers of visitors swim, bath or wade in the surf from the shoreline out to as far as the lifeguards will permit. Many more visitors set up their blankets and chairs right next to the water and allow their children to play at the water's edge. The high concentration of visitors on these beaches effectively creates a wall of people extending the length of the guarded area.

36 CFR 3.6e prohibits "operating a vessel not propelled by hand within 500 feet of a location designated as a swimming beach."

Shorebird Nesting Areas

Four different and extensive areas of ocean beaches at Sandy Hook are utilized by Piping Plovers (*Charadrius melodus*) as nesting areas. The Piping Plover is a federally threatened and state endangered species and, as such, is protected by law. Consultations with US F&WS, NJ Endangered and Non-Game Species Program and the National Park Service have resulted in the delineation of Critical Habitat for Piping Plovers at Sandy Hook.

Nesting generally takes place from the high tide line throughout the dune system and the primary feeding area for these birds is the intertidal zone. Piping Plovers are particularly sensitive to human disturbance and even low levels of-visitor use near feeding or nesting areas often results in nest failure. Activities associated with the launching and landing of boats would only serve to increase the number of potential disturbances to these birds.

The boundaries of the nesting areas and the associated feeding areas are dynamic and can therefore change from year to year. This results in the need for both management and protection practices to be equally dynamic by not allowing potentially conflicting visitor use activities to occur in close proximity to areas used by these birds in past years.

Visitor Use Conflicts

Certain ocean beach areas of Sandy Hook have historically been used for specific purposes by park visitors even though the NPS has not purposely designated or delineated these areas for such use, These historic uses can be expected to continue in future years.

a) Lot C Beach: Used by surfers during periods when lifeguards are off duty. The presence of boats in areas used by surfers would produce hazards similar to those associated with allowing boats into swimming and bathing areas.

b) Lot F Beach: Used by fishermen throughout the year with periods of peak use from early spring to late fall. Launching and landing of boats would create a hazard to fishermen wading in the surf and standing at the water's edge. Fishermen casting their lines would create a hazard to the boaters.

Beach Areas Adjacent to Hazardous Waters and Currents

The waters from north end of the lifeguarded beach at Lot I (North Beach) to the USCG Station on the bays side of Sandy Hook are not suitable for the safe launching and landing of boats. Strong currents exist here during tidal changes and the often heavy surf makes this area dangerous for boating activities. The beach in this area is also designated as Critical Habitat for Piping Plovers so even during periods of calm water, boat launching and landing conflicts with threatened/endangered species protection practices.

The non-lifeguarded area between North Beach and Gunnison Beach is not safe for boating activity due to the presence of several large rocks in the water. These rocks are completely submerged at high tide. The non-lifeguarded area is of such a small size that many boats attempting to launch or land without coming too close to the guarded area would necessarily pass dangerously close to these rocks.

The only area not specifically addressed so far is south of the Gunnison shorebird nesting area and north of the fishing beach at Lot F. This area does not typically experience high levels of visitation and was not used in 1991 as a nesting area by Piping Plovers. However, the area is designated as Critical Habitat for Piping Plovers and therefore any planned increases or changes to recreational usage would require consultation with USF&WS prior to initiating such changes.

Compendium Appendix T
January 1992

Designations and conditions for the launching of vessels within the Sandy Hook Unit (Car Top Boating Program).

Purpose

The Sandy Hook Unit of Gateway National Recreation Area has recognized the need to establish a designated "Car-Top" boating area. This need is based on numerous visitor inquiries as to designated locations for launching and recovering vessels for the purpose of recreational access to the waters of Sandy Hook Bay.

The car top boating program will be conducted on an experimental basis and subject to periodic review. The National Park Service will insure that this program is not detrimental to environmental or scenic values, natural or cultural resources, and that launching activities do not compromise visitor safety and health or create conflicts among other visitor use activities. Based upon this review, the program and policy can be amended or terminated by the superintendent at any time.

Applicable Regulations

36 CFR 3.3 Authorizes the superintendent to require a permit for use of a vessel within a park area.

36 CFR 3.6(h) Prohibits the launching of a vessel by trailer except at designated launch sites.

36 CFR 3.6(i) Prohibits launching vessels propelled by machinery except at designated launch sites.

It is the purpose of this document to identify a launch site and set forth a policy and permit conditions for launching vessels within the Sandy Hook Unit.

Definition

For boats to qualify under the title of a "car-top" boater they must meet the following conditions. Any vessels which do not meet this criteria may not be launched at any location on Sandy Hook.

Conditions for "Car Top" Classification

1. Vessels propelled by machinery must be 16 feet or less in length.

2. Sailboats must be 16 feet or less in length.
3. Maximum horsepower may not exceed 25.
4. The vessel and equipment must be able to be hand carried. Pneumatic rollers may be used to guide boats to the water.
5. The vessel is not defined as personal watercraft. (Jet Ski)

Designated Location

A small section of bayside shoreline has been designated for car-top boat launching. The site is located between the two coastal fortification gun batteries known as Kingman and Mills, approximately 3/4 miles north of the Ranger Station.

Procedures and Regulations

1. Access to the Kingman and Mills boat launch site is by permit only. - Permits may be obtained at the Sandy Hook Ranger Station.
    - Boaters must register in the log book and provide departure and return times, and the number of persons on board. (Float Plan)
    - Boaters will be issued a key from the Ranger Station to access the gate. Keys must be returned immediately upon returning to the boat launch area.
    - A daily use pass will be issued to each vehicle.
    - No more than 5 passes will be issued at anyone time.
2. Launching of Jet Skis is prohibited.
3. Vessels may be transported to the launch site on top of vehicles or on trailers.
4. All vessels and equipment must be hand carried from the parking area to the water and from the water to the parking area upon returning. Pneumatic rollers may be used to guide boats into the water.
5. Backing trailers into the water to launch or recover vessels is strictly prohibited.
6. Boaters must launch and recover vessels in the designated launch zone. Obstructions and hazards may exist in other areas.
7. Boaters are expected to exercise caution and safety while operating vessels, and to follow all applicable state and federal laws pertaining to operation and equipment. Applicable laws include:

    Title 36 CFR part 3
    Title 33 CFR
    Title 46 CFR
    Title 49 CFR
    Title 7 NJSA
    Title 12 NJSA

    Vessels may be inspected by Park Rangers to insure compliance at any time.

8. Launching of vessels for the purpose of hunting is prohibited. Firearms are not permitted in park areas.
9. Boat launching and recovering activities must be conducted between sunrise and sunset. 10. The boat launching area will be closed between December 15 and March 15.
10. The boat launch areas may be closed at any time by the on-duty supervising ranger based on severe weather conditions, water pollution incidents, or other hazardous conditions.

11. Use of the boat launch area is limited to launching and recovering vessels. Other activities such as picnicking, swimming, sunbathing, etc. are not permitted. Entering Gun Batteries or other closed areas (Holly Forrest) is prohibited.
12. Driving vehicles outside of marked area is prohibited.
13. Violations of these conditions or any other park regulations are subject to revocation of the permit, fines and or imprisonment. -
14. The boat launch area may not be utilized for commercial purposes.

Compendium Appendix U
March 1992

Determination regarding the closure of intertidal zones for the protection of threatened and endangered wildlife.

The Sandy Hook Unit of Gateway National Recreation Area supports a significant breeding population of piping plover (*Charadrius melodus*). Piping plovers were afforded protection under the Endangered Species Act as a threatened species in 1986. The National Park Service's responsibility under the Endangered Species Act and our congressional mandates as a conservation agency to preserve and protect natural resources requires that the park actively manage shorebirds within the recreation area. This insures breeding success is not affected by the variety of land uses and visitor activities. After several years of research followed by review and recommendations of the US Fish and Wildlife Service it was determined that potential disturbances within the intertidal zone may be limiting the productivity and survival of piping plovers. It is the purpose of this determination to establish conditions for the closure of park areas to protect piping plovers.

Authority

Title 36 of the Code of Federal Regulations section 1.5 authorizes park superintendents to establish public use limits or to close all or a portion of a park area to all public use or to a specific use or activity. These closures and limits must be based upon a determination that such action is necessary... for the protection of natural and cultural resources... The legislative boundary of Gateway National Recreation Area extends 1/4 mile from the mean high water mark, which includes all intertidal areas. Jurisdiction and authority in this area has been further defined in the State of New Jersey Assembly, No. 2008, introduced on June 10, 1976 which states... "the secretary shall be and hereby is authorized to adopt, implement and enforce reasonable rules and regulations for the management, operation and control of Gateway National Recreation Area..."

Closure Description

To eliminate potential adverse affects within the intertidal zones the park has considered and adopted two closure alternatives based on the availability of trained and knowledgeable staff to monitor shorebird nesting activity. The preferred closure option relies on park staff identifying locations of shorebird nesting activity and considering a number of factors which affect plover productivity. These factors include; locations of nests, weather conditions, current and expected visitation, nesting behavior, egg and chick development, tolerance to disturbance, and availability of NPS personnel for protection.

If the National Park Service is unable *to* provide personnel *to* monitor plover development throughout the nesting season the superintendent will enact closures at all intertidal zones adjacent to piping plover nests. The preferred alternative provides greater latitude in permitting use of the intertidal zone. Critical periods can be identified and visitors can continue to utilize the intertidal beach when shorebirds are less likely to be affected. At a minimum two full time Resource Management Rangers and/or researchers must be available throughout the nesting season (March - August) to adequately monitor piping plovers, determine critical nesting periods, and institute closures.

Closure Conditions

Authority and responsibility for public closures rests with the unit Superintendent. Closures will be evaluated and recommended by the Chief Ranger and Resource Management Specialist. Environmental conditions and nesting status at each plover nest site will be determined by the resource management staff and/or researchers assigned to monitor the shorebirds.

The closure will be based on an evaluation of all of the following conditions, how the conditions interact, and the expected impact these conditions will have on plover productivity and survival.

1. Nesting behavior. Egg and Chick Development — This aspect is the primary and most important condition *for* determination of intertidal closure. The effects of disturbance, weather and predation depend greatly on the level of nesting activity or stage of plover development. Newly hatched chicks for example are at a greater risk from intertidal disturbance than eggs being incubated on the upper beach.

2. Weather — Weather conditions such as periods of prolonged temperature extremes and storm events cause additional stress to nesting shorebirds. Additionally, periods of poor weather for recreational activities may minimize stress to shorebirds due to reduced visitation and use of the intertidal zone. These factors will be considered in closure determinations.

3. Visitation — Visitation within the park has a direct correlation to the level of visitor use within the intertidal zone. The numbers of visitors utilizing the intertidal zone and the type of recreational activity they are engaged in cause different disturbances and have different effects on piping plovers. For instance, plover adults with chicks feeding in the intertidal zone may obtain adequate nourishment if disturbances are limited to a few persons walking the intertidal beach. These same birds however may be excluded from feeding by large numbers of walkers or sunbathers and persons picnicking at a stationary location near the nesting zones at the intertidal beach.

4. Tolerance to Disturbance — Different piping plover individuals have different levels of tolerance to disturbance than others. Some can tolerate heavy recreational use while others require more secure and less intrusive surroundings. The NPS staff monitoring shorebirds will weigh these factors in considering the need to effect an intertidal zone closure.

5. Predation — Opportunistic predators such as gulls, crows, raccoons, and feral cats can have devastating affects on the survival and productivity of piping plovers. This natural predation can be exacerbated by human disturbance as plovers leave their nests exposing eggs or chicks to predators. Additionally, predators can be attracted to trash left behind by beach users. Plovers already heavily impacted by predation may be afforded extra protection by closures of the intertidal zone.

Closure Procedure

Park staff responsible for monitoring shorebird activities will consider each of the above elements along with any other known factors causing disturbance or influencing plover productivity in determining if an intertidal closure will be necessary. The Resource Management Specialist and the Chief Ranger will be kept informed as to the current nesting status. When conditions indicate, the employees monitoring shorebirds and the Resource Management Specialist will notify the Chief Ranger and Superintendent of the need for an intertidal closure.

Upon approval from the Superintendent the Chief Ranger will provide adequate Law Enforcement personnel to enforce the closure. Signs indicating the areas of intertidal zone and beach which are closed shall be placed in the appropriate locations by park staff to inform the public. Visitor compliance with the closure is not voluntary. The appropriate level of enforcement will be utilized to gain compliance in accordance with NPS policy. A Case/Incident report (10-343) will be prepared for each intertidal zone closure outlining the conditions which led to the determination of the closure.

APPENDIX B: CONSULTATION REGARDING THREATENED AND ENDANGERED SPECIES

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930-2298

JUN 12 2002

Ms. Shannon R. Cauley
The Louis Berger Group, Inc.
1819 H Street, NW, Suite 900
Washington, DC 20006

Dear Ms. Cauley:

This responds to your inquiry on March 22, 2002, requesting information on the presence of any federally listed threatened or endangered species and/or designated critical habitat for listed species in the vicinity of the Gateway National Recreation Area.

The National Park Service (NPS) in compliance with the National Environmental Policy Act (NEPA) has contracted the Louis Berger Group, Inc. to prepare an Environmental Assessment (EA) to determine the potential effects associated with the use of personal watercraft (PWC) at the Gateway National Recreation Area. The Gateway National Recreation Area consists of four park units: Jamaica Bay, Breezy Point, Sandy Hook, and Staten Island. The EA will evaluate three alternatives concerning the use of PWC at Gateway. The alternatives include: no action (eliminating PWC use entirely); continuing PWC use under current park management policies; and continuing PWC use with additional operating restrictions.

Federally threatened loggerhead (*Caretta caretta*) and endangered Kemp's ridley sea turtles (*Lepidochelys kempi*) can be found in New York and New Jersey waters during the summer months. The general trend for sea turtles found in the New York Bight is to migrate to the region in early summer and return south when the water temperature decreases around October. While sea turtles occur in nearby New York waters (e.g., Long Island Sound, the eastern and southern bays) throughout the warmer months each year, there is limited documented evidence of their presence within the Harbor Complex. While habitat sampling has not recorded any sea turtles within the Upper New York Bay or the Lower New York Bay, there has been little attention and few resources focused directly on determining the frequency and extent of sea turtle distribution within the Harbor Complex. Given this information, it is difficult to confirm the presence or absence of sea turtles in any areas within the Harbor Complex. Sea turtles are in New York waters in the warmer months and are known to inhabit shallow harbors and embayments. Therefore, it is reasonable to assume that sea turtles may inhabit the Upper and Lower New York Bays. Federally endangered leatherback sea turtles (*Dermochelys coriacea*) are located in New York and New England waters during the warmer months as well. Concentrations of leatherbacks were observed during the summer off the

south shore of Long Island and off New Jersey. Leatherbacks in these waters are thought to be pursuing their preferred jellyfish prey.

Federally endangered Northern right whales (*Eubalaena glacialis*), humpback whales (*Megaptera novaeangliae*), and fin whales (*Balaenoptera physalus*) may all also be found seasonally in New York and New Jersey waters. Northern right whales have been documented in the nearshore waters of this region from January through September. Humpback whales feed during the spring, summer, and fall over a range, which encompasses the eastern coast of the United States. Fin whales are common in waters of the United States Exclusive Economic Zone, principally offshore from Cape Hatteras northward.

Consultation for Essential Fish Habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act may be necessary for this project due to the potential presence of federally managed species in the project area. A guide to essential fish habitat designations in the Northeastern United States is located on the Habitat Conservation Division web site at http://www.nero.nmfs.gov/ro/doc/index2a.htm.

Questions regarding EFH assessments in this area can be directed to Karen Greene at (732) 872-3023. Should you have any questions about the Protected Resources comments, please contact Kim Damon-Randall at (978) 281-9112.

Sincerely,

Mary A. Colligan
Assistant Regional Administrator
for Protected Resources

cc: Greene, F/NER4-SH

File Code: 1514-05 (A) General

New York State Department of Environmental Conservation
Division of Fish, Wildlife & Marine Resources
New York Natural Heritage Program
625 Broadway, 5th floor, Albany, New York 12233-4757
Phone: (518) 402-8935 • **FAX:** (518) 402-8925
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

May 30, 2002

Shannon R. Cauley
Senior Scientist
The Louis Berger Group
1819 H Street, NW
Washington, DC 20006

Dear Ms. Cauley:

In response to your request, we have reviewed the New York Natural Heritage Program database with respect to the New York portions of the Gateway National Recreation Area and vicinity, located in Richmond, Kings and Queens Counties, New York City.

Enclosed are reports of rare or state-listed animals and plants, significant natural communities, and other significant habitats, which our databases indicate occur, or may occur, on or in the vicinity of the New York portion of Gateway National Recreation Area. One reports lists records last documented more recently than 1979; the other lists historical records last documented before 1979. Note that we do not have any information on the Sandy Hook Unit in New Jersey; please contact the New Jersey Natural Heritage Program for that information.

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

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

Sincerely,

Nicholas Conrad
Information Resources Coordinator
NY Natural Heritage Program
518-402-8944

Encs.

31 MAY 2002 NEW YORK NATURAL HERITAGE PROGRAM REPORT ON RARE SPECIES FOR GATEWAY NRA SINCE 1980 PAGE 1

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	STATE LEGAL STATUS	FED. STATUS
** BIRDS					
Ardea alba	Great egret	G5	S2	PROTECTED	
Asio flammeus	Short-eared owl	G5	S2	ENDANGERED	
Bubulcus ibis	Cattle egret	G5	S2	PROTECTED	
Charadrius melodus	Piping plover	G3	S3B	ENDANGERED	(LE,LT)
Circus cyaneus	Northern harrier	G5	S3B,S3N	THREATENED	
Egretta thula	Snowy egret	G5	S2S3	PROTECTED	
Egretta tricolor	Tricolored heron	G5	S2	PROTECTED	
Falco peregrinus	Peregrine falcon	G4	S3B,SZN	ENDANGERED	(PS:LE)
Larus atricilla	Laughing gull	G5	S1	PROTECTED	
Plegadis falcinellus	Glossy ibis	G5	S2	PROTECTED	
Podilymbus podiceps	Pied-billed grebe	G5	S3B,S1N	THREATENED	
Rynchops niger	Black skimmer	G5	S2	PROTECTED - SPECIAL CONCERN	
Sterna antillarum	Least tern	G4	S3B	THREATENED	(PS:LE)
Sterna dougallii	Roseate tern	G4	S1B	ENDANGERED	(PS:LE,LT)
Sterna forsteri	Forster's tern	G5	S1	PROTECTED	
Sterna hirundo	Common tern	G5	S3B	THREATENED	
Tyto alba	Barn owl	G5	S3	PROTECTED	
** OTHERS					
Gull nesting colony	Gull nesting colony		S?	UNPROTECTED	
** VASCULAR PLANTS					
Amaranthus pumilus	Seabeach amaranth	G2	S2	ENDANGERED	LT
Asclepias viridiflora	Green milkweed	G5	S2	THREATENED	
Aster subulatus	Saltmarsh aster	G5	S2	THREATENED	
Bouteloua curtipendula	Side-oats grama	G5	S1	ENDANGERED	
Cenchrus tribuloides	Dune sandspur	G5	S2	THREATENED	
Chenopodium rubrum	Red pigweed	G5	S2	THREATENED	
Cyperus echinatus	Globose flatsedge	G5	S1	ENDANGERED	
Cyperus flavescens	Yellow flatsedge	G5	S1	ENDANGERED	
Cyperus lupulinus ssp lupulinus	Hop sedge	G5T5?	S2	THREATENED	
Cyperus retrorsus	Retrorse flatsedge	G5	S1	ENDANGERED	
Cyperus schweinitzii	Schweinitz's flatsedge	G5	S3	RARE	
Eupatorium album var subvenosum	White boneset	G5T3T4	S2S3	THREATENED	
Eupatorium hyssopifolium var laciniatum	Fringed boneset	G5T4T5	S2	THREATENED	
Juncus scirpoides	Scirpus-like rush	G5	S1	ENDANGERED	
Oenothera laciniata	Cut-leaved evening-primrose	G5	S1	ENDANGERED	
Oenothera parviflora	Evening primrose	G4G5Q	S2	THREATENED	
Poa sylvestris	Woodland bluegrass	G5	S1	ENDANGERED	
Polygonum glaucum	Seabeach knotweed	G3	S3	RARE	
Polygonum hydropiperoides var opelousanum	Opelousa smartweed	G5T?Q	S2S3	THREATENED	
Quercus phellos	Willow oak	G5	S1	ENDANGERED	
Sporobolus clandestinus	Rough rush-grass	G5	S1	ENDANGERED	
Suaeda linearis	Narrow-leaf sea-blite	G5	S1	ENDANGERED	

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SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	STATE LEGAL STATUS	FED. STATUS
Suaeda rolandii	Roland's sea-blite	G1G2Q	S1	ENDANGERED	
Tripsacum dactyloides	Northern gamma grass	G5	S2	THREATENED	
** COMMUNITIES					
Low salt marsh	Low salt marsh	G5	S3S4	UNPROTECTED	

43 Records Processed

USERS GUIDE TO NY NATURAL HERITAGE DATA

New York Natural Heritage Program, 700 Troy-Schenectady Road, Latham NY 12110-2400 phone: (518) 783-3932

NATURAL HERITAGE PROGRAM: The Natural Heritage Program is an ongoing, systematic, scientific inventory whose goal is to compile and maintain data on the rare plants and animals native to New York State, and significant ecological communities. The data provided in the report facilitate sound planning, conservation, and natural resource management and help to conserve the plants, animals and ecological communities that represent New York's natural heritage.

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

NATURAL HERITAGE REPORTS (may contain any of the following types of data):

COUNTY NAME: County where the occurrence of a rare species or significant ecological community is located.
TOWN NAME: Town where the occurrence of a rare species or significant ecological community is located.
USGS 7 ½' TOPOGRAPHIC MAP: Name of 7.5 minute US Geological Survey (USGS) quadrangle map (scale 1:24,000).

SIZE (acres): Approximate acres occupied by the rare species or significant ecological community at this location. A blank indicates unknown size.
SCIENTIFIC NAME: Scientific name of the occurrence of a rare species or significant ecological community.
COMMON NAME: Common name of the occurrence of a rare species or significant ecological community.
ELEMENT TYPE: Type of element (i.e. plant, animal, significant ecological community, other, etc.)

LAST SEEN: Year rare species or significant ecological community last observed extant at this location.

EO RANK: Comparative evaluation summarizing the quality, condition, viability and defensibility of this occurrence. Use with LAST SEEN.
A-E = Extant: A=excellent, B=good, C=marginal, D=poor, E=extant but with insufficient data to assign a rank of A - D.
F = Failed to find. Did not locate species, but habitat is still there and further field work is justified.
H = Historical. Historical occurrence without any recent field information.
X = Extirpated. Field/other data indicates element/habitat is destroyed and the element no longer exists at this location.
? = Unknown.
Blank = Not assigned.

NEW YORK STATE STATUS (animals): Categories of Endangered and Threatened species are defined in New York State Environmental Conservation Law section 11-0535. Endangered, Threatened, and Special Concern species are listed in regulation 6NYCRR 182.5.
E = Endangered Species: any species which meet one of the following criteria:
1) Any native species in imminent danger of extirpation or extinction in New York.
2) Any species listed as endangered by the United States Department of the Interior, as enumerated in the Code of Federal Regulations 50 CFR 17.11.
T = Threatened Species: any species which meet one of the following criteria:
1) Any native species likely to become an endangered species within the foreseeable future in NY.
2) Any species listed as threatened by the U.S. Department of the Interior, as enumerated in the Code of the Federal Regulations 50 CFR 17.11.
SC = Special Concern Species: those species which are not yet recognized as endangered or threatened, but for which documented concern exists for their continued welfare in New York. Unlike the first two categories, species of special concern receive no additional legal protection under Environmental Conservation Law section 11-0535 (Endangered and Threatened Species).
P = Protected Wildlife (defined in Environmental Conservation Law section 11-0103): wild game, protected wild birds, and endangered species of wildlife.
U = Unprotected (defined in Environmental Conservation Law section 11-0103): the species may be taken at any time without limit; however a license to take may be required.
G = Game (defined in Environmental Conservation Law section 11-0103): any of a variety of big game or small game species as stated in the Environmental Conservation Law; many normally have an open season for at least part of the year, and are protected at other times.

NEW YORK STATE STATUS (plants): The following categories are defined in regulation 6NYCRR part 193.3 and apply to NYS Environmental Conservation Law section 9-1503.
E = Endangered Species: listed species are those with:
1) 5 or fewer extant sites, or
2) fewer than 1,000 individuals, or
3) restricted to fewer than 4 U.S.G.S. 7 ½ minute topographical maps, or
4) species listed as endangered by U.S. Department of Interior, as enumerated in Code of Federal Regulations 50 CFR 17.11.
T = Threatened: listed species are those with:
1) 6 to fewer than 20 extant sites, or
2) 1,000 to fewer than 3,000 individuals, or
3) restricted to not less than 4 or more than 7 U.S.G.S. 7 and ½ minute topographical maps, or
4) listed as threatened by U.S. Department of Interior, as enumerated in Code of Federal Regulations 50 CFR 17.11.
R = Rare: listed species have:
1) 20 to 35 extant sites, or
2) 3,000 to 5,000 individuals statewide.

continued on next page

page 2 Users Guide to Natural Heritage Data

V = Exploitably vulnerable: listed species are likely to become threatened in the near future throughout all or a significant portion of their range within the state if causal factors continue unchecked.
U = Unprotected; no state status.

NEW YORK STATE STATUS (communities): At this time there are no categories defined for communities.

FEDERAL STATUS (plants and animals): The categories of federal status are defined by the United States Department of the Interior as part of th 1974 Endangered Species Act (see Code of Federal Regulations 50 CFR 17). The species listed under this law are enumerated in the Federal Registe vol. 50, no. 188, pp. 39526 - 39527.

(blank) = No Federal Endangered Species Act status.
LE = The element is formally listed as endangered.
LT = The element is formally listed as threatened.
E/SA = The element is treated as endangered because of similarity of appearance to other endangered species or subspecies.
PE = The element is proposed as endangered.
PT = The element is proposed as threatened.
C= The element is a candidate for listing.
(LE) = If the element is a full species, all subspecies or varieties are listed as endangered; if the element is a subspecies, the full species is listed as endangered.
(LE-LT) = The species is formally listed as endangered in part of its range, and as threatened in the other part; or, one or more subspecies or varieties is listed as endangered, and the others are listed as threatened.
(LT-C) = The species is formally listed as threatened in part of its range, and as a candidate for listing in the other part; or, one or more subspecies varieties is listed as threatened, and the others are candidates for listing.
(LT-(T/SA)) = One or more subspecies or populations of the species is formally listed as threatened, and the others are treated as threatened because of similarity of appearance to the listed threatened subspecies or populations.
(PS) = Partial status: the species is listed in parts of its range and not in others; or, one or more subspecies or varieties is listed, while the others are not listed.

GLOBAL AND STATE RANKS (animals, plants, ecological communities and others): Each element has a global and state rank as determined by the NY Natural Heritage Program. These ranks carry no legal weight. The global rank reflects the rarity of the element throughout the world and th state rank reflects the rarity within New York State. Infraspecific taxa are also assigned a taxon rank to reflect the infraspecific taxon's rank throughou the world. ? = Indicates a question exists about the rank. Range ranks, e.g. S1S2, indicate not enough information is available to distinguish between two ranks.

GLOBAL RANK:
G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences), or very few remaining acres, or miles of stream) or especially vulnerable to extinction because of some factor of its biology.
G2 = Imperiled globally because of rarity (6 - 20 occurrences, or few remaining acres, or miles of stream) or very vulnerable to extinction throughout its range because of other factors.
G3 = Either rare and local throughout its range (21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range (e.g. a physiographic region), or vulnerable to extinction throughout its range because of other factors.
G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
GH = Historically known, with the expectation that it might be rediscovered.
GX = Species believed to be extinct.

STATE RANK:
S1 = Typically 5 or fewer occurrences, very few remaining individuals, acres, or miles of stream, or some factor of its biology making it especially vulnerable in New York State.
S2 = Typically 6 to 20 occurrences, few remaining individuals, acres, or miles of stream, or factors demonstrably making it very vulnerable in New York State.
S3 = Typically 21 to 100 occurrences, limited acreage, or miles of stream in New York State.
S4 = Apparently secure in New York State.
S5 = Demonstrably secure in New York State.
SH = Historically known from New York State, but not seen in the past 15 years.
SX = Apparently extirpated from New York State.
SZ = Present in New York State only as a transient migrant.

SxB and SxN, where Sx is one of the codes above, are used for migratory animals, and refer to the rarity within New York State of the breeding (B) populations and the non-breeding populations (N), respectively, of the species.

TAXON (T) RANK: The T-ranks (T1 - T5) are defined the same way as the Global ranks (G1 - G5), but the T-rank refers only to the rarity of the subspecific taxon.
T1 through T5 = See Global Rank definitions above.
Q = Indicates a question exists whether or not the taxon is a good taxonomic entity.

OFFICE USE: Information for use by the Natural Heritage Program.

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
New Jersey Field Office
Ecological Services
927 North Main Street, Building D
Pleasantville, New Jersey 08232
Tel: 609/646 9310
Fax: 609/646 0352
http://njfieldoffice.fws.gov

In Reply Refer to:

ES-02/451

AUG 5 2002

Shannon R. Cauley, Senior Scientist
The Louis Berger Group, Inc.
1819 H Street, NorthWest
Washington, DC 20006

Dear Ms. Cauley:

This responds to your June 26, 2002 request to the U.S. Fish and Wildlife Service (Service) for information on the presence of federally listed endangered and threatened species within the vicinity of the proposed use of personal watercraft (PWC) to be located within the National Park Service's Gateway National Recreation Area, Sandy Hook Unit (Sandy Hook), New Jersey. The following comments are applicable to the State of New Jersey only. Please contact the Service's Long Island Field Office for any Service concerns regarding the proposed activities in New York.

Long Island Field Office
U.S. Fish and Wildlife Service
P.O. Box 608
Islip, New York 11751-0608
(631) 581-2941

AUTHORITY

This response is provided pursuant to the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to ensure the protection of endangered and threatened species and does not address all Service concerns for fish and wildlife resources. These comments do not preclude separate review and comments by the Service as afforded by the Fish and Wildlife Coordination Act (48 Stat. 401; 16 U.S.C. 661 *et seq.*), if project implementation requires a permit from the U.S. Army Corps of Engineers pursuant to the Clean Water Act of 1977 (33 U.S.C. 1344 *et seq.*), nor do they preclude comments on any forthcoming environmental documents pursuant to the National Environmental Policy Act of 1969 as amended (83 Stat. 852; 42 U.S.C. 4321 *et seq.*) (NEPA).

FEDERALLY LISTED SPECIES

Piping plovers

There are known nesting occurrences of the federally listed (threatened) piping plover *(Charadrius melodus)* located within the project site in New Jersey. These small, territorial shorebirds are present on the New Jersey shore between March and August. Piping plovers nest above the high tide line, usually on sandy ocean beaches and barrier islands, but also on gently sloping foredunes, blowout areas behind primary dunes, washover areas cut into or between dunes, the ends of sandspits, and deposits of suitable dredged or pumped sand. Piping plover nests consist of a shallow scrape in the sand, frequently lined with shell fragments and often located near small clumps of vegetation. Piping plover adults and chicks feed on marine invertebrates such as worms, fly larvae, beetles, and crustaceans. Feeding areas include the intertidal zone of ocean beaches, ocean washover areas, mudflats, sandflats, wrack lines (organic ocean material left by high tide), and the shorelines of coastal ponds, lagoons, and salt marshes.

Threats to the piping plover include habitat loss, human disturbance of nesting birds, predation, and oil spills and other contaminants. Habitat loss results from development, as well as from beach stabilization, beach nourishment, and other physical alterations to the beach ecosystem. Human disturbance of nesting birds includes foot traffic, sunbathing, kite flying, pets, fireworks displays, beach raking, construction, and vehicle use. These disturbances can result in crushing of eggs, failure of eggs to hatch, and death of chicks. Predation on piping plover chicks and eggs is intensified by development because predators such as foxes, gulls, and raccoons, thrive in developed areas and are attracted to beaches by food scraps and trash. Unleashed and feral dogs and cats also prey on piping plover chicks and eggs.

Seabeach amaranth

Known occurrences of the federally listed (threatened) plant seabeach amaranth (*Amaranthus pumilus*) are located within the project site. Seabeach amaranth is an annual plant endemic to Atlantic Coast beaches and barrier islands. The primary habitat of seabeach amaranth consists of overwash flats at accreting ends of islands, lower foredunes, and upper strands of non-eroding beaches (landward of the wrackline), although the species occasionally establishes small temporary populations in other habitats, including sound-side beaches, blowouts in foredunes, inter-dunal areas, and on sand and shell material deposited for beach replenishment or as dredge spoil. Seabeach amaranth usually is found growing on a nearly pure sand substrate, occasionally with shell fragments mixed in.

Seabeach amaranth occupies elevations from 8 inches to 5 feet above mean high tide. The plant grows above the high tide line and is intolerant of even occasional flooding during its growing season. The plant is dependent on a terrestrial, upper beach habitat that is not flooded during the growing season from May into the fall. The habitat of seabeach amaranth is sparsely vegetated with annual herbs and, less commonly, perennial herbs (mostly grasses) and scattered shrubs.

Vegetative associates of seabeach amaranth include sea rocket (*Cakile edentula*), seabeach spurge (*Chamaesyce polygonifolia*), and other species of open, sandy beach habitats. However, this species is intolerant of competition and does not occur on well-vegetated sites. Seabeach amaranth is often associated with beaches managed for the protection of beach nesting birds such as the piping plover (*Charadrius melodus*) and least tern (*Sterna antillarum*). Threats to seabeach amaranth include beach stabilization efforts (particularly the use of beach armoring, such as sea walls and riprap), intensive recreational use, and herbivory by webworms.

Northeastern beach tiger beetles

There are also, known occurrences of the federally listed (threatened) northeastern beach tiger beetle *(Cicindela dorsalis dorsalis)* located within the project site. Northeastern beach tiger beetles inhabit the intertidal zone of wide, sandy ocean beaches. Adults prey and scavenge on amphipods, flies, and other beach arthropods along the water's edge. Eggs are deposited in the mid- to above-high tide drift zone. Larval beetles occur in a relatively narrow band of the upper intertidal to high drift zone, taking nearly 2 years to develop from eggs to adults. Larvae dig vertical burrows in the sand and wait at the burrow mouth to capture passing prey, primarily small amphipods. The primary threat to the northeastern beach tiger beetle is habitat disturbance and destruction from development, beach stabilization activities, and recreational beach uses including pedestrian and vehicle traffic, all of which affect the larvae. Other threats include spills of oil or other contaminants, pesticide use, natural or human-induced beach erosion, and natural factors such as predation and storms.

CONSULTATION REQUIREMENTS UNDER THE ESA

Endangered species and their habitats are afforded protection under Section 7(a)(2) of the Endangered Species Act (ESA), which requires every federal agency, in consultation with the Service, to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. An assessment of potential direct, indirect, and cumulative impacts is required for all federal actions that may affect listed species. Since the proposed use of PWC's within Sandy Hook requires authorization from the National Park Service, further consultation pursuant to Section 7 of the ESA will be required due to the presence of piping plovers, northeastern beach tiger beetles, and seabeach amaranth within the project site.

The lead federal agency for an action has the responsibility under Section 7(c) of the Endangered Species Act (ESA) to prepare a Biological Assessment (BA), if the proposed action may affect a species listed under the ESA. The BA should contain information concerning listed or proposed species that may be present in the action area and an analysis of any potential effects of the proposed action on such species. The following may be considered for inclusion in a BA of the proposed action, although actual contents are at the discretion of the lead federal agency:

1. results of field surveys to determine if listed species are present or occur seasonally;
2. views of recognized experts on the species;
3. literature review;
4. analysis of direct, indirect, and cumulative effects of the action on the species; and,
5. analysis of alternative actions.

Disturbance of beach, dune, intertidal or nearshore areas, or increased human use may occur as a result of project implementation. Therefore, the BA should contain an analysis of effects to the piping plover, northeastern beach tiger beetle, and seabeach amaranth. The BA should also contain an assessment of the effects of an oil spill or fuel spill on these species due to use of the PWC on Sandy Hook. Biological Assessments may be consolidated with interagency cooperation procedures required by other statutes such as the Fish and Wildlife Coordination Act (48 Stat. 401; 16 U.S.C. 661 *et seq.*) or NEPA. The results of a BA may be incorporated into the NEPA document. The satisfaction of the requirements of these other statutes, however, does not in itself relieve a federal agency of its obligation to comply with the BA procedures of the ESA. If the BA indicates that no federally listed or proposed species are present or will be affected, and the Service concurs in writing, then no formal consultation pursuant to Section 7 of the ESA will be required. The results of the BA must be forwarded to this office to determine if further consultation is necessary to protect piping plover, northeastern beach tiger beetle, and seabeach amaranth.

Except for the above-mentioned species and an occasional transient bald eagle (*Haliaeetus leucocephalus*) or Roseate tern (*Sterna dougallii dougallii*), no other federally listed or proposed endangered or threatened flora or fauna under Service jurisdiction are known to occur within the vicinity of the proposed project site. If additional information on federally listed species becomes available, or if project plans change, this determination may be reconsidered.

Current information regarding federally listed and candidate species occurring in New Jersey is enclosed, as well as addresses of State agencies that may be contacted for current site-specific information regarding federal candidate and State-listed species. The Service encourages federal agencies and other planners to consider federal candidate species in project planning.

Please contact Lisa Solberg of my staff at (609) 646-9310, extension 47 if you have any questions about the enclosed material or require further assistance regarding federally listed endangered or threatened species.

Sincerely,

John C. Staples
Assistant Supervisor

Enclosures

4

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN NEW JERSEY

An **ENDANGERED** species is any species that is in danger of extinction throughout all or a significant portion of its range.

A **THREATENED** species is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

	COMMON NAME	SCIENTIFIC NAME	STATUS
FISHES	Shortnose sturgeon*	*Acipenser brevirostrum*	E
REPTILES	Bog turtle	*Clemmys muhlenbergii*	T
	Atlantic Ridley turtle*	*Lepidochelys kempii*	E
	Green turtle*	*Chelonia mydas*	T
	Hawksbill turtle**	*Eretmochelys imbricata*	E
	Leatherback turtle*	*Dermochelys coriacea*	E
	Loggerhead turtle*	*Caretta caretta*	T
BIRDS	Bald eagle	*Haliaeetus leucocephalus*	T
	Piping plover	*Charadrius melodus*	T
	Roseate tern	*Sterna dougallii dougallii*	E
MAMMALS	Eastern cougar	*Felis concolor couguar*	E+
	Indiana bat	*Myotis sodalis*	E
	Gray wolf	*Canis lupus*	E+
	Delmarva fox squirrel	*Sciurus niger cinereus*	E+
	Blue whale*	*Balaenoptera musculus*	E
	Finback whale*	*Balaenoptera physalus*	E
	Humpback whale*	*Megaptera novaeangliae*	E
	Right whale*	*Balaena glacialis*	E
	Sei whale*	*Balaenoptera borealis*	E
	Sperm whale*	*Physeter macrocephalus*	E

	COMMON NAME	SCIENTIFIC NAME	STATUS
INVERTEBRATES	Dwarf wedgemussel	*Alasmidonta heterodon*	E
	Northeastern beach tiger beetle	*Cicindela dorsalis dorsalis*	T
	Mitchell saytr butterfly	*Neonympha m. mitchellii*	E+
	American burying beetle	*Nicrophorus americanus*	E+
PLANTS	Small whorled pogonia	*Isotria medeoloides*	T
	Swamp pink	*Helonias bullata*	T
	Knieskern's beaked-rush	*Rhynchospora knieskernii*	T
	American chaffseed	*Schwalbea americana*	E
	Sensitive joint-vetch	*Aeschynomene virginica*	T
	Seabeach amaranth	*Amaranthus pumilus*	T

STATUS:			
E	endangered species	PE	proposed endangered
T	threatened species	PT	proposed threatened
+	presumed extirpated**		

* Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service.

** Current records indicate the species does not presently occur in New Jersey, although the species did occur in the State historically.

Note: for a complete listing of Endangered and Threatened Wildlife and Plants, refer to 50 CFR 17.11 and 17.12.

For further information, please contact:

U.S. Fish and Wildlife Service
New Jersey Field Office
927 N. Main Street, Building D
Pleasantville, New Jersey 08232
Phone: (609) 646-9310
Fax: (609) 646-0352

Revised 12/06/00

FEDERAL CANDIDATE SPECIES IN NEW JERSEY

CANDIDATE SPECIES are species that appear to warrant consideration for addition to the federal List of Endangered and Threatened Wildlife and Plants. Although these species receive no substantive or procedural protection under the Endangered Species Act, the U.S. Fish and Wildlife Service encourages federal agencies and other planners to give consideration to these species in the environmental planning process.

SPECIES	SCIENTIFIC NAME
Bog asphodel	*Narthecium americanum*
Hirst's panic grass	*Panicum hirstii*

Note: For complete listings of taxa under review as candidate species, refer to Federal Register Vol. 64, No. 205, October 25, 1999 (Endangered and Threatened Wildlife and Plants; Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species).

Revised 11/99

FEDERAL CANDIDATE AND STATE-LISTED SPECIES

Candidate species are species under consideration by the U.S. Fish and Wildlife Service (Service) for possible inclusion on the List of Endangered and Threatened Wildlife and Plants. Although these species receive no substantive or procedural protection under the Endangered Species Act, the Service encourages federal agencies and other planners to consider federal candidate species in project planning.

The New Jersey Natural Heritage Program maintains the most up-to-date information on federal candidate species and State-listed species in New Jersey and may be contacted at the following address:

Mr. Thomas Breden
Natural Heritage Program
Division of Parks and Forestry
P.O. Box 404
Trenton, New Jersey 08625
(609) 984-0097

Additionally, information on New Jersey's State-listed wildlife species may be obtained from the following office:

Dr. Larry Niles
Endangered and Nongame Species Program
Division of Fish and Wildlife
P.O. Box 400
Trenton, New Jersey 08625
(609) 292-9400

If information from either of the aforementioned sources reveals the presence of any federal candidate species within a project area, the Service should be contacted to ensure that these species are not adversely affected by project activities.

Revised 08/00

State of New Jersey

James E. McGreevey
Governor

Department of Environmental Protection
Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
P.O. Box 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

Bradley M. Campbell
Commissioner

June 20, 2002

Shannon R. Cauley
The Louis Berger Group, Inc.
1819 H Street, NW
Washington, DC 20006

Re: Gateway National Recreation Area, Sandy Hook Unit

Dear Shannon Cauley:

Thank you for your data request regarding rare species information for the above referenced project site in Middletown Township, Monmouth County.

The Natural Heritage Data Base has twenty three records for occurrences of rare species and natural communities that may be on the site. The attached list provides more information about these occurrences. **Because some species are sensitive to disturbance or sought by collectors, this information is provided to you on the condition that no specific locational data are released to the general public. This is not intended to preclude your submission of this information to regulatory agencies from which you are seeking permits.**

Also attached is a list of rare species and natural communities that have been documented from Monmouth County. This county list can be used as a master species list for directing further inventory work. If suitable habitat is present at the project site, these species have potential to be present. If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend you contact the Division of Fish and Wildlife, Endangered and Nongame Species Program.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and natural communities. One of these sites is located within or near the areas you have outlined. Please refer to the enclosed Natural Heritage Priority Site Map for the location and boundary of this site. On the back of each Priority Site Map is a report describing the significance of the site.

PLEASE SEE THE ATTACHED 'CAUTIONS AND RESTRICTIONS ON NHP DATA'.

Thank you for consulting the Natural Heritage Program. The attached invoice details the

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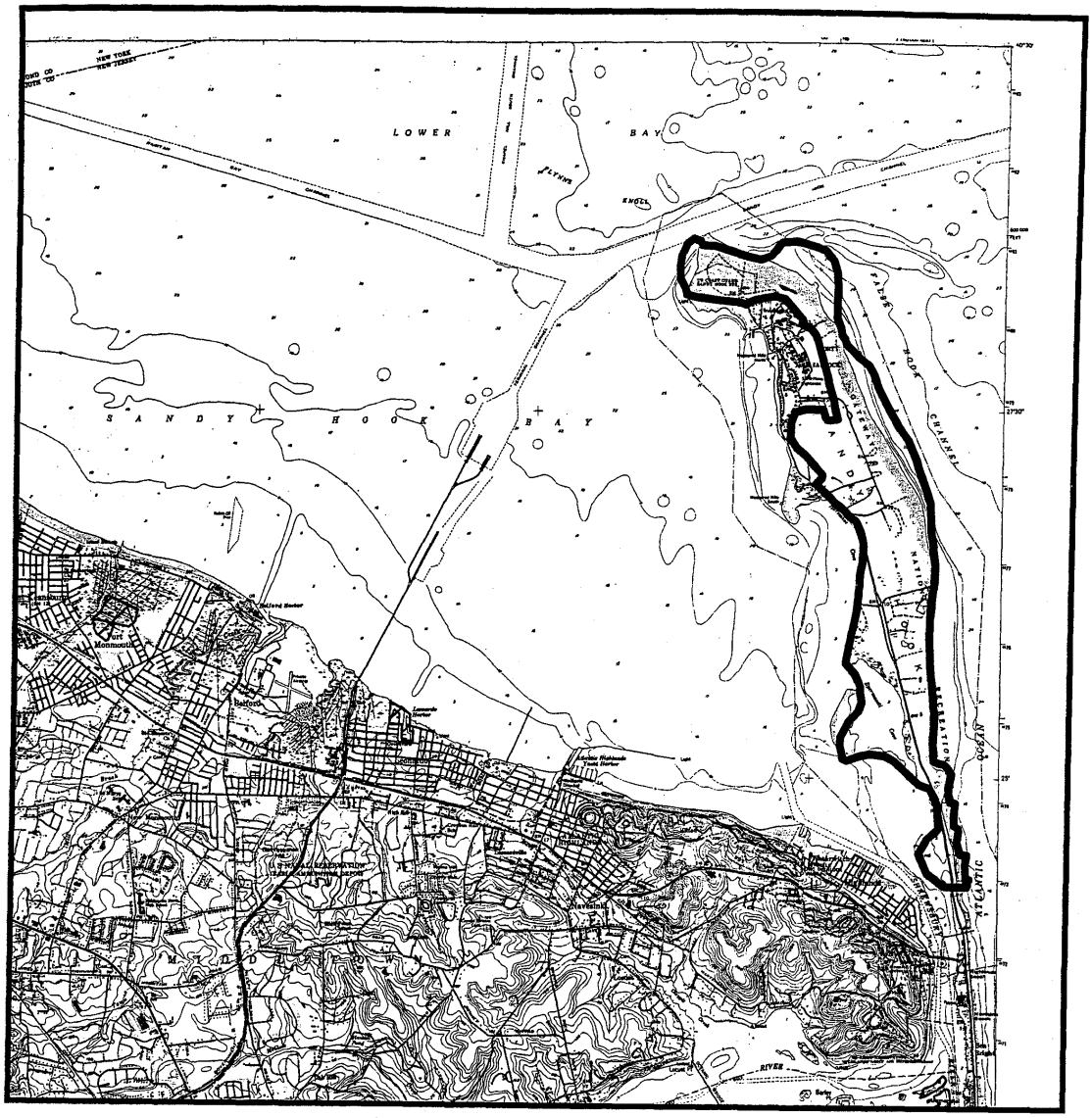
payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

Herbert A. Lord

Herbert A. Lord
Data Request Specialist

cc: Thomas F. Breden
Lawrence Niles
NHP File No. 02-4007348



Natural Heritage Priority Site

Sandy Hook

Monmouth County

NJ Department of Environmental Protection
Division of Parks and Forestry
Natural Lands Management

0.9 0 0.9 Miles

Priority Site
Public Land

N W E S

Natural Heritage Priority Site
Sandy Hook

Locational Information

Quad Name: Sandy Hook
County: Monmouth
Municipality Middletown Twp

Description of Site

The site contains extensive beach and undeveloped dune natural communities along the Sandy Hook spit.

Boundary Justification

Secondary bounds include all undeveloped dune and beach communities on the Sandy Hook spit. Developed portions of Fort Hancock and marshes immediately north of Horseshoe Cove are excluded.

Biodiversity Rank B2

Contains excellent populations of a globally rare State Endangered bird species, good stands of two globally rare natural communities, populations of two additional State Endangered bird species, and a migratory shorebird concentration site.

NJ Department of Environmental Protection
Division of Parks and Forestry
Natural Lands Management

July, 2001
Site Code: S.USNJHP1*475

1
19 JUN 2002

POSSIBLY ON PROJECT SITE
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK	DATE OBSERVED	IDENT.	LOCATION
*** Vertebrates									
CHARADRIUS MELODUS	PIPING PLOVER	LT	E		G3	S1B	2001-??-??	Y	[redacted]
CHARADRIUS MELODUS	PIPING PLOVER	LT	E		G3	S1B	2001-??-??	Y	
CHARADRIUS MELODUS	PIPING PLOVER	LT	E		G3	S1B	2001-??-??	Y	
CHARADRIUS MELODUS	PIPING PLOVER	LT	E		G3	S1B	2001-??-??	Y	
CHARADRIUS MELODUS	PIPING PLOVER	LT	E		G3	S1B	1987-07-??	Y	
CHARADRIUS MELODUS	PIPING PLOVER	LT	E		G3	S1B	2001-??-??	Y	
IXOBRYCHUS EXILIS	LEAST BITTERN		D/S		G5	S3B	1999-08-25		
PANDION HALIAETUS	OSPREY		T/T		G5	S2B	1987-??-??	Y	
PANDION HALIAETUS	OSPREY		T/T		G5	S2B	1987-??-??	Y	

2
19 JUN 2002

POSSIBLY ON PROJECT SITE
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK	DATE OBSERVED	IDENT.	LOCATION
PANDION HALIAETUS	OSPREY		T/T		G5	S2B	1987-??-??	Y	[redacted]
RYNCHOPS NIGER	BLACK SKIMMER		E		G5	S1B	1986-SUMMR	Y	
STERNA ANTILLARUM	LEAST TERN		E		G4	S1B	1996-06-??	Y	
STERNA ANTILLARUM	LEAST TERN		E		G4	S1B	1996-SUMMR	Y	
STERNA ANTILLARUM	LEAST TERN		E		G4	S1B	1986-SUMMR	Y	
*** Ecosystems									
COASTAL DUNE WOODLAND	COASTAL DUNE WOODLAND				G2G3	S1	1986-02-04		
MARITIME FOREST	MARITIME FOREST				G3?	S1	1986-02-04		
*** Invertebrates									
CALLOPHRYS HENRICI	HENRY'S ELFIN				G5	S3S4	1991-05-04	Y	

*** Other types

3
19 JUN 2002

POSSIBLY ON PROJECT SITE
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK	SRANK	DATE OBSERVED	IDENT.	LOCATION
MIGRATORY SHOREBIRD CONCENTRATION SITE	MIGRATORY SHOREBIRD CONCENTRATION SITE				G?	S?	1982-10-??	Y	[redacted]
MIGRATORY SHOREBIRD CONCENTRATION SITE	MIGRATORY SHOREBIRD CONCENTRATION SITE				G?	S?	1982-10-??	Y	
MIGRATORY SHOREBIRD CONCENTRATION SITE	MIGRATORY SHOREBIRD CONCENTRATION SITE				G?	S?	1982-10-??	Y	
*** Vascular plants									
AMARANTHUS PUMILUS	SEABEACH AMARANTH	LT	E		G2	S1	2000-09-07	Y	
ARTEMISIA CAMPESTRIS SSP CAUDATA	BEACH WORMWOOD				G5T5	S2	1980-09-27	Y	
POLYGONUM GLAUCUM	SEA-BEACH KNOTWEED		E		G3	S1	1993-07-01	Y	

23 Records Processed

EXPLANATIONS OF CODES USED IN NATURAL HERITAGE REPORTS

FEDERAL STATUS CODES

The following U.S. Fish and Wildlife Service categories and their definitions of endangered and threatened plants and animals have been modified from the U.S. Fish and Wildlife Service (F.R. Vol. 50 No. 188; Vol. 61, No. 40; F.R. 50 CFR Part 17). Federal Status codes reported for species follow the most recent listing.

LE Taxa formally listed as endangered.

LT Taxa formally listed as threatened.

PE Taxa already proposed to be formally listed as endangered.

PT Taxa already proposed to be formally listed as threatened.

C Taxa for which the Service currently has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.

S/A Similarity of appearance species.

STATE STATUS CODES

Two animal lists provide state status codes after the Endangered and Nongame Species Conservation Act of 1973 (NSSA 23:2A-13 et. seq.): the list of endangered species (N.J.A.C. 7:25-4.13) and the list defining status of indigenous, nongame wildlife species of New Jersey (N.J.A.C. 7:25-4.17(a)). The status of animal species is determined by the Nongame and Endangered Species Program (ENSP). The state status codes and definitions provided reflect the most recent lists that were revised in the New Jersey Register, Monday, June 3, 1991.

D Declining species-a species which has exhibited a continued decline in population numbers over the years.

E Endangered species-an endangered species is one whose prospects for survival within the state are in immediate danger due to one or many factors - a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow.

EX Extirpated species-a species that formerly occurred in New Jersey, but is not now known to exist within the state.

I Introduced species-a species not native to New Jersey that could not have established itself here without the assistance of man.

INC Increasing species-a species whose population has exhibited a significant increase, beyond the normal range of its life cycle, over a long term period.

T Threatened species-a species that may become endangered if conditions surrounding the species begin to or continue to deteriorate.

P Peripheral species-a species whose occurrence in New Jersey is at the extreme edge of its present natural range.

S Stable species-a species whose population is not undergoing any long-term increase/decrease within its natural cycle.

U Undetermined species-a species about which there is not enough information available to determine the status.

Status for animals separated by a slash(/) indicate a dual status. First status refers to the state breeding population, and the second status refers to the migratory or winter population.

Plant taxa listed as endangered are from New Jersey's official Endangered Plant Species List N.J.S.A. 131B-15.151 et seq.

E Native New Jersey plant species whose survival in the State or nation is in jeopardy.

REGIONAL STATUS CODES FOR PLANTS

LP Indicates taxa listed by the Pinelands Commission as endangered or threatened within their legal jurisdiction. Not all species currently tracked by the Pinelands Commission are tracked by the Natural Heritage Program. A complete list of endangered and threatened Pineland species is included in the New Jersey Pinelands Comprehensive Management Plan.

EXPLANATION OF GLOBAL AND STATE ELEMENT RANKS

The Nature Conservancy has developed a ranking system for use in identifying elements (rare species and natural communities) of natural diversity most endangered with extinction. Each element is ranked according to its global, national, and state (or subnational in other countries) rarity. These ranks are used to prioritize conservation work so that the most endangered elements receive attention first. Definitions for element ranks are after The Nature Conservancy (1982: Chapter 4, 4.1-1 through 4.4.1.3-3).

GLOBAL ELEMENT RANKS

G1 Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout it's range; with the number of occurrences in the range of 21 to 100.

G4 Apparently secure globally; although it may be quite rare in parts of its range, especially at the periphery.

G5 Demonstrably secure globally; although it may be quite rare in parts of its range, especially at the periphery.

GH Of historical occurrence throughout its range i.e., formerly part of the established biota, with the expectation that it may be rediscovered.

GU Possibly in peril range-wide but status uncertain; more information needed.

GX Believed to be extinct throughout range (e.g., passenger pigeon) with virtually no likelihood that it will be rediscovered.

G? Species has not yet been ranked.

STATE ELEMENT RANKS

S1 Critically imperiled in New Jersey because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres). Elements so ranked are often restricted to very specialized conditions or habitats and/or restricted to an extremely small geographical area of the state. Also included are elements which were formerly more abundant, but because of habitat destruction or some other critical factor of its biology, they have been demonstrably reduced in abundance. In essence, these are elements for which, even with intensive searching, sizable additional occurrences are unlikely to be discovered.

S2 Imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically many of these elements may have been more frequent but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences.

S3 Rare in state with 21 to 100 occurrences (plant species in this category have only 21 to 50 occurrences). Includes elements which are widely distributed in the state but with small populations/acreage or elements with restricted distribution, but locally abundant. Not yet imperiled in state but may soon be if current trends continue. Searching often yields additional occurrences.

S4 Apparently secure in state, with many occurrences.

S5 Demonstrably secure in state and essentially ineradicable under present conditions.

SA Accidental in state, including species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded; examples include European strays or western birds on the East Coast and vice-versa.

SE Elements that are clearly exotic in New Jersey including those taxa not native to North America (introduced taxa) or taxa deliberately or accidentally introduced into the State from other parts of North America (adventive taxa). Taxa ranked SE are not a conservation priority (viable introduced occurrences of G1 or G2 elements may be exceptions).

SH Elements of historical occurrence in New Jersey. Despite some searching of historical occurrences and/or potential habitat, no extant occurrences are known. Since not all of the historical occurrences have been field surveyed, and unsearched potential habitat remains, historically ranked taxa are considered possibly extant, and remain a conservation priority for continued field work.

SP Element has potential to occur in New Jersey, but no occurrences have been reported.

SR Elements reported from New Jersey, but without persuasive documentation which would provide a basis for either accepting or rejecting the report. In some instances documentation may exist, but as of yet, its source or location has not been determined.

SRF Elements erroneously reported from New Jersey, but this error persists in the literature.

SU Elements believed to be in peril but the degree of rarity uncertain. Also included are rare taxa of uncertain taxonomical standing. More information is needed to resolve rank.

SX Elements that have been determined or are presumed to be extirpated from New Jersey. All historical occurrences have been searched and a reasonable search of potential habitat has been completed. Extirpated taxa are not a current conservation priority.

SXC Elements presumed extirpated from New Jersey, but native populations collected from the wild exist in cultivation.

SZ Not of practical conservation concern in New Jersey, because there are no definable occurrences, although the taxon is native and appears regularly in the state. An SZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations), transitory, and dispersed to be reliably identified, mapped and protected. In other words, the migrant regularly passes through the state, but enduring, mappable element occurrences cannot be defined.

Typically, the SZ rank applies to a non-breeding population (N) in the state - for example, birds on migration. An SZ rank may in a few instances also apply to a breeding population (B), for example certain lepidoptera which regularly die out every year with no significant return migration.

Although the SZ rank typically applies to migrants, it should not be used indiscriminately. Just because a species is on migration does not mean it receives an SZ rank. SZ will only apply when the migrants occur in an irregular, transitory and dispersed manner.

B Refers to the breeding population of the element in the state.

N Refers to the non-breeding population of the element in the state.

T Element ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species. For example *Stachys palustris* var. *homotricha* is ranked "G5T? SH" meaning the full species is globally secure but the global rarity of the var. *homotricha* has not been determined; in New Jersey the variety is ranked historic.

Q Elements containing a "Q" in the global portion of its rank indicates that the taxon is of questionable, or uncertain taxonomical standing, e.g., some authors regard it as a full species, while others treat it at the subspecific level.

.1 Elements documented from a single location.

Note: To express uncertainty, the most likely rank is assigned and a question mark added (e.g., G2?). A range is indicated by combining two ranks (e.g., G1G2, S1S3).

IDENTIFICATION CODES

These codes refer to whether the identification of the species or community has been checked by a reliable individual and is indicative of significant habitat.

Y Identification has been verified and is indicative of significant habitat.

BLANK Identification has not been verified but there is no reason to believe it is not indicative of significant habitat.

? Either it has not been determined if the record is indicative of significant habitat or the identification of the species or community may be confusing or disputed.

PRECISION CODES

These codes refer to the precision to which the location of the occurrence (species or community) is known.

S Documented location is known precisely.

M Documented location is uncertain by as much as 1.5 miles.

G General precision: documented location is uncertain by as much as approximately 5 miles.

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APPENDIX C: APPROACH TO EVALUATING SURFACE WATER QUALITY IMPACTS

Objective

Using simplifying assumptions, estimate the minimum (threshold) volume of water in a reservoir or lake below which concentrations of gasoline constituents from personal watercraft or outboards would be potentially toxic to aquatic organisms or humans. Using the estimated threshold volumes, and applying knowledge about the characteristics of the receiving waterbody and the chemical in question, estimate if any areas within the waterbody of interest may present unacceptable risks to human health or the environment.

Overall Approach

Following are the basic steps in evaluating the degree of impact a waterbody (or portion of a waterbody) would experience based on an exceedance of water quality standards / toxicity benchmarks for PWC- and outboard-related contaminants.

1. Determine concentrations of polycyclic aromatic hydrocarbons (PAHs), benzene, and methyl tertiary-butyl ether (MTBE) in gasoline (convert from weight percent to mg/L, as needed) and PAHs in exhaust. The half-life of benzene in water is 5 hours at 25°C (Verschuren 1983; US EPA 2001).
2. Estimate loading of PAHs, benzene, and MTBE for various appropriate PWC-hour levels of use for one day (mg/day)
3. Find/estimate ecotoxicological and human health toxicity benchmarks (risk-based concentrations [RBCs]) (micrograms [μg]/L) for PAHs, benzene, and MTBE.
4. Divide the estimated loading for each constituent (μg) by a toxicity benchmark (μg/L) to determine the waterbody threshold volume (L) below which toxic effects may occur (convert liters to acre-feet).

Estimated hydrocarbon (HC) emissions from personal watercraft and outboards will be significantly reduced in the near future, based on regulations issued by the U.S. Environmental Protection Agency and the California Air Resources Board (see the estimated reductions on pages 80 and 262).

Assumptions and Constants

Several assumptions must be made in order to estimate waterbody threshold volumes for each HC evaluated. Each park should have park-specific information that can be used to modify these assumptions or to qualitatively assess impacts in light of park-specific conditions of mixing, stratification, etc. and the characteristics of the chemicals themselves. The assumptions are as follows:

- BTEX (benzene, toluene, ethyl benzene, and xylene) are volatile and do not stay in the water column for long periods of time. Because benzene is a recognized human carcinogen, it is retained for the example calculations below and should be considered in each environmental assessment or environmental impact statement (Verschuren 1983; US EPA 2001).
- MTBE volatilizes slightly and is soluble in water. MTBE may accumulate in water from day to day, but this is not factored into the calculation and should be considered qualitatively in the assessment.
- PAHs volatilize slightly (depending on structure and molecule size) and may adhere to sediment and settle out of the water column or float to the surface and be photo-oxidized. They may accumulate in water from day to day, but this is not factored into the calculation and should be considered qualitatively in the assessment.

- The toxicity of several PAHs increases (by several orders of magnitude) when the PAHs are exposed to sunlight. This was not incorporated because site-specific water transparency is not known, and should be discussed qualitatively.
- The threshold volume of water will mix vertically and aerially with contiguous waters to some extent, but the amount of this mixing will vary from park to park and location to location in the lake, reservoir, river, etc. Therefore, although the threshold volume calculation assumes no mixing with waters outside the "boundary" of the threshold volume of water, this should be discussed in the assessment after the threshold volume is calculated. The presence or absence of a thermocline should also be addressed.
- Volume of the waterbody, or portion thereof, is estimated by the area multiplied times the average depth.

In addition to these assumptions, several constants required to make the calculations were compiled from literature and agency announcements. Gasoline concentrations are provided for benzene, MTBE and those PAHs for which concentrations were available in the literature. Constants used are:

- Gasoline emission rate for two-stroke personal watercraft: 3 gal/hour at full throttle (CARB 1998a)
- Gasoline emission rate for two-stroke outboards: estimated at approximately the same as for personal watercraft for same or higher horsepower outboards (80–150 hp); approximately twice that of personal watercraft for small (e.g. 15 hp) outboards. (Note: Assume total hours of use for the various size boats/motors, and that smaller 15 hp motors that exhaust relatively more unburned fuel would probably be in use for a much smaller amount of time than the recreational speedboats and PWC). This estimate is based on data from Allen et al. 1998 (Fig. 5). It is noted that other studies may indicate different relative emission rates (e.g., about the same emissions regardless of horsepower, or larger horsepower engines having higher emission rates than smaller engines [CARB 2001]). The approach selected represents only one reasonable estimate.
- 1 gallon = 3.78 liters
- Specific gravity of gasoline: 739 g/L
- 1 acre-foot = 1.234×10^6 L
- Concentration of benzo(a)pyrene (B[a]P) in gasoline: up to 2.8 mg/kg (or 2.07 mg/L) (Gustafson et al. 1997)
- Concentration of naphthalene in gasoline: 0.5% or 0.5 g/100 g (or 3,695 mg/L) (Gustafson et al. 1997)
- Concentration of 1-methyl naphthalene in gasoline: 0.78% or 0.78 g/100 g (or approx. 5,760 mg/L) (estimated from Gustafson et al. 1997)
- Concentration of benzene in gasoline: 2.5% or 2.5 g/100 g (or 1.85×10^4 mg/L) (Hamilton 1996)
- Concentration of MTBE in gasoline: up to 15% or 15 g/100 g (or approx. 1.10×10^5 mg/L) (Hamilton 1996). (Note: MTBE concentrations in gasoline vary from state to state. Many states do not add MTBE.)
- Estimated emission of B(a)P in exhaust: 1080 μg/hr (from White and Carroll, 1998, using weighted average B(a)P emissions from 2-cylinder, carbureted two-stroke liquid cooled snow mobile engine using gasoline and oil injected Arctic Extreme injection oil, 24-38:1 fuel:oil ratio. Weighted average based on percentage of time engine was in five modes of operation, from full throttle to idle).
- Estimated amount of B(a)P exhaust emissions retained in water phase = approximately 40% (based on value for B(a)P from Hare and Springier, cited in North American Lake Management Society 2001).

Toxicity Benchmarks

A key part of the estimations is the water quality criterion, standard, or toxicological benchmark for each contaminant evaluated. There are no EPA water quality criteria for the protection of aquatic life for the PWC-related contaminants (US EPA 1999a). There are, however, a limited number of EPA criteria for the protection

of human health (via ingestion of water and aquatic organisms or ingestion of aquatic organisms only). Chronic ecotoxicological and human health benchmarks for contaminants were acquired from various sources.

Toxicological benchmarks for benzo(a)pyrene, naphthalene, and benzene are from *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision* (Suter and Tsao 1996). The ecotoxicological benchmarks for benzo(a)pyrene (0.014 μg/L) and benzene (130 μg/L) are Tier II Secondary Chronic Values in Table 1 of Suter and Tsao (1996), which were calculated using methods in the Great Lakes Water Quality Initiative (US EPA 1993). The ecotoxicological benchmark for naphthalene (62 μg/L) is the EPA Region 4 chronic screening value (Table 3 of Suter and Tsao 1996). This screening value was chosen for use as a conservative mid-range value considering the wide range of chronic values for naphthalene (12-620 μg/L) shown in Suter and Tsao (1996). The ecotoxicological benchmarks for 1-methyl naphthalene (19 and 34 μg/L) are based on LC_{50} values of 1900 and 3400 μg/L for the marine invertebrate, dungeness crab (*Cancer magister*), and the freshwater / estuarine fish, sheepshead minnow (*Cyprinodon variegatus*), respectively (USFWS 1987). The MTBE benchmarks of 18,000 and 51,000 μg/L are for marine and freshwater, respectively, and are based on the preliminary chronic water quality criteria presented in Mancini et al. (2002). Below are the default toxicity benchmarks for the PAHs, benzene, and MTBE with gasoline concentration information:

Chemical	Ecotoxicological Benchmark (μg/L)	Source	Human Health Benchmark** (μg/L)	Source
Benzo(a)pyrene	0.014	Suter and Tsao 1996	0.0044** 0.049***	US EPA 1999a
Naphthalene	62	Suter and Tsao 1996	--	--
1-methyl naphthalene	19* 34*	USFWS 1987	--	--
Benzene	130	Suter and Tsao 1996	1.2** 71***	US EPA 1999a
MTBE****	18,000 51,000	Mancini et al. 2002	13	CA DHS 2002

NOTES:
* Based on LC_{50}s of 1900 and 3400 μg/L for dungeness crab and sheepshead minnow, respectively (19 μg/L used for marine/estuarine calculations; 34 μg/L used for freshwater calculations).
** Based on the consumption of water and aquatic organisms.
*** Based on the consumption of aquatic organisms only.
**** Ecotoxicological benchmarks, which are considered preliminary chronic water quality criteria, are 18,000 μg/L for marine and 51,000 μg/L for freshwater. There is no EPA human health benchmark, but California DHS (2002) has established a primary maximum contaminant level (MCL) of 13 μg/L.

Example Calculations

Calculations of an example set of waterbody volume thresholds are provided below for the chemicals listed above together with their concentrations in gasoline and available toxicity benchmarks.

Loading to Water

Loadings of the five contaminants listed above are calculated for one day assuming 10 personal watercraft operate for four hours (40 PWC-hours), each discharging 11.34 L gasoline per hour and having concentrations in fuel or exhaust as listed.

Benzo(a)pyrene (from the fuel): 40 PWC-hrs × 11.34 L gas/hr × 2.07 mg/L = 939 mg

Benzo(a)pyrene (from the gas exhaust): 40 PWC-hrs × 1080 μg/hr × 1/1000 mg/μg × 0.40 = 17 mg

Total B(a)P = 956 mg

Naphthalene: 40 PWC-hrs × 11.34 L gas/hr × 3695 mg/L = 1.68×10^6 mg

1-methyl naphthalene: 40 PWC-hrs × 11.34 L gas/hr × 5764 mg/L = 2.62×10^6 mg

Benzene: 40 PWC-hrs × 11.34 L gas/hr × 1.85×10^4 mg/L = 8.39×10^6 mg

MTBE: 40 PWC-hrs × 11.34 L gas/hr × 1.10×10^5 mg/L = 4.99×10^7 mg

Loadings of contaminants from two-stroke outboards should be estimated based on the estimated loading based on the horsepower of the outboards involved (see "Assumptions and Constants" above) and the estimated hours of use, based on the types of boats and the pattern of use observed.

Threshold Volumes

Threshold volumes of water (volume at which a PWC- or outboard-related contaminant would equal the benchmarks listed above) are calculated by dividing the estimated daily loadings (mg of contaminant) for the number of operational hours (e.g., 40 PWC-hours) by the listed toxicity benchmark concentrations (μg/L), correcting for units (1 mg = 10^3 μg), and converting from liters to acre-feet (1 ac-ft = 1.234 x 10^6 L):

Protection of Freshwater Aquatic Organisms

Benzo(a)pyrene: 956 mg B(a)P × 10^3 μg/mg / 0.014 μg/L = 6.8 × 10^7 L or 55 ac-ft

Naphthalene: 1.68 × 10^6 mg naphthalene × 10^3 μg/mg / 62 μg/L = 2.71 × 10^7 L or 22 ac-ft

1-methyl naphthalene: 2.62 × 10^6 mg 1-methyl naphthalene × 10^3 μg/mg / 34 μg/L = 7.69 × 10^7 L or 62 ac-ft

Benzene: 8.39 × 10^6 mg benzene × 10^3 μg/mg / 130 μg/L = 6.45 × 10^7 L or 52 ac-ft

MTBE: 4.99 × 10^7 mg MTBE × 10^3 μg/mg / 51,000 μg/L = 9.78 × 10^5 L or 0.79 ac-ft

Based on these estimates and assumptions, 1-methyl naphthalene appears to be the contaminant (of those analyzed) that would be the first to accumulate to concentrations potentially toxic to freshwater aquatic organisms (i.e., it requires more water [62 ac-ft] to dilute the contaminant loading to a concentration below the toxicity benchmark). However, the threshold volumes are very similar for 1-methyl naphthalene, benzo(a)pyrene, and benzene.

Protection of Human Health

Benzo(a)pyrene: 956 mg B(a)P × 10^3 μg/mg / 0.0044 μg/L = 2.17 × 10^8 L or 176 ac-ft

Benzene: 8.39 × 10^6 mg benzene × 10^3 μg/mg / 1.2 μg/L = 6.99 × 10^9 L or 5,670 ac-ft

MTBE: 4.99 × 10^7 mg MTBE × 10^3 μg/mg / 13 μg/L = 3.83 × 10^9 L or 3,110 ac-ft (If the CA MCL of 13 μg/L for fresh water is used)

The California public health goal for MTBE is a drinking water–based MCL and is not as broadly applicable as the other criteria used in this analysis. However, it may be of interest, since MTBE is very soluble, and MTBE concentration could be an issue if the receiving body of water is used for drinking water purposes and MTBE is not treated. Using the numbers provided above, benzene would be the first PWC-related contaminant in these example calculations that would reach unacceptable levels in surface water; however, volatilization of benzene from water to air was not included in the calculation. MTBE would be the next contaminant to reach unacceptable concentrations. If human health water quality criteria for ingestion of aquatic organisms only were used for benzo(a)pyrene and benzene (0.049 μg/L and 71 μg/L, respectively), the corresponding threshold volumes would be 15.8 acre-feet and 95.8 acre-feet.

As a result of the estimated reductions in HC emissions (from the unburned fuel) in response to EPA regulations (listed above), additional personal watercraft and/or outboards may be used in the parks without additional impacts to water quality. For example, based on the expected overall reductions from EPA (1996a, 1997), up to twice the current number of personal watercraft/outboards may be used in a given area in 2012 without additional impacts to water quality over current levels. Effects on noise levels, physical disturbance, or hydrocarbon emissions that are products of combustion (e.g., B[a]P) may not be similarly ameliorated by the reduced emission regulations.

Application of Approach

Use of the approach described above for evaluating possible exceedance of standards or other benchmarks must be adapted to the unique scenarios presented by each park, PWC use, and waterbody being evaluated.

Factors that would affect the concentration of the contaminants in water must be discussed in light of the park-specific conditions. These factors include varying formulations of gasoline (especially for MTBE); dilution due to mixing (e.g., influence of the thermocline), wind, currents, and flushing; plus loss of the chemical due to volatilization to the atmosphere (Henry's Law constants can help to predict volatilization to air; see Yaws et al. 1993); adsorption to sediments and organic particles in the water column (e.g., PAHs), oxidation, and biodegradation (breakdown by bacteria). Toxicity of phototoxic PAHs may be of concern in more clear waters, but not in very turbid waters.

The chemical composition of gasoline will vary by source of crude oil, refinery, and distillation batch. No two gasolines will have the exact same chemical composition. For example, B(a)P concentrations may range from 0.19 to 2.8 mg/kg, and benzene concentrations may range from 0 to 7% (2 to 3% is typical). MTBE concentrations will vary from state to state and season to season, with concentrations ranging from 0 to 15%. The composition of gasoline exhaust is dependent on the chemical composition of the gasoline and engine operating conditions (i.e., temperature, rpms, and oxygen intake). If site-specific information is available on gasoline and exhaust constituents, they should be considered in the site-specific evaluation. If additional information on the toxicity of gasoline constituents (e.g., MTBE) become available, they should be considered in the site-specific evaluation.

Table C-1: Pollutant Concentrations Reported in Water

Pollutant	Source(s)	Levels Found	
		"Lower Use" (e.g. open water, offshore locations; reduced motorized watercraft use)	"Higher Use" (e.g., nearshore, motorized watercraft activity high)
Benzene	*Lake Tahoe Motorized Watercraft Report* (Allen et al. 1998); several studies reported 1. USGS 2. Miller and Fiore 3. U of CA	1. <0.032 μg/l 2. ≤0.3 μg/l 3. <0.1 μg/l	1. 0.13 – 0.33 μg/l 2. just over 1 μg/l 3. 0.1 – 0.9 μg/l
PAHs	A. Mastran et al. B. Oris et al.	A. All below detection limits (<0.1 μg/l for pyrene and naphthalene; <2.5 μg/l for B(a)P, B(a)A, chrysene) B. Experiment #1 – 2.8 ng/l phototoxic PAHs	A. Total PAHs – up to 4.12 μg/l in water column; total PAHs – up to 18.86 μg/l in surface sample at marina, with naphthalene at 1μg/l; B(a)P – ≥2.3 μg/l B. Experiment #1 – ± 45 ng/l phototoxic PAHs; 5–70 ng/L total PAHs
MTBE	A. *Lake Tahoe Motorized Watercraft Report* (Allen et al. 1998); several studies reported 1. USGS 2. Miller and Fiore 3. U of CA 4. U of Nevada – Fallen Leaf Lake 5. Donner Lake (Reuter et al. 1998) B. NPS, VanMouwerik and Hagemann 1999 6. Lake Perris 7. Shasta Lake 8. 3-day Jet Ski event 9. Lake Tahoe	1. 0.11 – 0.51 μg/l 2. ≤3 μg/l 3. less than nearshore area 4. -- 5. <0.1 μg/l 6. 8 μg/l (winter)	1. 0.3 – 4.2 μg/l 2. 20 μg/l (up to approx. 31μg/l) 3. up to 3.77 μg/l 4. 0.7 – 1.5 μg/l 5. up to 12 μg/l (Dramatic increase from 2 to 12 μg/l from July 4 to 7) 6. up to 25 μg/l 7. 9 – 88 μg/l over Labor Day weekend 8. 50 – 60 μg/l 9. often within range of 20 – 25 μg/l, with max of 47 μg/l

GLOSSARY

***de minimis* —** In the context of the Clean Air Act's general conformity requirements, *de minimis* levels are annual quantities of air pollutant emissions below which a federal action in a non-attainment or maintenance area is presumed to conform to a state's implementation plan without undergoing more rigorous air quality analysis or modeling.

Conformity *de minimis* levels are levels of emissions below which a federal action in a non-attainment or maintenance area is presumed to conform to a state's implementation plan and would not require further review. Actions in attainment areas are presumed to conform and do not require analysis with respect to *de minimis* levels. Emission values representing the Clean Air Act conformity *de minimis* levels are shown below:

Non-Attainment Area (NAA)	Tons/year
Ozone (VOCs or NO_x):	
Serious NAA's	50
Severe NAA's	25
Extreme NAA's	10
Other ozone NAA's outside an ozone transport region	100
Marginal and moderate NAA's inside an ozone transport region:	
VOC	50
NO_x	100
Carbon monoxide: All NAA's	100
SO_2 or NO_2: All NAA's	100
PM_{10}:	
Moderate NAA's	100
Serious NAA's	70
Pb: All NAA's	25

Maintenance Areas	Tons/year
Ozone (NO_x), SO_2 or NO_2: All maintenance areas	100
Ozone (VOCs):	
Maintenance areas inside an ozone transport region	50
Maintenance areas outside an ozone transport region	100
Carbon monoxide: All maintenance areas	100
PM_{10}: All maintenance areas	100
Pb: All maintenance areas	25

SOURCE: 40 CFR CHAPTER 1, sec. 51.853 Applicability.

maintenance area — A geographic region that at some time in the past was designated as a non-attainment area but has been redesignated through a formal rule-making process as being in attainment with the national ambient air quality standards. Maintenance areas continue to be monitored more rigorously than attainment areas and to be subject to controls to keep it in attainment with the national standards.

national ambient air quality standards (NAAQS) — Concentrations of criteria pollutants in ambient air (outdoor air to which the public may be exposed) below which it is safe for humans or other receptors to be permanently exposed. The Clean Air Act establishes two types of national air quality standards. **Primary standards** set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. **Secondary standards** set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

The EPA Office of Air Quality Planning and Standards has set national ambient air quality standards for six principal pollutants, which are called "criteria" pollutants. They are listed below. Units of measure for the standards are parts per million (ppm) by volume, milligrams per cubic meter of air (mg/m^3), and micrograms per cubic meter of air ($\mu g/m^3$).

National Ambient Air Quality Standards

Pollutant	Standard Value*		Standard Type
Carbon Monoxide (CO)			
8-hour Average	9 ppm	(10 mg/m^3)	Primary
1-hour Average	35 ppm	(40 mg/m^3)	Primary
Nitrogen Dioxide (NO_2)			
Annual Arithmetic Mean	0.053 ppm	(100 $\mu g/m^3$)	Primary & Secondary
Ozone (O_3)			
1-hour Average	0.12 ppm	(235 $\mu g/m^3$)	Primary & Secondary
8-hour Average **	0.08 ppm	(157 $\mu g/m^3$)	Primary & Secondary

Pollutant	Standard Value*		Standard Type
Lead (Pb)			
Quarterly Average	1.5 $\mu g/m^3$		Primary & Secondary
Particulate (PM 10) *Particles with diameters of 10 micrometers or less*			
Annual Arithmetic Mean	50 $\mu g/m^3$		Primary & Secondary
24-hour Average	150 $\mu g/m^3$		Primary & Secondary
Particulate (PM 2.5) *Particles with diameters of 2.5 micrometers or less*			
Annual Arithmetic Mean **	15 $\mu g/m^3$		Primary & Secondary
24-hour Average **	65 $\mu g/m^3$		Primary & Secondary
Sulfur Dioxide (SO_2)			
Annual Arithmetic Mean	0.03 ppm	(80 $\mu g/m^3$)	Primary
24-hour Average	0.14 ppm	(365 $\mu g/m^3$)	Primary
3-hour Average	0.50 ppm	(1,300 $\mu g/m^3$)	Secondary

* Parenthetical value is an approximately equivalent concentration.

** The ozone 8-hour standard and the PM 2.5 standards are included for information only. A 1999 federal court ruling blocked implementation of these standards, which EPA proposed in 1997. EPA has asked the U.S. Supreme Court to reconsider that decision.

non-attainment area — A geographic region usually designated by an air quality planning authority through a formal rulemaking process within which one or more national ambient air quality standards are subject to violation. Sources of air pollutants in a non-attainment area are subject to more stringent requirements and controls than those in attainment areas (i.e., in areas where national standards are met).

NONROAD Model — An air quality emissions estimation model developed by the U.S. Environmental Protection Agency to estimate emissions from various spark-ignition type "nonroad" engines. The June 2000 draft of the NONROAD model was used to estimate air pollutant emissions from personal watercraft. It is available at www.epa.gov/otaq/ nonrdmdl.htm.

personal watercraft (PWC) — As defined in 36 CFR 1.4(a) (2000), refers to a vessel, usually less than 16 feet in length, which uses an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. The vessel is intended to be operated by a person or persons sitting, standing, or kneeling on the vessel, rather than within the confines of the hull. The length is measured from end to end over the deck excluding sheer, meaning a straight line measurement of the overall length from the foremost part of the vessel to the aftermost part of the vessel, measured parallel to the centerline. Bow sprits, bumpkins, rudders, outboard motor brackets, and similar fittings or attachments, are not included in the measurement. Length is stated in feet and inches.

SUM06 — The cumulation of instances when measured hourly average ozone concentrations equal or exceed 0.06 part per million (ppm) in a stated time period, expressed in ppm-hours.

wake — Moving waves, track, or path that a boat leaves behind when moving across the waters.

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BCC	Brookdale Community College
CCU	Coastal Carolina University
CFR	Code of Federal Regulations
IWL	Izaak Walton League of America
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NTSB	National Transportation Safety Board
NYCDOH	New York City Department of Health
NYSDEC	New York State Department of Conservation
NYSDOH	New York State Department of Health
NYSDOS	New York State Department of State
NYSGO	New York State Governor's Office
NJDEP	New Jersey Department of Environmental Protection
ODEQ	Oregon Department of Environmental Quality
OPRHP	Office of Parks, Recreation, and Historic Preservation
PWIA	Personal Watercraft Industry Association
SAE	Society of Automotive Engineers
USCG	U.S. Coast Guard
US EPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historic places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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