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4.0 AFFECTED ENVIRONMENT

4.1 Ecological Environment

4.1.1 Wildlife

4.1.1.1 Historical Development of the Jamaica Bay Laughing Gull Colony and the Regional Laughing Gull Population

In Jamaica Bay, Laughing Gulls breed on JoCo Marsh, East High Meadow, and Silver Hole Marsh (which for purposes of this document are considered a single colony site). Initiated by about 15 pairs in 1979 (Buckley and Buckley 1984), the Laughing Gull colony expanded as follows:

Year	Est. # Pairs[a]
1979	15[b]
1980	235
1981	325
1982	715
1983	1805
1984	2802
1985	2741
1986	3000
1987	2875
1988	2665
1989	455[c]
1990	7462
1991	7101[c]
1992	5000[d]
1993	6005

[a] Population estimates (except where otherwise noted) from Litwin et al. (1993).
[b] Population estimates for 1979-1984 from Buckley and Buckley (1984).
[c] Colony surveyed late.
[d] Population estimate from aerial survey conducted by Belant and Dolbeer (1992).

The establishment and the rapid growth of the Jamaica Bay colony appear to be closely associated with the large increase in Laughing Gulls in New Jersey over the same period. New Jersey colonies increased from 30,730 breeding pairs in 1977 to 58,796 breeding pairs in 1989 (Belant and Dolbeer 1993a). Further, band recovery data indicate that New Jersey colonies were the origin of 99% of the 464 banded Laughing Gulls shot at JFKIA (Dolbeer et al. 1993). More Laughing Gulls in the Northeast banded as chicks were recovered as adults north (74%) of their banding site than south (26%) during subsequent breeding seasons (Belant and Dolbeer 1993b). These data indicate that Laughing Gull numbers in the Northeast are rapidly increasing, and that their range is expanding northward. More specifically, it appears that New Jersey gull colonies contribute much to the growth of the Jamaica Bay Laughing Gull population. Further, Laughing Gull populations in Massachusetts, New York, and New Jersey should be considered a regional population, representing nearly 68,000 breeding pairs.

The migrant and summer population of Laughing Gulls in Jamaica Bay, however, is much larger than indicated by the number of nesting pairs. Even in the years before 1979, when no breeding colony was present between southern New Jersey and a small colony in Massachusetts, Bull (1964) noted the "mystery" of the great number of birds apparently migrating through the New York area. There are several classes of Laughing Gulls associated with the Jamaica Bay nesting colony: breeding adults, young of the year, non-breeding adults, immature birds.

4.1.1.2 Age Structure of the Jamaica Bay Laughing Gull Colony

No representative data are available on the age structure of the Jamaica Bay or New Jersey Laughing Gull populations. Although Dolbeer et al. (1993) reported a preponderance (94 percent) of adult Laughing Gulls (two years and older) in the sample shot at JFKIA in 1991 and 1992, this sample is not necessarily representative of the age distribution of the Jamaica Bay Laughing Gull population. This is because most one-year-old Laughing Gulls from the Northeast United States do not typically return to their natal area during their first year (Belant and Dolbeer 1993a). Further, the shooting program at the airport was conducted into the first week of August, extending past the peak fledging period for the colony (late July). Hatch-year birds comprised only one percent of the shooting sample, despite the relatively large numbers of juvenile gulls in the area. Of the adult gulls (two years and older) shot, 74 percent were between three and seven years of age, and the oldest birds recovered were eleven years old (Dolbeer et al. 1993).

4.1.1.3 Seasonal Presence of Laughing Gulls and Other Gull Species

- **Laughing Gulls**

Laughing Gulls are considered a common species along the Atlantic and Gulf coasts of the United States and winter from North Carolina south to Central and South America and the Pacific Coast of Mexico (Terres 1980). Belant and Dolbeer (1993a) estimated nearly 250,000 breeding pairs of Laughing Gulls in the United States in 1990. Although Gulf Coast state Laughing Gull populations have remained stable or declined slightly since the late 1970s, Laughing Gull populations have increased substantially in Delaware, New Jersey, New York, Massachusetts and Maine since the late 1970s (Belant and Dolbeer 1993a). Andrews (1990) reported a 49 percent increase in numbers of Laughing Gulls from Maine to Virginia between 1977 and 1985.

Laughing Gulls are generally present in the New York area from early April through early November (Fables 1955). The species is rarely seen in the area in the winter (Leck 1984); the bulk of the population winters from the Carolinas south to Central and South America and the Pacific Coast of Mexico (Bent 1921, Terres 1980).

- **Herring Gulls and Great Black-backed Gulls**

Herring and Great Black-Backed gulls also breed in Jamaica Bay. The 1991 breeding population of Herring Gull was 300+ and that of Great Black-backed Gull was 30+ (several known colony sites used by both species were not surveyed). On Canarsie Pol, the one site surveyed, the 1991 populations of each represented notable decreases from 1990, when 2000 pairs of Herring and 200 pairs of Great Black-backed nested (Litwin et al. 1993). These two species are present year-round in the New York area (Bull 1964).

In New York State, the Herring Gull is most numerous in the Long Island coastal lowlands, where it forms nesting colonies on shorelines and islands. The Long Island population numbers 24,000 birds within 34 nesting colonies. The largest single colony is on Plum Island and contains 7,000 pairs (Andrle and Carroll 1991). Belant (1992) estimated the current population of nesting Herring Gulls along the U.S. northeast coast and Canada's Atlantic Provinces to be 430,000 individuals.

Great Black-backed Gulls nest in at least 23 colonies, which together consist of approximately 7,000 pairs on Long Island (Peterson et al. 1985 in Andrle and Carroll 1991). The species is undergoing northward range expansion and population growth in New York State. Belant (1992) estimated the current population of nesting Great Black-backed Gulls in the northeastern U.S. and Atlantic Provinces of Canada to be 170,000 individuals.

- **Ring-billed Gull**

Although not a local breeder, Ring-billed Gull are present year-round in this region. The largest populations are present during the fall and spring migrations and in winter, but numbers of summering birds are substantial (Bull 1964). In New York, Ring-billed Gulls nest abundantly along the St. Lawrence River and the Great Lakes; Blokpoel and Tessier (1986) estimated 1,400,000 nesting Ring-billed Gulls in these regions during 1984.

- **Bonaparte's Gull**

Bonaparte's Gull is a common to abundant migrant and winter resident, and occurs occasionally in summer (Bull 1964). Gulls that occur occasionally to rarely in the New York area include Iceland Gull, Glaucous Gull, Lesser Black-backed Gull, Black-headed Gull, Little Gull, Franklin's Gull, and Ivory Gull (Bull 1964).

4.1.1.4 Presence of Other Avian Species

The National Park Service (D. Riepe, pers. comm.) indicated that other bird species known to nest on the Jamaica Bay colony site include Common Tern (State Threatened), Osprey (State Threatened), Forster's Tern (the largest colony in New York State—about 40 pairs), Boat-tailed Grackle, American Oystercatcher, Willet, Clapper Rail, Black Duck, Seaside Sparrow, Sharp-tailed Sparrow, Song Sparrow, Red-winged Blackbird, Canada Goose, Gadwall, and possibly Black Rail. In winter, the site is heavily used by Black Duck and other waterfowl, and Great Blue Heron. Northern Harriers (migrant and winter resident) have been observed hunting over the marsh, which is also an important feeding site for Glossy Ibis and all species of herons found in Jamaica Bay. Various species of shorebirds roost on all three marshes, with Silver Hole receiving the heaviest use.

Table 4-1 lists species of birds observed at JFKIA by the Bird Control Unit between 1957 and 1992.

4.1.1.5 Presence of Threatened and Endangered Species

- **State Endangered Species**

Common Tern (classified as Threatened by the New York State Department of Environmental Conservation) breeds on Duck Creek Marsh, East High Meadow, Silver Hole Marsh, and JoCo Marsh;

Table 4-1

Bird Species Observed at JFKIA, 1957-1992

FAMILY	COMMON NAME	SCIENTIFIC NAME
Anatidae	Mute Swan	*Cygnus olor*
	Tundra Swan	*Cygnus columbianus*
	Snow Goose	*Chen caerulescens*
	Brant	*Branta bernicla*
	Canada Goose (n)	*Branta canadensis*
	Wood Duck	*Aix sponsa*
	Green-winged Teal	*Anas crecca*
	American Black Duck (n)	*Anas rubripes*
	Mallard (n)	*Anas platyrhynchos*
	Northern Pintail	*Anas acuta*
	Northern Shoveler	*Anas clypeata*
	Gadwall	*Anas strepera*
	American Widgeon	*Anas americana*
	Canvasback	*Aythya valisineria*
	Greater Scaup	*Aythya marila*
	Lesser Scaup	*Aythya affinis*
	Oldsquaw	*Clangula hyemalis*
	Black Scoter	*Melanitta nigra*
	White-winged Scoter	*Melanitta fusca*
	Common Goldeneye	*Bucephala clangula*
	Bufflehead	*Bucephala albeola*
	Red-breasted Merganser	*Mergus serrator*
	Ruddy Duck	*Oxyura jamaicensis*
Gaviidae	Common Loon	*Gavia immer*
Podicipedidae	Horned Grebe	*Podiceps auritus*
Phalacrocoracidae	Double-crested Cormorant	*Phalacrocorax auritus*
Ardeidae	American Bittern	*Botaurus lentiginosus*
	Great Blue Heron	*Ardea herodias*
	Great Egret	*Casmerodius albus*
	Snowy Egret	*Egretta thula*
	Green-backed Heron	*Bubulcus ibis*
	Cattle Egret	*Butorides striatus*
	Black-crowned Night Heron	*Nycticorax nycticorax*
Threskiornithidae	Glossy Ibis	*Plegadis falcinellus*
Pandionidae	Osprey	*Pandion haliaetus*

Table 4-1 (Continued)

Bird Species Observed at JFKIA, 1957-1992

FAMILY	COMMON NAME	SCIENTIFIC NAME
Accipitridae	Northern Harrier (n)	*Circus cyaneus*
	Sharp-shinned Hawk	*Accipiter stratus*
	Cooper's Hawk	*Accipiter cooperii*
Accipitridae	Northern Goshawk	*Accipiter gentilis*
	Red-tailed Hawk	*Buteo jamaicensis*
	Rough-legged Hawk	*Buteo lagopus*
Falconidae	American Kestrel	*Falco sparverius*
	Merlin	*Falco columbarius*
	Peregrine	*Falco peregrinus*
Phasianidae	Ring-necked Pheasant (n)	*Phasianus colchicus*
Rallidae	Clapper Rail (n)	*Rallus longirostris*
	Virginia Rail	*Rallus limicola*
	Sora Rail	*Porzana carolina*
	American Rail	*Fulica americana*
Charadriidae	Black-bellied Plover	*Pluvialis squatarola*
	Lesser Golden Plover	*Pluvialis dominica*
	Semipalmated Plover	*Charadrius semipalmatus*
	Piping Plover (n)	*Charadrius melodius*
	Killdeer (n)	*Charadrius vociferus*
Haematopodidae	American Oystercatcher (n)	*Haematopus palliatus*
Scolopacidae	Greater Yellowlegs	*Tringa melanoleuca*
	Lesser Yellowlegs	*Tringa flavipes*
	Willet	*Catoptrophorus semipalmatus*
	Upland Sandpiper (n)	*Bartramia longicauda*
	Whimbrel	*Numenius phaepus*
	Ruddy Turnstone	*Arenaria interpres*
	Red Knot	*Calidris canutus*
	Sanderling	*Calidris alba*
	Semipalmated Sandpiper	*Calidris pusilla*
	Dunlin	*Calidris alpina*
	Buff-breasted Sandpiper	*Tryngites suruficollis*
	Short-billed Dowitcher	*Limnodromus griseus*
	American Woodcock	*Scolopax minor*

Table 4-1 (Continued)

Bird Species Observed at JFKIA, 1957-1992

FAMILY	COMMON NAME	SCIENTIFIC NAME
Laridae	Laughing Gull	*Larus atricilla*
	Bonaparte's Gull	*Larus philadelphia*
	Ring-billed Gull	*Larus delawarensis*
	Herring Gull	*Larus argentatus*
	Lesser Black-backed Gull	*Larus fuscus*
	Great Black-backed Gull	*Larus marinus*
	Gull-billed Tern	*Sterna nilotica*
	Caspian Tern	*Sterna caspia*
	Royal Tern	*Sterna maxima*
	Common Tern	*Sterna hirundo*
	Least Tern	*Sterna antillarum*
	Sooty Tern	*Sterna fuscata*
Rynchopidae	Black Skimmer	*Rynchops niger*
Columbidae	Rock Dove (n)	*Columa livia*
	Mourning Dove	*Zenaida macroura*
Psittacidae	* Budgerigar	*Melopsittacus undulatus*
	* Black-hooded Parakeet	*Nandayus nenday*
Tytonidae	Common Barn Owl (n)	*Tyto alba*
Strigidae	Snowy Owl	*Nyctea scandiaca*
	Burrowing Owl	*Athene cunicularia*
	Long-earred Owl	*Asio otus*
	Short-earred Owl (n)	*Asio flammeus*
Caprimulgidae	Common Nighthawk	*Chordeiles minor*
Alcedinidae	Belted Kingfisher	*Ceryke alcyon*
Picidae	Downy Woodpecker	*Picoides pubescens*
	Northern Flicker	*Colaptes auratus*
Tyrannidae	Eastern Kingbird	*Tyrannus tyrannua*
	Scissor-tailed Flycatcher	*Tyrannus forficatus*
Alaudidae	Horned Lark (n)	*Eremophila alpestris*
Hirundinidae	Tree Swallow	*Tachycineta bicolor*
	Barn Swallow	*Hirundo rustica*
Corvidae	Blue Jay	*Cyanocitta cristata*
	American Crow (n)	*Corvus brachyrhynchos*
Troglodytidae	Marsh Wren	*Cistothorus palustris*

Table 4-1 (Continued)

Bird Species Observed at JFKIA, 1957-1992

FAMILY	COMMON NAME	SCIENTIFIC NAME
Turdidae	Veery	*Catharus fuscescens*
	Hermit Thrush	*Catharus guttatus*
	American Robin	*Turdus migratorius*
Mimidae	Gray Catbird	*Dumetella Carolinensis*
	Northern Mockingbird (n)	*Mimus polyglottos*
	Brown Thrasher	*Toxostoma rufum*
Motacillidae	Water Pipit	*Anthus spinoletta*
Laniidae	Loggerhead Shrike	*Lanius ludovicianus*
Sturnidae	European Starling (n)	*Sturnus vulgaris*
Parulidae	Yellow-rumped Warbler	*Dendroica coronata*
	Common Yellowthroat	*Geothlypis trichas*
Thraupidae	Scarlet Tanager	*Piranga olivacea*
Fringillidae	Northern Cardinal	*Cardinalis carinalis*
	Rose-breasted Grosbeak	*Pheuticus ludovicianus*
	American Tree Sparrow	*Spizella arborea*
	Field Sparrow	*Spizella pusilla*
	Savannah Sparrow	*Passerculus sandwichensis*
	Grasshopper Sparrow (n)	*Ammodramus savannarum*
	Song Sparrow	*Melospiza melodia*
	Swamp Sparrow	*Melospiza georgiana*
	White-throated Sparrow	*Zonotrichia albicollis*
	Dark-eyed Junco	*Junco hyemalis*
	Lapland Longspur	*Calcarius lapponicus*
	Snow Bunting	*Plectrophanax nivalis*
	American Goldfinch	*Carduelis tristis*
	Pine Siskin	*Carduelis pinus*
	House Finch	*Carpodacus mexicanus*
Ploceidae	House Sparrow (n)	*Passar domesticus*
Icteridae	Red-winged Blackbird (n)	*Agelaius phoeniceus*
	Eastern Meadowlark (n)	*Sturnella magna*
	Common Grackle (n)	*Quiscalus quiscula*
	Brown-headed Cowbird	*Melothrus ater*

(n) Species observed nesting at JFKIA.
* These species are not migratory birds and should be classified as escapes.

the 1993 population for this area was about 750 pairs (Long Island Colonial Waterbird Survey unpublished 1993 data).

Information retrieved from the NYSDEC Natural Heritage Program (Conrad 1993) indicates that records exist of the occurrence of the following rare vertebrates in or near the study area: Black Skimmer (Protected), Common Tern (Threatened), Common Barn-Owl (Protected), Short-eared Owl (Protected - Special Concern), Piping Plover (Endangered), Northern Harrier (Threatened), and Osprey (Threatened).

- **Federal Endangered Species**

The only federally classified species identified in the area is the Piping Plover, which is classified as endangered in this part of its range. Piping Plovers formerly nested along the shores of JFKIA but have not been recorded since 1984. In 1993 approximately 15 pairs of Piping Plovers nested along the western shore of the Rockaway Peninsula in the Breezy Point Unit of GNRA. The USFWS has provided a listing of threatened and endangered species (Appendix E.6).

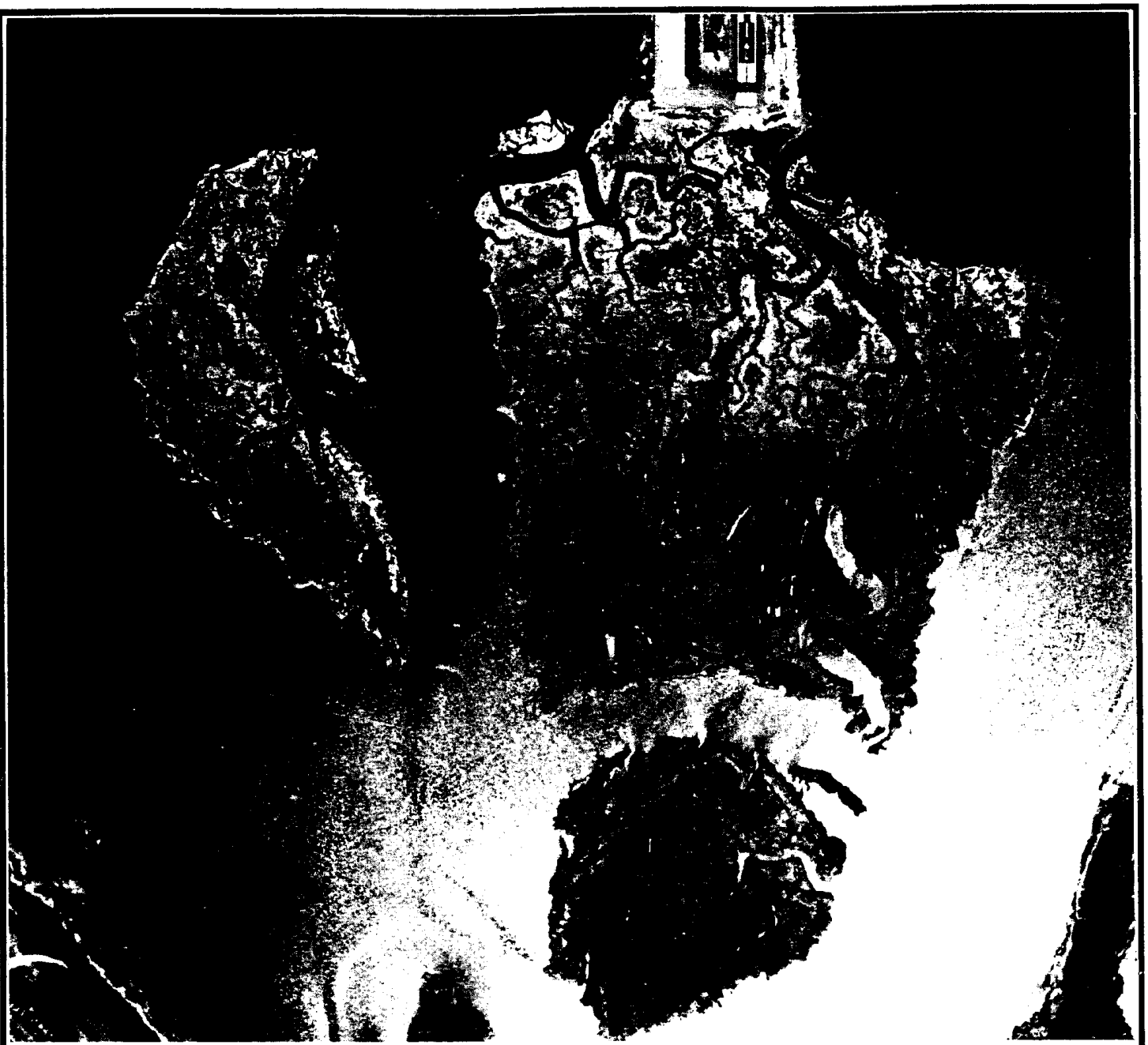
4.1.2 Habitat

4.1.2.1 Project Area Habitats

The colony site comprises three principal salt marsh islands: JoCo Marsh, Silver Hole Marsh, and East High Meadow—each separated by tidal channels. The marsh complex is the most productive and ecologically important area within the Gateway National Recreation Area (GNRA) Wildlife Refuge District, providing the greatest contiguous expanse of low and high marsh in Jamaica Bay. Aside from Laughing Gulls, other species nesting there include common tern (NYS Threatened), Forster's Tern (Largest colony in NYS), Clapper Rail, Boat-tailed Grackle, Seaside Sparrow, Black Duck, American Oystercatcher, Willet, Canada Goose, and Red-winged Blackbird.

The terrestrial habitats on the colony site consist predominantly of high salt marsh and low salt marsh, with a few acres of panne; very high areas where salt concentrations in the soil restrict the growth of plants (Bridges 1976). The marshes are internally dissected and dotted with tidal creeks, channels, pools of various sizes, and bordered in places by tidal flats and algal beds (see Figure 4-1). Although Bridges (1976) indicates that several marsh islands include large contiguous blocks of "high salt marsh," and the U.S. Department of the Interior (1980) National Wetland Inventory map indicates the same for "Estuarine intertidal narrow-leaved persistent emergent irregularly flooded" wetland (assumed here to be equivalent), the 1974 New York State Tidal Wetland Maps, done on a much smaller scale, indicate that these contiguous blocks actually consist of a complex mosaic of low (regularly flooded) and high (irregularly flooded) marsh. Buckley and Buckley (1984) described the colony site as "large areas of short-form *Spartina alterniflora* interspersed with *S. patens* and *Distichlis spicata*."

Bridges (1976) described the vegetation of the Jamaica Bay Wildlife Refuge. The dominant vegetation species in low salt marsh is salt marsh cord grass (*Spartina alterniflora*). Diversity is somewhat higher in high salt marsh. The three dominant species are salt meadow cord grass (*Spartina patens*), *S. alterniflora,* and salt grass (*Distichlis spicata*). Subdominant species that may occur include the herbaceous plants: Spearscale (*Atriplex patula*), saltworts (*Salicornia* spp.), sea lavender (*Limonium carolinianum*), sea blite (*Suaeda maritima*), and marsh pink (*Sabatia stellaris*); and the woody shrubs marsh-elder (*Iva frutescens*) and groundsel tree (*Baccharis halimifolia*). Of the subdominant species, marsh elder, sea lavender, sea rocket and saltwort are known to exist on JoCo marsh.



0 2000 4000

Approximate Scale in Feet

Source: USDA, 1993.

FIGURE 4-1

Aerial View of the East High Meadow, Joco and Silver Hole Marshes and JFKIA runway 4L

Associated with the islands are regularly and irregularly exposed tidal flats (U.S. Department of the Interior 1980). Bridges (1976) recorded algal beds as occurring near these islands.

4.1.2.2 Nesting Habitat Characteristics of Gulls

- **Laughing Gull Nesting Habitat Characteristics**

Along the middle Atlantic coast, Laughing Gulls nest on salt marsh islands (Bent 1921, Bull 1964, Bongiorno 1970, Buckley and McCaffrey 1978). The selection of this type of habitat appears to function as a defense against predators (Montevecchi 1977, Zale and Mulholland 1985, Landin and Soots 1978), who have difficulty reaching such islands, and if they do, cannot establish permanent populations owing to the islands' susceptibility to complete inundation during storms (Burger and Shisler 1980a). Burger and Lesser (1978) found that New Jersey Laughing Gulls nest only on islands vegetated with both *Spartina alterniflora* and S. *patens;* islands with only *S. alterniflora* were not occupied. Islands with mosquito ditching make acceptable colony sites (Burger and Shisler 1980a). Within occupied islands, Laughing Gulls generally nest in tall *S. alterniflora,* although sometimes nests are built in *S. patens* (Burger and Shisler 1978, 1980). During floods, Laughing Gulls will shift colony sites to higher locations within or among islands (Burger and Shisler 1980).

In New Jersey, Laughing Gulls generally build nests in Spartina, about 35 cm (14 in) tall and associated with low elevations (just above mean high tide level) near water (Montevecchi 1978); grass height at nest initiation may be a substantial predictor of reproductive success. Bongiorno (1970) also found the majority of Laughing Gull nests to be placed in tall 0.8 m (31.5 in) *S. alterniflora.* Both authors found that tall *S.alterniflora* prevents nests from washing away in storm tides.

Stone (1937) noted the tendency of Laughing Gulls to nest on masses of dried grass stems washed up by winter tides. Bongiorno (1970) found that artificially created mats of dead vegetation were preferentially utilized by the gulls, and Montevecchi (1978) also described the affinity of Laughing Gulls for nesting on mats, which provide additional elevation to protect nests from flooding. Severe floods generally occur during spring tides accompanied by sustained northeast winds, and are the most common cause of reproductive failure (Montevecchi 1978). Burger (1976) noted that Laughing Gulls conducted courtship activities on vegetation mats.

Montevecchi, et al. (1979) found that Laughing Gulls in New Jersey were socially attracted to nest in clusters, with nearby areas of apparently suitable habitat left unoccupied.

Studies of Laughing Gull colonies on similar back-barrier salt marshes along the New Jersey coast show that nests are not randomly distributed across marsh islands (Bongiorno, 1970; Montevecchi, 1978; Burger and Shisler, 1980). Gulls selectively nest at locations that offer optimum protection from damage due to flooding tides. A combination of factors lead to the distribution of gull nests, the key ones being surface elevation, proximity to water (tidal channels or pools), and grass height. Nests are not necessarily restricted to the high marsh to the exclusion of low marsh nor to the highest elevations of the marsh.

- **Ring-billed Gull Nesting Habitat Characteristics**

Ring-billed Gulls breed throughout North and Central America (Grant 1982). In New York State, Ring-billed Gulls nest abundantly along the St. Lawrence River, in Lake Champlain islands, and in Lake Ontario (Andrle and Carroll 1988); there has been no continued nesting on Long Island (Litman et al.

1993). No Ring-billed Gull nesting occurs on Gateway National Recreation Area or in Jamaica Bay (DEC and NPS pers. comm.). Nesting habitat on the upstate New York sites is rock or sand covered by a thin layer of soil (Belknap 1968). Recently, Ring-billed Gulls have nested in areas associated with manmade structures and altered sites, such as dredge spoil, water-control structures, rooftops, and docks. Nesting substrates include sand, earth, driftwood, concrete, slag and rocks (Blokpoel and Tessier 1986). On natural sites, the Ring-billed Gull nest is placed in a scrape on the ground, on matted vegetation, or along beaches among rocks (Andrle and Carroll 1988).

- **Herring Gull Nesting Habitat Characteristics**

Herring Gulls breed in North America including Greenland, Europe, and Africa (Grant 1982). In New York State, Herring Gulls nest along the St. Lawrence River, in the Adirondacks, and most-abundantly in the coastal lowlands (Long Island) (Andrle and Carroll 1988). Recent (1991) surveys indicate a Long Island breeding population of approximately 19,000 pairs in 32 colonies (Litman et al. 1993). Herring Gulls are present in the Jamaica Bay area year-round, and are most abundant during winter. In Jamaica Bay, this species feeds in tidal bays at low tides and uses freshwater ponds at high tides (Burger 1983 a). Herring Gulls nest on Gateway National Recreation Area on a number of sites: Breezy Point (approx. 860 adults in 1993)(Sillings 1993), Canarsie Pol (approx. 300 in 1991, although this approximation may be low and actual numbers much higher than 300 after 1991)(Litman et al. 1993), Hoffman Island (approx. 340 in 1993)(D. Riepe, NPS pers. comm. 1994), Ruffle Bar (approx. 650 in 1991)(Litman et al. 1993), Subway Island (approx. 400 in 1991)(Litman et al. 1993), Swinburne Island (approx. 250 in 1991)(Litman et al. 1993). On Long Island, most (80%) of the Herring and Great Black-backed gull colonies were on saltwater non-barrier islands, and a lesser amount (17%) were on barrier islands and peninsulas. Nests were commonly constructed on spoil/fill areas (43% of the colonies), salt marsh (26%), beach (24%), and dunes (10%). Primary nesting substrates were grass/sedge/rush/herb, sand, and dead herbaceous/wrack types and rip-rap (Litman et al. 1993). Maccarone et al. (1993) documented Herring (850 pairs) and Great Black-backed gull (50 pairs) nesting on Prall Island in New York Harbor in 1988 and 1989; dredged materials, garbage-wrack, and rip-rap were important habitats used by gulls on this site.

- **Great Black-backed Gull Nesting Habitat Characteristics**

Great Black-backed Gulls nest on coasts and islands of North America and Europe (Bent 1986). Great Black-backed Gulls are present in the Jamaica Bay area year-round, and are most abundant during winter. This species feeds in tidal bays at low tides and uses freshwater ponds at high tides (Burger 1983 a). In New York State, Great Black-backed Gulls nest primarily along the Long Island coast, with breeding noted in only four other New York State sites (Andrle and Carroll 1988). On Long Island, Peterson et al. (1985) reported that most Great Black-backed Gull nests are associated with man-altered sites such as dredge spoil, abandoned buildings, and docks. Nests are most-often located on the ground, associated with clumps of vegetation or trees. Nesting material consists of course grasses, mosses and other vegetation, and can measure up to 4.5 feet in diameter (Bent 1986). The 1991 survey of Long Island Colonial Waterbirds indicated a total of approximately 10,000 nesting Great Black-backed Gulls on Long Island (Litman et al. 1993). This species usually nests in association with Herring Gulls (Peterson et al. 1985). On Long Island, most (80%) of the Herring and Great Black-backed Gull colonies were on saltwater non-barrier islands, and a lesser amount (17%) were on barrier islands and peninsulas. Nests were commonly constructed on spoil/fill areas (43% of the colonies), salt marsh (26%), beach (24%), and dunes (10%). Primary nesting substrates were grass/sedge/rush/herb, sand, and dead herbaceous/wrack types (Litman et al. 1993).

Great Black-backed Gulls nest on Gateway National Recreation Area on a number of sites: Breezy Point (approx. 34 adults in 1993)(Sillings 1993), Canarsie Pol (approx. 50 in 1991)(Litman et al. 1993), Hoffman Island (approx. 40 in 1993)(D. Riepe, NPS pers. comm. 1994), Ruffle Bar (approx. 50 in 1991)(Litman et al. 1993), Subway Island (approx. 30 in 1991)(Litman et al. 1993), Swinburne Island (approx. 14 in 1991)(Litman et al. 1993).

4.2 Water Quality

4.2.1 Circulation

Jamaica Bay is the westernmost back-barrier lagoon system along the south shore of Long Island. It is a polyhaline, eutrophic estuary (Franz and Tanacredi, 1992) that is part of the overall Hudson-Raritan estuary. It is connected to the Lower Bay of New York Harbor by Rockaway Inlet through which all tidal waters enter (Figure 4-2). The bay is about 20 square miles (Franz and Harris, 1988) and drains approximately 8 square miles (Tanacredi, 1993). Depths at mean low water range from nearly 50 feet in the larger channels that rim the outer bay to a few feet in the narrower channels that separate interior salt marsh islands (NOAA, 1993). Marsh islands are also traversed by smaller and shallower highly sinuous tidal creeks that direct flow onto the marshes and channel drainage off them.

NOAA (1988) records maximum values of approximately 3.3 feet/sec at the Beach Channel Bridge and 1.7 feet/sec in Grass Hassock Channel that borders JoCo Marsh and Silver Hole Marsh on the southeast. Ramondetta and Harris (1978) also report a sharp decrease in current velocities in Grass Hassock Channel with channel bottom muds. Grassy Bay, bordering East High Meadow to the northeast, has weak circulation that promotes settling of sediments.

The circulation patterns and current velocity strengths in these areas of the bay have been altered by the dredge and fill activities associated with the initial construction of the airport and of the runway extension such that the flushing rate was reduced (residence time increased from about 10 days to 35 days) and the deposition of fine sediments favored (Dames and Moore, 1976; Ramondetta and Harris, 1978).

Freshwater enters the bay primarily from combined sewer overflows (CSO) and four water pollution control facilities (WPCF) (Olufeagba et al., 1975; Franz and Tanacredi, 1992).

4.2.2 Surface Water Quality

The major sources of pollutants to Jamaica Bay are the WPCFs, CSOs, and leachate from three closed landfills that border the bay. The WPCFs contribute 320 million gallons of secondary treated wastewater per day (Tanacredi, 1993). The CSOs contribute untreated wastewater during wet weather. The 1992 New York State Section 305(b) Water Quality Report (NYSDEC, 1992) lists pathogens from CSOs as being the primary pollutant of Jamaica Bay. Other factors that affect water quality in the bay include the quality of flooding oceanic waters, the quality of ebbing water draining the marsh islands, the quality of resuspended sediments, and the flushing capability of the system. The waters of Jamaica Bay are classified 'SB' by the New York State Department of Environmental Conservation (NYSDEC, 1992) and 'A' by the Interstate Sanitation Commission (ISC, 1992). The creeks and basins along the north shore of Jamaica Bay (Paerdegat Basin, Fresh Creek, Hendrix Creek, Shellbank Basin, Bergen Basin, Hawtree Basin) are classified by NYSDEC as 'I'. Oxygen demand is the primary pollutant at Shellbank Basin with

aesthetics affected by CSOs being the primary pollutant at the other locations (NYSDEC,1992). State, federal, and ISC water quality standards applicable to the Jamaica Bay area are provided in Table 4-2.

The designated best uses for 'B' and 'A' water classifications are primary and secondary contact, recreation and fishing. These waters should also be suitable for fish propagation and survival. Class 'I' waters are designated for secondary contact, recreation and fishing, and are suitable for fish propagation and survival.

The National Park Service (NPS) and the New York City Department of Environmental Protection (NYCDEP) conduct annual water quality surveys of Jamaica Bay. Tables 4-2 through 4-7 present the results of surveys conducted in 1992 for non-metal parameters and in 1991 for metals (NPS, 1992; NYCDEP, 1993). Sample locations are shown in Figure 4-2.

4.2.3 Sediment Quality

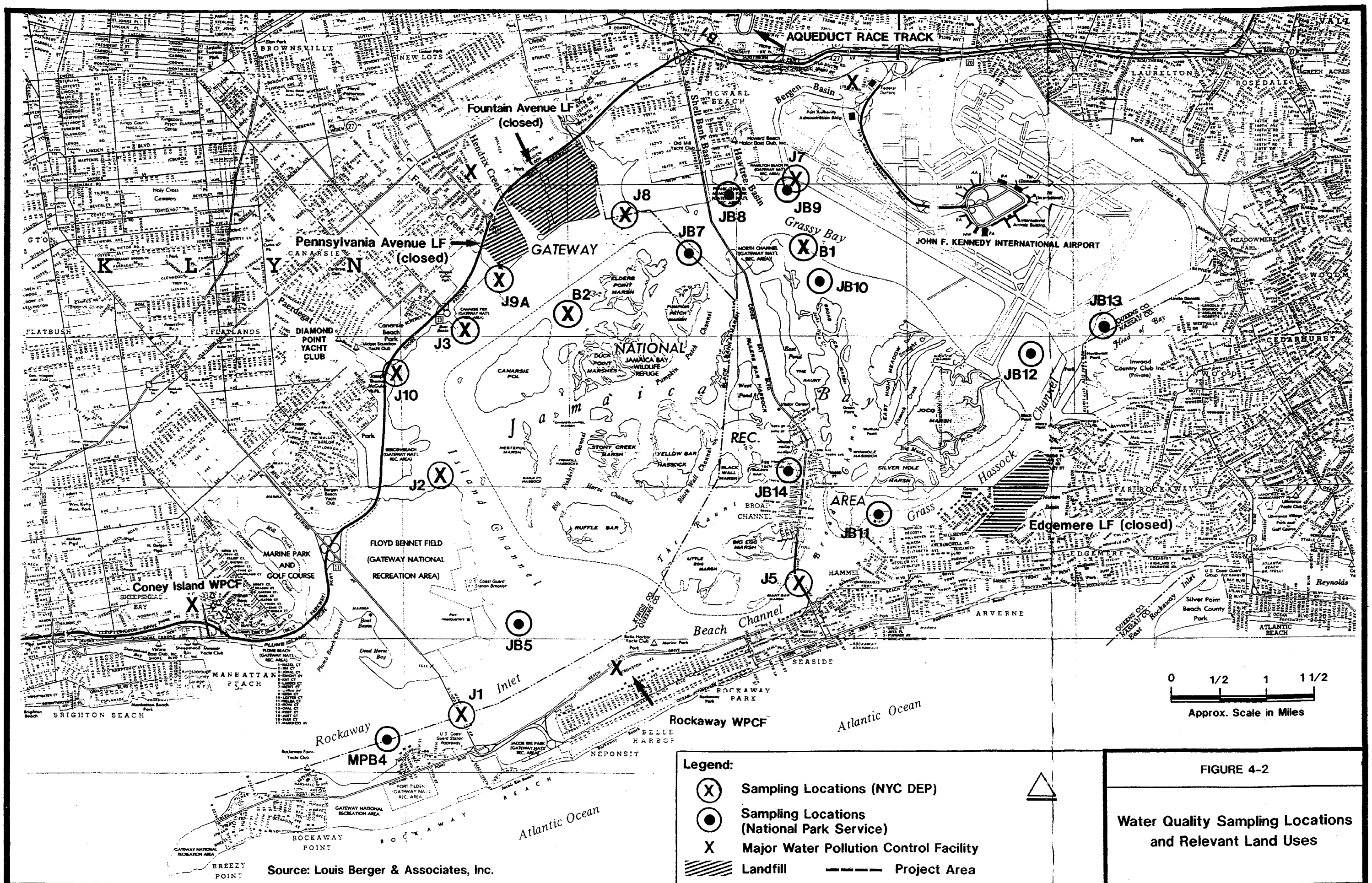
Sediment quality data of Jamaica Bay bottom sediments from the study conducted by Ramondetta and Harris (1978) are presented in Table 4-8. The distribution of metals in the bay varies and is correlated with proximity to the source of metals, the organic carbon content of sediments, and tidal current velocity.

In areas with lower tidal current velocities, metal concentrations are elevated well above background levels and at times these values are hundreds of times greater than background levels. Among different types of sediments, coarse sediments tend to have relatively low metal concentrations compared with fine sediments. Fine sediments have higher concentrations of metals due to the high organic matter content of low energy environments that favor the deposition of fine sediments. However, fine sediments such as silt and clay samples that are low in organic carbon have low metal concentrations.

The concentrations of metals were found to be higher in locations near sewage outfalls (Ramondetta and Harris, 1978). Presence of lead, chromium, zinc, copper, and cadmium in sediments is associated with sewage effluent while vanadium, cobalt, and nickel appear to be associated with petroliferous sources such as fuel terminals and heavy industry. Mercury values are high compared to other areas polluted with sewage, e.g., 1.0 ppm in Palos Verdes, California; 0.02 ppm in LaJolla, California; and 0.82 ppm in Los Angeles, California.

4.3 Air Quality

Existing air quality data representing the JFKIA area were examined by reviewing the Annual Report (DAR-92-1) of the New York State Ambient Air Monitoring System, and derived from several monitoring sites including Sheepshead Bay, Public School-321, Public School-314, and Public School-112 stations. The monitored maximum ambient concentrations for particulate matter (PM-10) range from 49 to 65 $\mu g/m^3$ for a 24-hour period and from 24 to 29 $\mu g/m^3$ for annual average concentrations. The maximum existing total suspended particulates (TSP) concentration in this area is 87 $\mu g/m^3$. The observed worst-case ambient data for carbon monoxide (CO) are 6.7 ppm (parts per million) and 4.4 ppm for 1- and 8-hour concentrations, respectively. The monitoring data indicate low concentration levels for existing ambient conditions within the JFKIA area. All levels are within the applicable regulatory standards.



Source: Louis Berger & Associates, Inc.

Legend:

- (X) Sampling Locations (NYC DEP)
- (●) Sampling Locations (National Park Service)
- X Major Water Pollution Control Facility
- Landfill
- ——— Project Area

FIGURE 4-2

Water Quality Sampling Locations and Relevant Land Uses

Table 4-2

State and Federal Water Quality Standards (1991)
for Class Designations of Tidal Waters in the Project Area
(all units in μg/l (micrograms per liter) unless otherwise noted)

PARAMETER	NYSDEC (CLASS SB)	NYSDEC (CLASS I)	U.S. EPA (SALT WATER) ACUTE[f]	U.S. EPA (SALT WATER) CHRONIC[g]
arsenic	63	---	69 (tri)	36 (tri)
cadmium	7.7	7.7	43 (H)	9.3 (H)
copper	2.9	2.9	2.9 (H)	2.9 (H)
dissolved oxygen (minimum)[a]	5.0 mg/l	4.0 mg/l	---	---
fecal coliform (#/100 ml)	200[b]	2000[b]	---	---
lead	8.6	---	220 (H)	8.5 (H)
mercury	---	---	2.1	0.025
nickel	7.1	---	75 (H)	8.3 (H)
pH (standard units)	[c]	[c]	---	---
silver	---	---	2.3 (H)	---
total coliform (#/100 ml)	2400[d] (5000)	10,000[e]	---	---
zinc	58	---	95 (H)	86 (H)

NOTES:

mg/l: milligrams per liter
ml: milliliter
H: dependent on hardness
(tri): trivalent

[a] ISC criteria for Class A and Class B-1 waters are a minimum of 5.0 mg/l and 4.0 mg/l, respectively
[b] geometric mean not to be exceeded
[c] normal range not to be extended more than 0.1 units
[d] monthly median not to be exceeded; number in parentheses is value not to be exceeded for more than 20 percent of the samples
[e] monthly geometric mean not to be exceeded
[f] acute criteria are one-hour average concentrations not to be exceeded more than once every three years, on average
[g] chronic criteria are 4-day average concentrations not to be exceeded more than once every three years, on average

Sources: Water Quality Regulations for Surface Waters and Groundwaters, 6NYCRR Parts 700-705, 10/7/93; Interstate Sanitation Commission Organization and Regulations, amended June 1986; U.S. EPA Criteria Chart, December 1992.

Table 4-3

Summer 1992 Water Quality Data for Jamaica Bay

SITE	J1	J2	J3	J5	J7	J8	J9A	J10
SALINITY (ppt) top mean	28.2	27.8	27.1	26.9	25.2	26.7	26.8	27.3
bottom mean	29.4	28.5	27.8	27.1	26.3	26.9	27.1	27.9
top minimum	24.9	25.3	24.5	25.0	23.0	24.6	24.5	24.4
bottom minimum	26.5	25.9	25.7	25.0	24.4	24.8	24.3	25.0
top maximum	31.3	30.9	30.6	30.4	28.4	29.2	30.6	30.9
bottom maximum	33.5	32.0	31.1	30.8	28.8	29.9	30.9	31.5
top # of samples	11	11	11	11	11	10	10	11
bottom # of samples	11	11	11	11	11	10	10	11
TEMPERATURE (°C) top mean	20.8	21.5	21.9	22.1	22.9	22.5	22.3	21.7
bottom mean	19.9	20.6	21.2	21.7	21.8	22.1	22.0	21.2
top minimum	16.6	17.2	17.4	17.2	17.8	17.5	17.4	17.4
bottom minimum	16.0	16.7	17.1	17.2	17.4	17.5	17.3	17.4
top maximum	23.8	24.3	24.4	25.2	25.8	25.0	24.5	24.3
bottom maximum	23.2	23.7	23.9	24.6	24.5	24.3	24.2	23.7
top # of samples	11	11	11	11	11	10	10	11
bottom # of samples	11	11	11	11	11	10	10	11
DISSOLVED OXYGEN top mean (mg/l)	7.8	8.2	8.8	7.8	9.8	8.3	8.6	7.8
bottom mean	7.4	6.7	6.6	6.8	5.0	6.1	6.9	7.4
top minimum	6.5	5.5	6.2	4.8	5.4	5.1	6.2	6.5
bottom minimum	6.2	4.7	4.5	4.4	1.0	4.0	4.8	6.2
top maximum	11.4	11.3	16.2	14.0	15.3	14.9	14.8	11.4
bottom maximum	9.6	9.9	10.4	11.1	12.3	9.4	10.1	9.6
top # of samples	11	11	11	11	11	10	10	11
bottom # of samples	11	11	11	11	11	10	10	11

Table 4-3 (Cont'd)

Summer 1992 Water Quality Data for Jamaica Bay

SITE	J1	J2	J3	J5	J7	J8	J9A	J10
BIOCHEMICAL OXYGEN DEMAND (5 day mg/l) top mean	2.7	3.2	4.7	3.3	5.7	5.3	4.3	2.7
bottom mean	2.0	2.1	4.1	2.7	3.1	3.0	3.6	2.0
top minimum	1.0	1.5	1.6	1.1	2.4	1.6	2.8	1.0
bottom minimum	1.1	1.2	1.5	1.4	0.9	1.4	2.2	1.1
top maximum	6.0	7.7	8.2	7.0	8.8	8.5	8.2	6.0
bottom maximum	3.9	4.5	12.0	5.5	8.7	4.4	7.3	3.9
top # of samples	10	10	10	10	10	8	9	10
bottom # of samples	9	9	9	9	10	7	8	9
pH (standard units) top mean	8.07	8.04	7.99	7.91	8.11	8.03	8.05	8.00
bottom mean	8.05	8.02	7.96	7.98	7.86	7.94	7.96	7.98
top minimum	7.80	7.75	7.65	7.30	7.84	7.70	7.74	7.70
bottom minimum	7.84	7.73	7.47	7.53	7.54	7.67	7.72	7.71
top maximum	8.51	8.49	8.54	8.36	8.46	8.49	8.66	8.60
bottom maximum	8.34	8.40	8.49	8.47	8.15	8.48	8.41	8.46
top # of samples	7	7	7	7	6	6	5	7
bottom # of samples	7	7	7	7	6	6	6	7
SECCHI DEPTH (feet) mean sample	6.3	5.0	4.9	5.8	3.9	4.6	4.6	5.2
minimum	3.5	3.0	3.0	3.0	2.0	2.5	3.0	3.0
maximum	11	8	10	11	5	9	8	8
sample number	11	11	11	11	11	10	10	11
NUTRIENTS IN SURFACE WATERS(mg/l) NH_4	0.187	0.316	0.630	0.300	1.256	0.837	0.774	0.416
$NO_3 + NO_2$	0.141	0.171	0.185	0.194	0.191	0.215	0.210	0.170
TDIN	0.329	0.487	0.815	0.494	1.447	1.052	0.984	0.585
P	0.102	0.149	0.164	0.162	0.275	0.214	0.182	0.160

Table 4-3 (Cont'd)

Summer 1992 Water Quality Data for Jamaica Bay

SITE	J1	J2	J3	J5	J7	J8	J9A	J10
PO_4	0.081	0.094	0.117	0.117	0.191	0.136	0.118	0.107
CHLOROPHYLL "a" (mg/m^3)	21.5	38.3	40.7	34.7	54.0	39.4	36.8	32.3
FECAL COLIFORM top mean (#/100ml)	15	21	28	30	187	123	53	116
bottom mean	7	13	31	34	55	93	38	5
top maximum	310	1240	1280	218	3200	2200	6320	16,500
bottom maximum	220	720	1280	244	230	4500	3300	1740
top minimum	4	2	7	11	27	10	9	10
bottom minimum	2	2	10	5	9	9	9	9
top # of samples	10	10	10	10	10	9	9	10
bottom # of samples	10	10	10	10	10	9	9	10
TOTAL COLIFORM top mean (#/100 ml)	54	140	108	120	1655	331	195	455
bottom mean	56	140	117	233	419	228	211	287
top maximum	2200	16,000	16,000	800	16,000	9000	16,000	16,000
bottom maximum	2400	9000	5000	2400	3500	5000	16,000	9000
top minimum	20	20	20	40	300	20	20	20
bottom minimum	20	20	20	20	40	20	40	20
top # of samples	8	8	8	8	8	7	7	8
bottom # of samples	8	8	8	8	8	7	7	8

ABBREVIATIONS:

PO_4 = dissolved orthophosphate
NH_4 = dissolved ammonium
TDIN = total dissolved inorganic nitrogen (NH_4 + NO_3 + NO_2)
NO_3 + NO_2 = dissolved nitrate + nitrite
mg/m^3 = milligrams per cubic meter
P = total phosphorus
°C = degrees Centigrade
ppt = parts per thousand
mg/l = milligrams per liter
ml = milliliter

Source: New York City Department of Environmental Protection, 1993.

Table 4-4

Water Quality Data for Jamaica Bay
May to September 1992*

SITE	ST	BT	SS	BS	SpH	BpH	SDO	BDO	Se	TOT	FEC	SC	BC
JB-8	21.8	21.5	25.8	25.5	8.15	8.12	7.12	5.78	4.5	1941	537	36.7	36
JB-9	22.0	21.4	25.5	25.0	8.05	8.01	6.8	5.5	4.0	5815	3865	36.4	35
JB-10	21.9	21.2	25.5	25.8	8.32	8.02	8.4	5.5	4.2	2957	955	36.5	36
JB-11	21.5	21.2	26.8	26.8	8.27	8.19	7.7	6.8	5.2	1239	621	37.8	38
JB-12	22.1	21.0	26.3	26.8	8.41	8.0	8.9	5.6	4.8	742	218	37.6	37
JB-13	22.4	21.7	25.7	26.1	8.31	8.17	9.0	6.5	4.5	1713	1545	37.0	****

NOTES:
* Values represent seasonal averages consisting of 15 sampling dates.

ST = surface water temperature
BS = bottom salinity
SDO = Surface dissolved oxygen
TOT = total coliform
BpH = bottom pH
SC = surface conductivity average
BC = bottom conductivity average

BT = bottom water temperature
SS = surface salinity
BDO = bottom dissolved oxygen
FEC = fecal coliform
SpH = surface pH
Se = Secchi depth
CFU = colony forming units

Units:
temperature = degrees Centigrade
salinity = parts per thousand
dissolved oxygen = milligrams per liter (mg/l)
total coliform = colony forming units per 100 milliliters
fecal coliform = colony forming units per 100 milliliters
Secchi depth = feet
conductivity = millimhos per centimeter

Within the seasonal averages, the following sites exceeded New York State Class SB standards for total coliform (2400 CFU/100ml) or fecal coliform (200 CFU/100ml) and/or dissolved oxygen values of 3.0 mg/l.

JB-8 (North Channel Bridge) SDO exceeded once; BDO twice; TOT on 4 dates; FEC on 3 dat
FEC seasonal average also exceeded standard
JB-9 (Bergen Basin) SDO once; TOT and FEC exceeded on 11 dates;
TOT and FEC seasonal average also exceeded standards
JB-10 (Winhole Channel) BDO exceeded once; TOT and FEC exceeded on 7 dates;
TOT and FEC seasonal average also exceeded standard
JB-11 (Subway Tressel) BDO exceeded once; TOT on 3 dates; FEC on 4 dates;
TOT and FEC seasonal average also exceeded standard
JB-12 (Jo Co Marsh) TOT exceeded on 2 dates; FEC exceeded on 3 dates;
FEC seasonal average also exceeded standard
JB-13 (Head of the Bay) BDO exceeded once; TOT on 4 dates; FEC on 6 dates;
FEC seasonal average also exceeded standard

Source: NPS (1992).

Table 4-5

1992 Volatile Organic Compounds in Jamaica Bay

SITE	DATE	methylene chloride	trans-1,2 dichloro ethene	chloro form	1,2-di chloro ethane (2)	1,1,1-tri chloro ethane (2)	carbon tetra chloride (2)	bromo dichloro methane	1,2-di chloro propane	tri chloro ethylene (1,2)	benzene (1,2)	1,1,2-tri chloro ethane	bromo form	tetra chloro ethylene (1,2)	1,1,2,2-tetra chloro ethane(2)	toluene (2)	chloro benzene (1)	ethyl benzene (2)	iso propyl benzene	4-bromo fluoro benzene surrogate	styrene	n-propyl benzene	1,3-di chloro benzene (1)*	1,2-di chloro benzene (1)*	1,4-di chloro benzene (1)*
J1-T	5/6/92	0.2	ND	0.2	0.2	0.3	1.3	0.1	ND	0.9	0.1	ND	0.7	0.6	1.1	0.3	ND	0.1	ND	133.5	ND	ND	0.6	ND	ND
J1-B	5/6/92	ND	ND	0.9	ND	0.2	1.6	ND	ND	ND	0.1	ND	ND	ND	0.2	0.4	ND	ND	ND	135.0	ND	ND	ND	ND	ND
J1-T	7/14/92	ND	ND	8.6	ND	0.3	ND	1.9	ND	1.1	ND	ND	0.7	1.1 a	0.7	ND	ND	ND	ND	85.4	7.9	ND	0.2	0.6	ND
J1-B	7/14/92	ND	ND	9.3	ND	ND	ND	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	94.4	7.9	ND	ND	ND	ND
J2-T	6/17/92	0.3	ND	0.5	0.1	0.2	ND	ND	ND	0.7	0.7	ND	0.4	0.8	0.4	1.1	0.9	ND	ND	94.7	ND	2.7	0.1	0.4	ND
J2-B	6/17/92	0.2	ND	0.2	ND	0.2	ND	ND	0.2	ND	1.6	ND	ND	0.1	0.3	3.1	3.0	ND	ND	100.4	ND	6.9	ND	ND	ND
J2-T	7/30/92	ND	ND	4.5	ND	0.4	ND	1.4	ND	1.5	ND	ND	0.6	1.1 a	0.5	0.4	0.1	0.1	0.1	87.3	ND	ND	0.2	0.6	ND
J2-B	7/30/92	0.5	ND	3.9	ND	ND	ND	1.3	ND	ND	ND	ND	ND	ND	ND	0.1	ND	ND	ND	95.4	ND	ND	ND	ND	ND
J3-T	6/17/92	0.2	ND	0.3	ND	0.2	ND	ND	ND	ND	0.1	ND	ND	0.1	0.3	0.2	0.2	ND	ND	127.6	ND	0.5	ND	ND	ND
J3-B	6/17/92	0.2	ND	0.6	ND	0.2	ND	ND	0.1	ND	1.0	ND	0.1	0.1	0.3	1.7	1.5	ND	ND	107.6	ND	3.9	ND	ND	ND
J3-T	7/30/92	ND	ND	4.4	ND	0.4	ND	1.4	ND	ND	ND	ND	0.1	ND	0.4	0.1	ND	ND	ND	ND	95.5	ND	ND	ND	ND
J3-B	7/30/92	ND	ND	3.6	ND	0.4	ND	1.2	ND	ND	ND	ND	ND	ND	0.4	0.1	ND	ND	ND	ND	94.1	ND	ND	ND	ND
J5-T	5/6/92	ND	ND	0.7	ND	0.2	2.0	ND	ND	ND	0.1	ND	0.1	0.4	0.2	0.2	ND	ND	ND	138.3	0.4	ND	ND	ND	ND
J5-B	5/6/92	ND	ND	0.1	ND	0.2	0.6	ND	ND	ND	ND	ND	0.1	ND	ND	0.3	ND	ND	ND	0.3	ND	ND	ND	ND	ND
J5-T	7/14/92	ND	ND	9.7	ND	0.4	ND	2.1	ND	ND	0.3	ND	0.3	ND	0.5	0.8	ND	ND	ND	89.1	7.7	ND	ND	ND	ND
J5-B	7/14/92	0.2	ND	0.1	ND	0.4	ND	ND	ND	0.1	ND	ND	0.2	ND	ND	ND	ND	ND	ND	79.9	7.5	ND	ND	ND	ND
J7-T	6/2/92	0.2	ND	0.3	0.1	0.3	0.1	ND	ND	0.5	0.1	ND	0.3	0.6	1.2	0.3	ND	ND	ND	95.6	0.3	ND	0.1	0.9	ND
J7-B	6/2/92	0.1	ND	0.2	ND	0.2	ND	ND	ND	0.1	ND	ND	0.1	0.2	0.5	0.1	ND	ND	ND	132.5	0.4	ND	ND	ND	ND
J7-T	7/21/92	ND	0.2	1.1	ND	0.4	0.5	0.5	ND	0.2	ND	ND	ND	ND	0.6	0.1	ND	ND	ND	78.7	ND	ND	ND	ND	ND
J7-B	7/21/92	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6	ND	ND	ND	ND	65.3	ND	ND	ND	ND	ND
J8-T	6/17/92	0.2	ND	0.2	ND	0.2	0.6	ND	ND	ND	0.2	ND	ND	0.1	0.4	0.3	0.5	ND	ND	98.4	ND	1.1	ND	ND	ND
J8-B	6/17/92	0.2	ND	0.6	0.2	0.2	0.2	ND	ND	1.0	0.4	ND	0.6	1.2 a	0.8	0.5	0.6	ND	ND	108.4	ND	1.5	0.1	0.5	ND
J8-T	7/21/92	ND	ND	1.2	ND	0.4	ND	0.5	ND	0.2	ND	ND	0.1	ND	0.5	0.1	ND	ND	ND	82.7	ND	ND	ND	ND	ND
J8-B	7/21/92	ND	0.4	1.3	ND	ND	ND	0.6	ND	ND	ND	ND	ND	ND	0.4	0.1	ND	ND	ND	ND	81.4	ND	ND	ND	ND
J9A-T	6/2/92	ND	0.1	0.2	ND	0.1	ND	ND	ND	0.2	ND	ND	0.1	0.2	0.5	0.1	ND	ND	ND	91.1	0.3	ND	ND	ND	ND
J9A-B	6/2/92	0.1	ND	0.2	ND	0.2	ND	ND	ND	ND	ND	ND	0.1	0.2	0.4	0.2	ND	0.1	ND	122.9	0.4	ND	ND	ND	ND
J9A-T	7/21/92	ND	ND	1.5	0.3	0.3	ND	0.8	ND	1.5	ND	ND	0.8	1.3 a	0.8	0.6	0.1	ND	ND	ND	90.9	ND	0.2	0.7	ND
J9A-B	7/21/92	ND	ND	0.2	ND	0.3	ND	0.1	ND	ND	ND	ND	0.1	0.1	0.4	0.1	ND	ND	ND	67.8	ND	ND	ND	ND	ND
J10-T	6/2/92	2.0	0.2	0.7	0.1	0.2	ND	ND	ND	ND	0.1	ND	0.1	0.2	0.5	0.4	ND	ND	ND	106.4	0.3	ND	ND	ND	ND
J10-B	6/2/92	ND	0.2	0.2	ND	ND	0.4	ND	ND	0.1	0.1	ND	ND	0.2	0.4	0.3	ND	ND	ND	100.4	0.4	ND	ND	ND	ND
J10-T	7/30/92	0.1	ND	0.2	ND	0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	84.2	ND	ND	ND	ND
J10-B	7/30/92	0.4	ND	5.1	ND	0.4	ND	1.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	91.5	ND	ND	ND	ND

NOTES:

Units = micrograms per liter
T = surface sample; B = bottom sample; ND = less than 0.1 micrograms per liter
a = Value shown exceeds New York State Guidance value
(1) = parameter has a New York State Guidance value
(2) = parameter has U.S. EPA criteria
* = indicates that the guidance value for Dichlorobenzenes applies to the sum of these substances

Source: New York City Department of Environmental Protection, 1993.

Table 4-6

Chlorophyll "a" Data for Jamaica Bay

Site	Chlorophyll "a" 5/28/92	Chlorophyll "a" 6/15/92	Chlorophyll "a" 7/13/92	Chlorophyll "a" 8/17/92
JB-8	12.5554	20.3416	10.9422	2.2574
JB-9	15.5748	18.7536	7.0404	1.0182
JB-10	13.5974	18.5474	7.5192	3.2618
JB-11	14.0896	15.5116	7.63354	2.11108
JB-12	10.3102	32.1922	7.7792	3.2958
JB-13	13.268	15.6252	7.3002	4.447

NOTES:

Chlorophyll "a" = milligrams per cubic meters

Source: NPS (1992).

Table 4-7

1991 Water Quality in Jamaica Bay

STATION	DATE	Ag	As	Cd	Cu	Hg	Ni	Pb	Zn	POC	DOC	TSS
		(μg/l)	(μg/l)	(μg/l)	(μg/l)	(μg/l)	(μg/l)	(μg/l)	(μg/l)	(mg/l)	(mg/l)	(mg/l)
TOTAL RECOVERABLE CONCENTRATIONS												
B1	1/10/91	0.015	NA	0.115	2.2	0.002	2	0.52	10.3	0.724	2.75	1.64
B2	1/10/91	NA	NA	0.058	1.9	0.002	1	0.31	5.6	0.28	1.83	1.28
B1	10/30/91	NA	NA	0.025	2.02	0.052*	1.57	0.22	6.17	0.598	2.02	1.58
ACID SOLUBLE CONCENTRATIONS												
B1	1/1/91	0.039	NA	0.113	2.59	0.006	1.23	0.52	10.81	---	---	---
B2	1/1/91	0.024	NA	0.084	1.82	0.007	0.95	0.31	6.36	---	---	---
DISSOLVED CONCENTRATIONS												
B1	1/1/91	0.018	NA	0.094	2.04	0.003	1.3	0.139	9.83	---	---	---
B2	1/1/91	0.011	NA	0.0074	1.55	0.005	1.04	0.162	6.59	---	---	---
B1	10/30/91	0.002	NA	0.042	1.62	0.003	1.68	0.07	32.54	---	---	---
PARTICULATE CONCENTRATIONS												
B1	1/1/91	<0.0005	0.067	0.004	0.374	<0.00016	0.034	0.4	0.6913	---	---	---
B2	1/1/91	<0.0005	0.043	0.002	0.25	<0.00015	<0.044	0.22	0.34	---	---	---

Notes:
*This exceeds the NY/NJ Harbor Estuary Program Criteria

Ag = silver
As = arsenic
Cd = cadmium
Cu = copper
Hg = mercury
Ni = nickel
Pb = lead
Zn = zinc
POC = particulate organic carbon
DOC = dissolved organic carbon
TSS = total suspended solids
NA = no data
μg/l: micrograms per liter
mg/l: milligrams per liter

Source: New York City Department of Environmental Protection, 1993.

Table 4-8

Jamaica Bay Sediments

	ORC	Pb	Cr	Ni	Zn	Cu	Co	Cd	V
Mean (ppm)	26,100	115	102	24.3	196	85.7	5.98	3.15	37.2
Peak (ppm)	135,000	507	501	103	1930	764	21.4	14.2	131
Standard deviations	28,095	121	121	24.3	256	117	4.23	3.32	39.0

NOTES:

ORC = percent organic carbon
Ni = nickel
Co = cobalt
ppm = parts per million

Pb = lead
Zn = zinc
Cd = cadmium

Cr = chromium
Cu = copper
V = vanadium

Source: Ramondetta and Harris, 1978.

4.4 Parkland

Parkland in the project area is defined as areas that are designated by local, state or federal laws or regulations as parkland, as well as other private or public areas that are used for outdoor recreational purposes typically associated with a park environment. Most of the parkland in the project area is administered by the National Park Service (U.S. Department of the Interior) as part of the Gateway National Recreation Area. This area was established in 1972 and consists of several management units in and around New York Harbor.

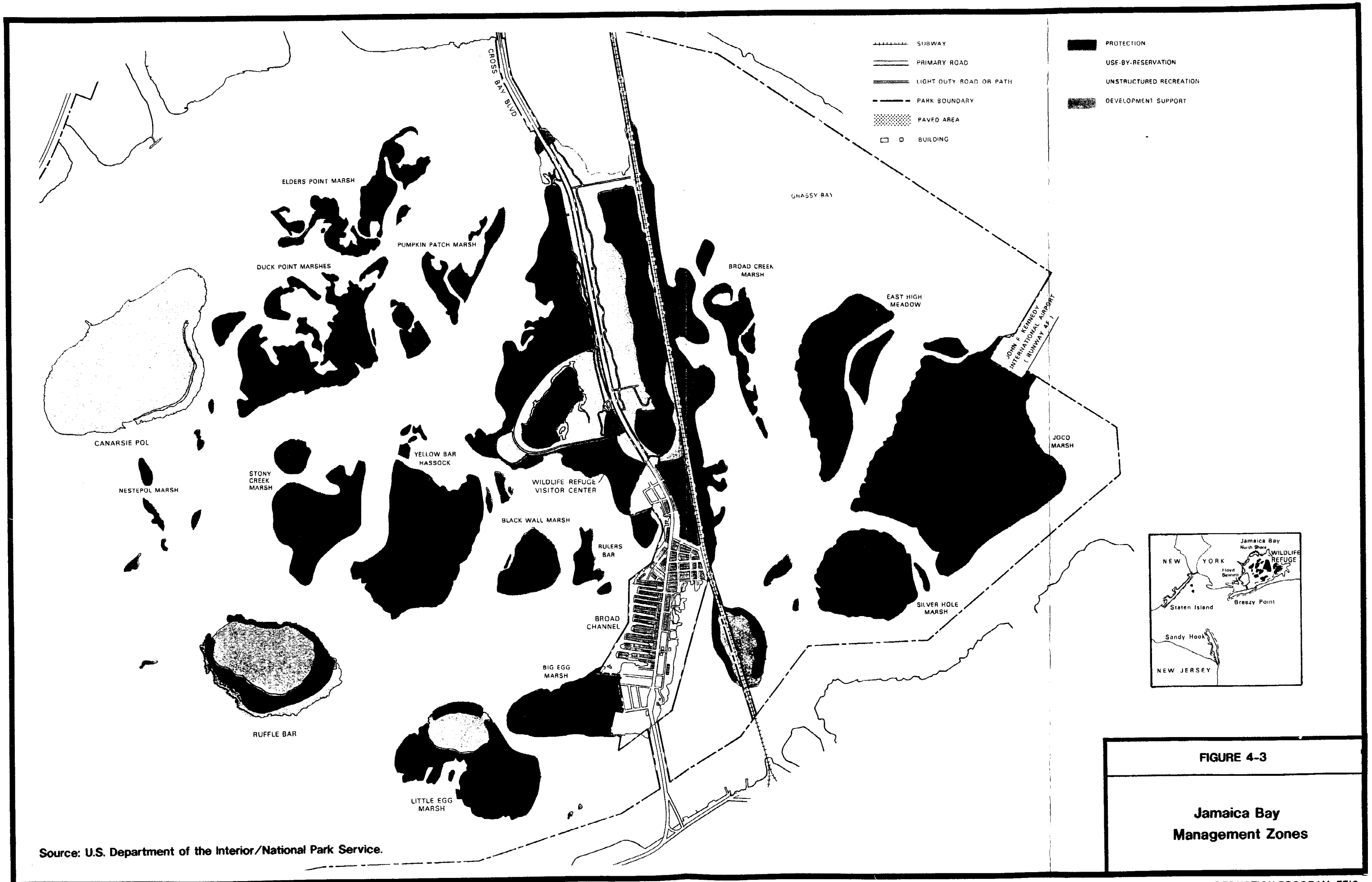
The project site is located in what is referred to as the Jamaica Bay Unit. This area encompasses approximately 4,450 acres of land and marshlands in and near Jamaica Bay. It includes all islands, marshes, hassocks, submerged lands and waters in Jamaica Bay, Floyd Bennett Field, the area located between Route 27A and Jamaica Bay, and the area of Jamaica Bay up to the shoreline of John F. Kennedy International Airport. The site is located in the central portion of Jamaica Bay, also known as the Jamaica Bay Wildlife Refuge; a conglomerate of islands and marshes transsected by Cross Bay Boulevard which connects the mainland north of the Bay with the Rockaways to the south. Joco, East High Meadow and Silver Hole marshes are designated as a Protection Zone within the GNRA management zoning concept. In such areas natural processes are encouraged and wildlife species, particularly those that are rare or endangered are protected through specific management strategies, including those involving elimination of predator species. An overview of the type of management zones within the Jamaica Bay Wildlife Refuge is presented in Figure 4-3.

In addition to the Jamaica Bay Wildlife Refuge, several city parks are located to the east, separated from the site by Grass Hassock Bay. Rockaway Community Park (former Edgemere landfill site) is located less than one-half mile southeast of Joco Marsh, while the Inwood Country Club—a private park—is located to the northeast. Other parks and recreation areas are located along the western edge of Jamaica Bay, along the Belt Parkway. North to south they include Canarsie Beach Park, Bergen Beach Park (GNRA), Marine Park and Floyd Benett Field (GNRA), a former airfield, and Manhattan Beach Park. South of Jamaica Bay are the Rockaways, a barrier "island" that separates Jamaica Bay from the Atlantic Ocean. Several portions of this area are part of the GNRA and have been developed as parks. Several other areas are proposed for development as parks, including new parks in the Edgemere Urban Renewal Area.

An important recreational resource of Jamaica Bay is the fact that a substantial amount of its shoreline is publicly accessible, creating views and opportunities for recreation that are unmatched in the New York metropolitan area. Several "greenways" providing bicycle transportation connections already exist in the area and several missing links are proposed in the city's Comprehensive Waterfront Plan. The Plan further recommends that natural edges of the waterfront are made available for limited public access. This will further enhance the already substantial opportunities in and around Jamaica Bay for bird watching.

4.5 Socioeconomics

The Jamaica Bay/Rockaway area is characterized by the (sometimes conflicting) economic, ecological, recreational and redevelopment aspects of New York City's waterfront. JFKIA represents one of the most important elements of the New York regional economy, while the natural waterfront of this area represents a remarkable natural resource with an estimated 4,000 acres of tidal wetlands and is listed in the International Shorebird Reserve System.



Source: U.S. Department of the Interior/National Park Service.

FIGURE 4-3

Jamaica Bay Management Zones

4.5.1 Economic Activities

John F. Kennedy International Airport is a major economic resource for the region. It is a gateway to international markets and provides essential transportation of goods for industries in and around the New York metropolitan region. The airport's importance as a vital link in the nation's transportation system is exemplified by its status of being the largest air cargo facility in the nation. In addition, the airport is served by all major domestic and international airlines and processes an enormous amount of tourist and business travelers to a broad variety of destinations within the United States and abroad. The airport and the associated industrial area also provides direct employment for approximately 37,000 people. The balance between the airport's economic importance and the area's ecological value is underlined by the city's Comprehensive Waterfront Plan which states that public actions should ensure that the safety and operational needs of the airport are met while protecting environmental resources in Jamaica Bay.

Other economic activities in the area include various water-dependent uses located around the Bay. A multitude of marinas and yacht clubs are located around Jamaica Bay, due to its moderately deep water, protection from currents, strong winds and wave action and absence of conflict with maritime activity. They include full-service marinas, accessory docks, and single docks for private recreational vessels. Marina-supported activities include boat repair and maintenance, boat storage and sail making and repair. Most marinas in Jamaica Bay have a recreational character. Two clusters of marinas are located in Jamaica Bay. Approximately one-half mile southeast of the project area are several full-service marinas and yacht clubs located in the vicinity of Verman Basin. The Egg Harbor Yacht Club is located in the central marsh portion of Jamaica Bay, approximately one-half mile west of Silver Hole Marsh. Approximately 3 miles northwest of the project site is a second cluster of marinas located in the Howard Beach area.

4.5.2 Land Use and Zoning

Most of the shoreline and islands in Jamaica Bay and its surroundings are zoned as parkland. Upland residential areas are low-to medium density zoned R2 to R6. Small industrial areas are zoned on some inlets and scattered on the north shore of the Rockaways. John F. Kennedy International Airport is zoned M1. Jamaica Bay is also a major recreational resource with marina and yacht facilities spread around the Bay. Rockaway Beach consists of long uninterrupted stretches of public beachfront. Future plans also designate the area as having potential for water transportation between Manhattan and JFKIA, with additional commuter stops in Brooklyn and Rockaway (New York City Planning Department 1992).

New York City Community Districts located around Jamaica Bay include Brooklyn community districts 5, 18 and 15 and Queens community district 14. The Jamaica Bay Task Force conducts and coordinates policy and program development for the area. Its membership includes federal, state, and city agencies, universities and institutions, community and environmental organizations.

Several residential communities are located around Jamaica Bay. Consequently, the Bay is considered a valuable resource to these communities. The community closest to Joco, East High Meadow and Silver Hole marshes is the enclave community of Broad Channel immediately to the south. Other nearby communities include those along the eastern shore of Jamaica Bay. They include from east to west, the communities of Inwood, Far Rockaway, Edgemere, Arverne, Hammel, Seaside and further to the west, Rockaway Park, Belle Harbor, Neponsit and Rockaway Point. Many of these communities are located immediately along the water's edge. Communities along the Bay's western edge are separated from the Bay by the Belt Parkway, but are linked to the Bay by several inlets, such as Shell Bank Basin, Old Mill

Creek, Fresh Creek, Paerdegat Basin, Mill Basin and Gerritson Creek. Communities located here from north to south are Howard Beach, Canarsie, Flatlands, and Sheepshead Bay.

Future residential projects planned for the area east of Jamaica Bay include a large approved residential project in Arverne with 7,500 housing units in combination with retail, public open space, and community facilities. Redevelopment and revitalization is further proposed in Edgemere through the construction of affordable housing (primarily on city-owned land), support services, infrastructure improvements and parks.

4.5.3 Sociocultural Environment

The sociocultural environments of wildlife damage management programs in general, and of the bird hazard reduction programs at airports specifically, are complex. The sociocultural environment issues discussed here are those that were identified throughout the scoping and Draft EIS public comment period (February-March, 1994). During these periods, the central sociocultural issues raised were concerns regarding human safety, animal welfare, animal rights, killing of wildlife, and ecological/environmental concerns in general. As identified in the ADC Programmatic Environmental Impact Statement (USDA 1994), the primary social issues relative to managing wildlife damage are humaneness, effectiveness, and ecological soundness. Humaneness is the minimization of pain or suffering in animals. Effectiveness is determined by how quickly, economically, and completely the methods resolve the problem. Ecological soundness is a broad category which includes minimizing adverse impacts on wildlife or the environments that are affected by the program.

The following general sociocultural values regarding the gull hazard reduction program at JFKIA were identified based on the Public Scoping Meeting (May 12, 1993), and comments and responses solicited by Federal Register and New York Environmental Notice Bulletin notices.

- Human life and safety exceed rights of birds.
- Wildlife and the environment should be cared for.
- Presence of dead or injured gulls (as a result of the intensive on-airport shooting program) adversely affects the quality of the experience for recreational visitors to Jamaica Bay.
- Natural ecosystems are irreplaceable, and are more important than airplanes.
- As part of the natural world, gulls should have precedence over human needs.
- Human beings and their endeavors must learn to coexist with wildlife and the environment.
- Air travel must be made as safe as possible, but methods must be selected judiciously.
- There are risks associated with all activities; people should accept the risks that come with air travel and not support activities that harm the environment.
- No living thing should ever be destroyed for any reason.

The following organizations have provided comments and concerns relative to the proposed program and birdstrike problem at JFKIA: Audubon Society, Sierra Club, Fund For Animals, Inc., Airline Pilots Association, Air Transport Association, American Littoral Society, Linnaean Society, Wildlife Damage Review, Predator Project, Humane Society of the U.S., Friends of Rockaway, and others. Major socioeconomic issues raised have been: human safety, animal rights, animal welfare, environmental protection, and air traffic safety.

The location of JFKIA in Jamaica Bay, within the boundaries of one of the world's largest metropolitan centers (New York City) is a unique situation. The population in the vicinity of JFKIA is culturally, economically, and politically diverse, and espouses a wide range of values and beliefs relative to the environment, wildlife, and the role of human activities within that context. The Gateway National Recreation Area is one of a group of National Park Service facilities within a metropolitan area, and it offers urbanites unique and varied opportunities to interact with the environment. Each year, Gateway NRA receives approximately 7 million visitors from the NYC metropolitan area, and from around the United States and the world. John F. Kennedy International Airport is one of the largest and busiest U.S. airports, with international and national flights that service up to 28 million passengers each year. A number of concerned publics are interested in the Jamaica Bay environment, the birdstrike problem at JFKIA and the potential solutions that are analyzed.

4.6 Coastal Zone Management

Jamaica Bay and John F. Kennedy Airport are located within the State and City Coastal Zone and any activities undertaken within this zone by federal agencies must be consistent to the maximum extent practicable with the approved programs effective in this zone.

4.6.1 Federal Coastal Zone Management Program

The Federal Coastal Zone Management Act of 1972 established the Federal Coastal Zone Management Program to encourage and assist the states in preparing and implementing management programs to "preserve, protect, develop and, where possible, to restore or enhance the resources of the nation's coastal zone."

Administrative responsibility of the program lies with the Secretary of Commerce, while the managing agency is the National Oceanic and Atmospheric Administration (NOAA). The Act stipulated that federal actions and federally funded actions within the coastal zone must be, to the maximum extent feasible, consistent with approved state management programs. This is formalized in a federal consistency review process involving state agencies.

According to 15 CFR § 923(c), the Gateway National Recreation Area (which includes the Jamaica Bay Wildlife Refuge and the colony site) as a federal property is excluded from the coastal zone. Although Gateway National Recreation Area (of which Jamaica Bay is part) as a federal property is excluded from the coastal zone as defined in the Coastal Zone Management Act (CZMA), the CZMA does not automatically pre-empt all state regulation of activities on federal lands.[a] Furthermore, uses in or activities affecting the resource boundary that may cause spillover effects within the coastal zone are generally considered to be within the purview of the federal consistency review provisions.

It is the intent of the lead agency to allow evaluation of all advanced alternatives in light of the coastal zone policies. Therefore, compatibility with relevant state and city coastal zone policies is discussed for each of the feasible alternatives.

[a] S. REV No. 753, 92nd Cong, 2d Sess. 1 (1972) *See California Coastal Commission v. Granite Rock Co., 480 U.S. 572, 593 (1987).*

4.6.2 New York State Coastal Management Program

Pursuant to the Federal Coastal Zone Management Act, New York State adopted the Waterfront Revitalization and Coastal Resources Act (WRCRA) in 1981. This act created the New York State Coastal Management Program (NYSCMP) under the direction of the New York State Department of State (NYSDOS).

The Coastal Management Program includes 44 policy statements addressing problems and opportunities associated with a wide range of coastal issues including: aesthetics, agriculture, air quality, economic activity, energy, fish and wildlife, flooding and erosion, development, public access, recreation and water quality. A description of all 44 policies is provided in Appendix E.4.

4.6.3 New York City Waterfront Revitalization Program

State legislation provides for the opportunity of fine-tuning the state program for specific local conditions through approval of local coastal management programs. Pursuant to this, the New York City Waterfront Revitalization Program (NYC WRP) was approved in 1981. The program contains 12 policies relating to local issues, in addition to guidelines for local application of the 44 state policies. (See Appendix E.4 for a list of WRP policies). The New York City Coastal Zone is presented in Figure 4-4.

The NYC WRP established a Coastal Zone Boundary within which all discretionary waterfront actions are subject to review for consistency with coastal policies. The City Planning Commission (NYCPC), acting as the City Coastal Commission, is the decision-making body for the local Waterfront Revitalization Program. The City Coastal Commission (with the assistance of the Department of City Planning) conducts consistency reviews for federal and state actions, such as the issuance of a U.S. Army Corps of Engineers dredging permit or a state tidal wetlands permit. If a federal action is found inconsistent by the City Coastal Commission and the finding is upheld by the New York State Department of State, the permit may not be issued and/or the action may not be funded.

4.6.4 New York City Comprehensive Waterfront Plan (Proposed)

In response to the recommendations of the Governor's Task Force on Coastal Resources, New York City undertook efforts to better balance the sometimes competing interests on its waterfront within a comprehensive planning framework. As a result, the city developed its Comprehensive Waterfront Plan in 1992. The plan is intended to form a basis for the revision and enhancement of the existing Waterfront Revitalization Plan. Formal revision of the city's WRP is subject to Section 197-a of the City Charter. Until the WRP is formally revised, the NYC Department of City Planning will be guided by the findings and recommendations of the Comprehensive Waterfront Plan in its analysis of projects subject to WRP consistency review.

The Comprehensive Waterfront Plan proposes several specific recommendations for the Jamaica Bay area within a larger framework of city coastal zone planning. Jamaica Bay is proposed for designation as a Special Waterfront Area in the city's Comprehensive Waterfront Plan and its central area is proposed for designation as a Substantial Coastal Fish & Wildlife Habitat (see Figure 4-5). The area was further designated as a Critical Environmental Area by the New York State Department of Environmental Conservation. As a result of this designation, any activities in Jamaica Bay are classified as Type I Actions, consistent with 6 NYCRR Part 617.12(b)(12).

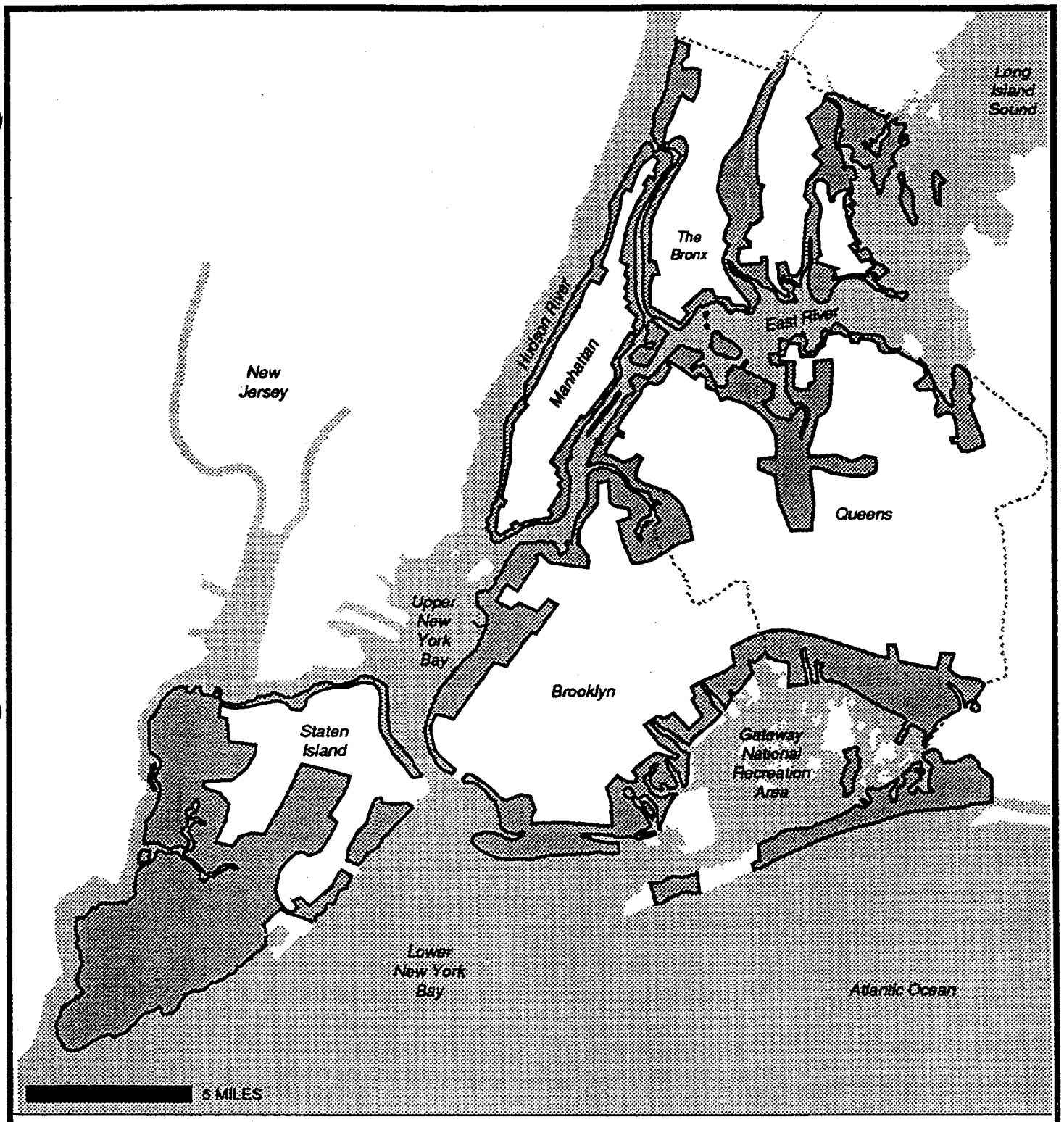


FIGURE 4 – 4

Coastal Zone Boundary

New York City Coastal Zone

Source: NYC Department of City Planning, 1992.

REACH 17: JAMAICA BAY/ROCKAWAY

Location: *southern shore of Brooklyn from Marine Park to Spring Creek, Queens from Spring Creek to the Nassau County border, the Rockaway Peninsula, and the islands and waters of the bay.*

Upland Neighborhoods: *Flatlands, Mill Basin, Bergen Beach, Canarsie, Ozone Park, Howard Beach, Broad Channel, Far Rockaway, Edgemere, Arverne, Rockaway Beach, Rockaway Park, Belle Harbor, Neponsit, Roxbury, Breezy Point*

Shoreline: *mostly natural; many of the inlets are bulkheaded.*

Zoning/Land Use: *most of the shoreline and islands are parkland. Upland residential areas are low- to medium-density R2 to R6. Small industrial areas are zoned on some inlets and scattered on the north shore of the Rockaways. JFK Airport is zoned M1.*

Waterfront Parkland: *The Jamaica Bay unit of Gateway National Recreation Area (GNRA) and a number of city parks, including Marine Park and Rockaway Beach.*

SUMMARY OF RECOMMENDATIONS

NATURAL WATERFRONT

Despite extensive human intrusion, including filling, dumping, and sewage discharge, Jamaica Bay remains a remarkable natural resource and wildlife habitat with an estimated 4,000 acres of tidal wetlands. The Bay is listed in the International Shorebird Reserve System.

1 Support designation of Jamaica Bay and Breezy Point as Significant Coastal Fish and Wildlife Habitats.

2 Designate Jamaica Bay as a Special Natural Waterfront Area.

3 An interagency task force (DCP, DEP, EDC, National Parks Service) should work with the Port Authority to minimize and reverse water-quality impacts of JFK operations, consistent with the airport's operational requirements.

4 Maintain natural areas along Four Sparrow Marsh, Fresh Creek, Spring Creek, Sommerville Basin, Vernam and Barbadoes Basins.

5 Map the area of Spring Creek containing the Old Mill Creek and associated tidal wetlands, including isolated privately-owned parcels, as park. Demap unbuilt streets within the proposed park boundary.

6 Develop site planning guidelines for any city owned property proposed for development to ensure appropriate density, configuration, buffer and runoff planning.

7 DEP and DOS should develop and initiate containment plans for landfills.

8 Limit dredging to the maintenance of established navigation channels.

9 DOS should increase enforcement of bans on illegal dumping. Clean and fence wetland areas that are subject to illegal dumping.

10 Continue funding of federal programs to ensure an uninterrupted cycle of beach nourishment and erosion control in the Rockaways.

11 Transfer the wetlands at "Public Place" in Hook Creek to DPR.

12 Transfer all city-owned parcels adjacent to Fresh Creek to DPR to protect tidal wetlands with sufficient upland buffer.

13 Transfer city-owned wetlands in Mott Point to DPR, and acquire a private parcel between the city park and Bayswater State Park for city or state park use. Demap paper streets through these wetlands.

14 Transfer certain city-owned lots containing wetlands on Sommerville Basin to DPR. Acquire a privately owned parcel at Conch Drive and B. 51st Street and transfer to DPR.

PUBLIC WATERFRONT

Jamaica Bay is a major recreational boating resource. Rockaway Beach offers miles of public beachfront.

15 Map new public parks as recommended in DCP's *Edgemere Neighborhood Land Disposition Plan.*

16 In cooperation with DRP and National Parks Service, identify possible sites for boat launches in GNRA.

17 Coast Guard and/or New York Harbor Police should consider appropriate boating speed limits to protect wildlife and shoreline vegetation.

18 Explore the feasibility of limited public access in natural edges.

WORKING WATERFRONT

JFK Airport is a vital component of the New York regional economy.

19 Accommodate expansion needs of JFK Airport, consistent with protection of the Bay's natural resources.

20 Explore means to improve truck access to JFK, inclulding widening the Van Wyck Expressway.

21 Explore feasibility of a Manhattan-JFK ferry, which could include additional commuter stops in Brooklyn and Rockaway (at Vernam/Barbadoes Peninsula if Arverne is developed).

22 Explore feasibilty of 'fast freight' ferry service to Manhattan and/or New Jersey.

23 Maintain the mapped but unbuilt Seaview Avenue Extension over Spring Creek for future circulation improvements in the Spring Creek Urban Renewal Area.

24 In accommodating some of the city's infrastructure needs at Spring Creek, design industrial development to minimize impacts on surrounding residential uses and natural resources.

25 Limit industrial development of the city-owned Vernam/Barbadoes Peninsula to previously disturbed areas, to preserve wetlands and coastal dune vegetation.

REDEVELOPING WATERFRONT

This reach offers several opportunities for new residential development compatible with natural areas.

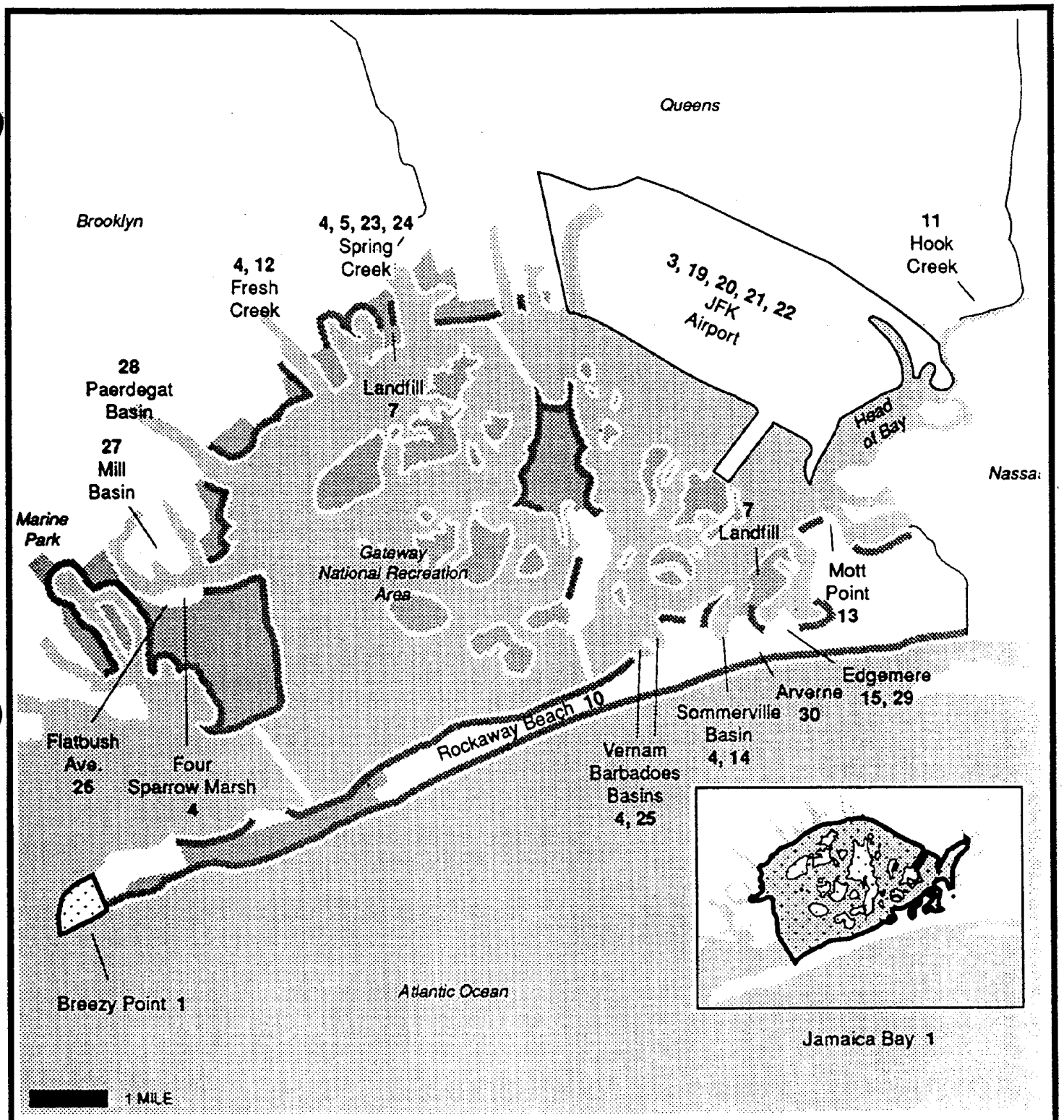
26 Develop the 12-acre upland site fronting on Flatbush Avenue for housing with public access to the adjacent marshland. Transfer the 65 acres of Four Sparrow Marsh to DPR for management as a natural area.

27 Rezone a manufacturing area of Mill Basin for low-density residential and waterfront commercial uses. Provide public access via a new street system.

28 Identify appropriate mixed residential and open space uses for the developable portion of Paerdegat Basin, with design guidelines that protect natural areas. Continuous public access on both sides of the basin should be provided, linked to existing city parks. Transfer wetlands adjacent to McGuire Park to DPR.

29 Develop the Edgemere Urban Renewal Area in accordance with DCP's *Edgemere Neighborhood Land Disposition Plan.*

30 Develop the Arverne Urban Renewal Area in accordance with the 1990 Urban Renewal Plan.



Jamaica Bay/Reach 17 Recommendations

Source: New York City Planing.

- significant coastal habit
- existing continuous or general access
- proposed continuous or general access
- upland extent of park
- new or improved point access
- significant maritime/industrial area
- approved redevelopment area
- proposed redevelopment area
- other site specific recommendation
- 20 recommendation key number in text

FIGURE 4-5

New York City Waterfront Plan
Reach 17 - Jamaica Bay

According to these regulations, "Type I Actions are presumed to be likely to have a significant effect on the environment and may require an Environmental Impact Statement," consistent with the New York State Environmental Quality Review Act (SEQRA). This EIS seeks to serve this purpose as both a federal (NEPA) and state (SEQRA) document.

5.0 ENVIRONMENTAL IMPACTS OF ALTERNATIVES

5.1 Characteristics of Non-Gull Bird Species that Nest in Jamaica Bay Marshes (JoCo, East High Meadow, and Silver Hole) 5-1

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5.0 ENVIRONMENTAL IMPACTS OF ALTERNATIVES

The environmental impacts of the alternatives that were considered to be feasible and effective are described herein. Impacts are identified for the following categories: ecological resources (including Coastal Zone Management Policies), water quality, parks and recreation, socioeconomic, airport operations and safety, air quality, and regulatory compliance.

Substantive discussion is given to impacts on ecological resources, including wildlife (Laughing Gulls, Herring Gulls, Ring-billed Gulls, Great Black-backed Gulls, other birds, other wildlife, vegetation, and other biotic resources). Discussion of impacts for non-gull bird species are concentrated on the bird species known to nest in the three Jamaica Bay Marshes (JoCo, East High Meadow, and Silver Hole) that contain the Laughing Gull nesting colony. A brief description of these species characteristics is given below.

5.1 Characteristics of Non-Gull Bird Species that Nest in Jamaica Bay Marshes (JoCo, East High Meadow, and Silver Hole)

5.1.1 Common Tern

Classified as a Threatened Species in New York State, the common tern is the most abundant colonial nesting waterbird in the Long Island coastal lowland region (Andrle and Carroll 1988). On the Long Island coast, this species is found on approximately 50 sites, numbering over 33 thousand birds. This species nests in saltwater non-barrier and barrier islands, dredge spoil areas, and salt marshes. Since at least 1988, disturbance from recreation uses, vandalism, flooding and predation has reduced nesting in some areas. Common terns nest on JoCo (235 adults in 1991), East High Meadow (150 adults), and Silver Hole Marsh (260 adults). Common terns eat fish, crustaceans, and insects (Ehrlich et al. 1988).

5.1.2 Forster's Tern

Forster's tern are relatively colonial nesters in salt marsh islands. This species nests in a few (3-4) sites on Long Island, and has been recorded as a nester in JoCo Marsh; the nest is a hollowed, compactly-woven platform or a depression in the marsh substrate. Forster's terns eat insects taken on the wing, as well as dead fish and amphibians (Ehrlich et al. 1988).

5.1.3 Clapper Rail

Commonly found in New York State's coastal marshes on Long Island, clapper rails seem to depend on extensive salt marsh habitat. They are most abundant as a nesting species along the southwestern shore of Long Island; the nest is often elevated on a bank, is concealed, and may be a domed basket of aquatic vegetation. Clapper rails eat crustaceans, worms and amphibians (Ehrlich et al. 1988).

5.1.4 American Oystercatcher

Although this species typically nests on sandy areas, it has been recorded nesting on salt marsh islands in Long Island, and has nested in JoCo Marsh (1987), East High Meadow (1988), and Silver Hole Marsh

(1988). It tends to nest on coastal barrier beaches away from human disturbance. This species feeds on blue and ribbed mussels in intertidal mud flats. (Andrle and Carroll 1988).

5.1.5 Willet

This is a common breeding bird in salt marshes along Long Island's South Shore, with high local breeding densities in Jamaica Bay (Andrle and Carroll 1988). Willets build nests on the salt marsh barely above the high tide mark.

5.1.6 Black Duck

Despite regional and statewide declines in black duck population since at least the 1960s, the black duck population on Long Island's coastal marshes has remained relatively stable (Andrle and Carroll 1988). the black duck breeds in a wide range of habitats, including coastal salt marshes, freshwater bogs, lakes, and ponds.

In salt marshes, the black duck nest is placed in concealing grass tussocks. Black ducks eat insects, snails, aquatic vegetation, and seeds (Ehlrich et al. 1988).

5.1.7 Boat-tailed Grackle

The boat-tailed grackle has recently extended its breeding range northward, and is now a rare and local nester in western Long Island. In the 1970s it was noted in the Jamaica Bay Wildlife Refuge, and was observed nesting in Jamaica Bay's East Pond in 1981 (Andrle and Carroll 1988). It nests on the ground, or in bushes or trees.

5.1.8 Seaside Sparrow

The seaside sparrow is a rare and local breeder in New York's tidal marshes, where it occupies loose colonies with individual territories (1-2 ac.). It usually nests in tidal wetlands of cord grass and blackfoot rush and tends to prefer wet areas. However, this species was recorded nesting in Jamaica Bay on dry ground adjacent to the marsh in 1962 (Andrle and Carroll 1988).

Seaside sparrows' nests are built in grass, sedge, and rushes; this species eats spiders, amphipods, and marsh plant seeds (Ehrlich et al. 1988).

5.1.9 Sharp-tailed Sparrow

The sharp-tailed sparrow is often found nesting near the seaside sparrow, and is a locally abundant breeding species in coastal saltwater marshes on Long Island's south shore. Nests are built on a clump of salt-meadowgrass, usually in dense vegetation. This species is sensitive to flooding and tends to run along the ground when disturbed from its nest. Sharp-tailed sparrows eat insects, spiders, amphipods, and marsh plant seeds (Ehrlich et al. 1988).

5.2 Regulatory Compliance Permits, Reviews, Authorizations and Licenses

Most of the analyzed alternatives would require the issuance of permits, authorizations, or licenses, or the conduct of reviews. Below are listed the major reviews that would be necessary for many of the alternatives.

5.2.1 NPS Coordinated Review of 516DM (Department of the Interior Manual)

This manual contains the guidelines that are consulted when there is preparation of a Federal Action by the NPS. All other alternatives, including the No-Action Alternative, are subject to provisions of the DM. The DM contains the codes, laws, regulations, executive orders, Code of Federal Regulations, standards, and principles necessary for NPS review of a proposed action. Natural Resource Protection and Environmental Compliance are contained in NPS 77 and NPS 12, respectively. The DM also notes the responsibilities of the NPS in each of the laws or acts that affect the Unit of the NPS. Some of these laws are the Clean Air Act, Flood Plain Management, wetlands protection acts, and the Clean Water Act.

5.2.2 NPS Integrated Pest Management Review (IPM Review)

IPM describes the policy that supports the use of pesticides only after full consideration of alternatives placed upon contingent analysis of environmental effects, safety, specificity, effectiveness and costs. The full range of alternatives, including chemical, biological, and physical methods, and No-Action must be considered. IPM includes the utilization of pest management research, education, control experiences, and assistance programs so as to develop support and adopt IPM strategies wherever practicable. IPM involves coordination with other legislative mandates such as the Endangered Species Act, since pesticide use in the environment may have adverse affects on endangered species or their critical habitat. The process is described in 50 CFR 402.

5.2.3 NPS Special Use Permits

An NPS special use permit is issued by the Park Superintendent for actions or activities which have a "special" affect or impact on natural and cultural resources that are not necessarily of a significant environmental impact. Special use permits are issued to non-NPS personnel to conduct activities on NPS properties. Examples are scientific collecting permits that may involve the removal of organisms from the park, access by special groups to areas of the park for observational purposes, or actions that would be educational or routine monitoring.

5.2.4 U.S. Fish and Wildlife Permit

The U.S. FWS authorizes and issues permits pursuant to the Migratory Bird Treaty Act, the Endangered Species Act, the Marine Sanctuary and Protection Act, and other laws, regulations, and authorities. FWS permits would be required to take protected migratory birds.

5.2.5 NYSDEC Fish and Wildlife Special License, Protection of Waters, Coastal Erosion Hazard Area, and Tidal Wetlands Permits

The New York State DEC is authorized to issue special use permits pursuant to New York State Environmental Conservation Law section 11-0515 (1) and 6 NYCRR Part 175. The DEC may issue separate permits or cosign FWS permits for the taking of protected migratory birds.

5.2.6 Coastal Zone Management Act (CZM) and Executive Orders

These require compliance with state and federally approved CZM Plans. These plans include the wide range of activities and actions which have been approved (in principle) to protect and preserve coastal natural and cultural resources. The CZM Act is one part of the U.S. Army Corps of Engineer's permitting process. In the Corps permits (such as 404 Permit), CZM coordination is an important part of the review process. Under the CZM Act, there are several Executive Orders that define and clarify the detailed analysis necessary under CZM review. CZM would also apply to NY DEC permits, and to clearances of New York City CZM Plans.

5.2.7 Section 7 Consultation with the U.S. FWS Under the Endangered Species Act

Section 7 requires consultation with the FWS whenever a proposed action may affect a federally listed threatened or endangered species. In order to provide maximum protection for T&E species, this consultation may require species inventories to determine the extent to which the action may affect T&E species and their critical habitat.

5.2.8 Federal Consistency Requirements with State and Local Environmental Laws

All federal government agencies are required to consult with state and local bodies to coordinate consideration of actions that may affect the environment. Because federal actions such as alteration of tidal marshes in Jamaica Bay would require a DEC permit, the NYS State Environmental Quality Review Act must be complied with.

5.3 No-Action Alternative

The most important potential impact of the No-Action Alternative is the increasing Laughing Gull-aircraft strike hazard, and the correlated increasing possibility of a major crash, resulting in the loss of human lives. JFKIA processed departures and arrivals of approximately 28 million passengers in 1992.[1]

The No-Action Alternative amounts to the continuation of gull management practices already in place at the airport without expansion. Thus, the existing impacts will continue. While impacts will not increase

[1]Port Authority of NY and NJ. Aviation Customer and Marketing Services, 1993.

at a particular instant in time (except perhaps, the beneficial impact of continuing to widen the use of closed garbage receptacles), the continued implementation of management measures with impacts will lead to an increase in cumulative impacts through time.

5.3.1 Ecological Resources

The No-Action Alternative, consisting of the continuation of JFKIA's ongoing bird hazard reduction program, would not have an impact on local, state or regional Laughing, Ring-billed, Herring, or Great Black-backed Gull populations. One source of gull mortality under this alternative is gull-aircraft collisions (Table 1-2) which, prior to 1991, accounted for the loss of approximately 200 gulls annually. Additionally, the JFKIA BCU takes approximately 300 gulls per year in order to reinforce nonlethal harassment measures. The removal of even 200 of each of the four gull species would not have an adverse effect on the species' local, state or regional populations.

The No-Action Alternative does contain components that could change local gull movements and foraging behaviors, since it serves to reduce nesting, roosting, and feeding resources on JFKIA. This could also have an impact on flight directions and behavior. These impacts are not considered to have an impact on the status of these species in the local vicinity of JFKIA.

The No-Action Alternative would have minimal impacts on non-gull birds.

5.3.2 Water Quality Impacts

As discussed previously, the ongoing gull control management practices that affect water quality are those that contribute to storm water runoff. These are: vegetation management by mowing; water management by the usage of methyl anthranilate (MA) repellant and leveling paved surfaces; and insect control by the application of insecticides. These measures contribute grass, litter, MA, paved surface runoff, and insecticides to the bay. Continuing attempts to increase the utilization of closed garbage receptacles will improve water quality and continuing harassment by the bird control unit will not impact water quality.

5.3.3 Parks and Recreation Impacts

The No-Action Alternative would not create any adverse impacts to parklands and/or recreational uses in the study area.

5.3.4 Socioeconomic Impacts

The No-Action Alternative has the potential to result in detrimental socioeconomic impacts, as litigation and settlements in the event of a crash could potentially have substantial economic impacts on the airline industry and federal and state agencies. A general estimate of incurred costs so far as a result of the birdstrike hazard indicates that between 1979 and 1993, birdstrikes at JFKIA have resulted in financial losses amounting to $2.9 million. Losses to the airline industry are incurred from damaged/destroyed aircraft, runway closures, personnel costs, and costs associated with passenger accommodations. Costs incurred by air passengers include increased ticket prices and auxiliary costs associated with travel delays. An estimate of delays incurred by passengers in aircraft at JFKIA that were delayed between 1979 and 1993 is 102 thousand person-hours, based on maximum seating capacity per aircraft type and airline-reported delays due to birdstrikes.

5.4 Nonlethal Gull Hazard Control: Off-Airport Alternatives

5.4.1 Habitat Modification: General Impacts

The following applies to **all** methods of displacing the colony by habitat modification:

- **Ecological Resources**

Laughing Gulls

Most Laughing Gulls of the Jamaica Bay Colony would be prevented from nesting and would have to seek replacement habitat elsewhere. If habitat is not available, the reproductive output of the regional population would initially be reduced, but stabilize at a level of 86 percent of the current regional population.

Under this alternative, the local Laughing Gull population would be impacted due to the alteration of the only known Laughing Gull nesting colony in New York State. If this alternative were to be accomplished, Laughing Gulls would no longer be included as a nesting species in Jamaica Bay, and unless an alternative New York State site was exploited as a nesting colony, it would also no longer be included as a nesting species in New York. Assuming that Laughing Gulls that were deterred from nesting in Jamaica Bay would relocate and/or nest elsewhere, the regional population would not be affected.

The component of the regional population breeding in New York State would be reduced substantially if the colony does not relocate within the state. The few pairs that nested in 1990 and 1991 on North Cinder Island in Great South Bay (Litwin et al. 1993)—the only other known colony in the state—did not nest in 1993 (New York State Dept. of Environmental Conservation 1993); therefore, apparently no New York colony exists other than Jamaica Bay.

Other Three Gull Species

The local, state and regional populations of Ring-billed, Herring, and Great Black-backed gulls would probably not be reduced by habitat alterations on the Jamaica Bay Laughing Gull nesting marshes. However, some types of habitat modifications (devegetation through burning, herbicide, mowing) of these marshes could increase roosting habitat for these other gull species and result in increased hazards to aircraft at JFKIA. Marsh alteration could impact these gull species by removing this site as a roost area. The preponderance of habitat for ring-billed, herring, and Great Black-backed Gulls elsewhere in Jamaica Bay for nesting, feeding, and roosting (refer to Sections 4.1.2.2.2-4) would indicate that these three species would be relatively unaffected by nonlethal habitat modifications of JoCo, East High Meadow, and Silver Hole Marshes.

Other Birds

Laughing Gulls moving to other nesting sites may displace or disrupt other species. The most likely species affected would be Common Tern (New York State Threatened), as this species nests in salt marshes as well as on barrier beaches. The number of Common Terns breeding in association with Laughing Gulls in the Jamaica Bay colony has declined with the growth of the Laughing Gull colony, in

1985 1630 pairs of Common Terns nested in association with 2741 pairs of gulls (Peterson et al. 1985), whereas in 1993 749 pairs of terns nested with 6005 pairs of gulls (New York State Dept. of Environmental Conservation 1993).

The Proposed Mitigation Plan (Section 7) provides for constant monitoring whereby agency biologists would conduct surveys and analyses to determine if Laughing Gulls impact other bird species. Potential impacts would be displacement of species such as common terns or other shorebirds.

- **Coastal Zone Management**

Policy 7: Substantial coastal fish and wildlife habitats will be protected and preserved so as to maintain their viability as habitats.

As the project site is located in a substantial coastal fish and wildlife habitat, the Habitat Impairment Test would need to be applied. This test is stated as follows:

"In order to protect and preserve a designated substantial coastal fish and wildlife habitat, land and water uses or development shall not be undertaken if such actions would:

- destroy the designated habitat; or
- substantially impair the viability of a designated habitat."

Vegetation modification and landform modification alternatives affect the habitat of the Laughing Gulls as well as other species and would therefore not pass the Habitat Impairment Test. Unless adequate mitigation measures are provided to compensate for and increase the size or quality of habitat likely to be lost by these alternatives, the continued viability of affected habitats may be reduced.

Policy 12: Activities or development in the coastal area will be undertaken so as to minimize their adverse effects upon natural features which protect against flooding and erosion.

Landform alteration and to a lesser extent devegetation alternatives will result in detrimental effects to the protection against flooding and erosion by natural features such as the Joco Marsh, East High Meadow and Silver Hole Marsh.

Policy 19: Protect, maintain and increase the level and types of access to public water related recreation sources.

Any alternatives that seek to alter the marsh will reduce its accessibility during implementation. Alternatives that temporarily but repeatedly limit the public use through spraying, burning, mowing, etc. would also reduce the permanent public access. Excavation may render certain parts of the marsh permanently inaccessible to the public due to flooding conditions.

Because of the substantial potential environmental impacts associated with this alternative, habitat modification alternatives are not advanced for consideration as a preferred alternative.

5.4.2 Habitat Modification: Specific Impacts

5.4.2.1 Devegetation

Specific impacts may be caused by the various methods of treating the salt-marsh grasses to achieve devegetation.

5.4.2.1.1 Mowing

- **Ecological Resources**

Laughing Gulls

The purpose of the mowing alternative would be to substantially reduce the vegetation of the subject marshes in order to deter nesting of Laughing Gulls. If the alternative was successful in eliminating Laughing Gull reproduction on JoCo, East High Meadow, and Silver Hole Marshes, it would impact the local Laughing Gull population by removing the Laughing Gull as a breeding bird in Jamaica Bay. Unless Laughing Gulls established a nesting colony elsewhere in New York State, it would also be a lost breeding bird in New York State. The regional Laughing Gull population would probably not be significantly impacted; modeling results from more severe actions (toxicant of adult Laughing Gulls, etc.) indicate that the annual removal of more than 14,500 adult gulls would be the threshold point beyond which the regional population would be affected. the modification of the marshes by habitat management would not result in the death of the birds, and there is a probability that they would establish nests elsewhere in the northeastern U.S., if not in New York State.

Other Three Gull Species

Herring, Ring-billed, and Great Black-backed gulls do not nest in JoCo, East High Meadow, or Silver Hole marshes (Litwin et al. 1993). The mowing of these three sites would not have adverse impacts on these three gull species. Herring and Great Black-backed gulls nest abundantly elsewhere in Jamaica Bay, and Ring-billed Gulls that occur in the area are non-nesters. Mowing the marshes may increase these sites' habitat values for roosting for the three non-Laughing Gull species.

Other Birds

Mowing of the JoCo, East High Meadow, and Silver Hole marshes could have adverse impacts on a number of marsh-nesting bird species, including sharp-tailed and seaside sparrows, willet, clapper rail, American Oystercatcher, and common and Forster's terns. Since these species and others nest in vegetation on coastal salt marshes, and have been recorded as active breeders in Jamaica Bay, they may be affected by the removal of salt marsh vegetation. The loss of nesting substrate and the subsequent growth of a potentially differed flora could remove nesting-habitat substrate for these species. Since the mowing would occur in April, few individual birds, if any, would be directly affected by mowing operations. Bird species such as sharp-tailed and seaside sparrows would be adversely impacted by the removal of important food sources (seeds of salt marsh plants).

Vegetation

It is likely that mowing, if successful in deterring breeding by Laughing Gulls, would have to be repeated annually. As a result of this periodic treatment, the health or vigor of the marsh vegetation (and consequently the structural and biological integrity of the marsh) may be adversely affected. DeLaune et al. (1984) clipped *Spartina alterniflora* in 6-m^2 (65-ft^2) plots in a Louisiana marsh to test this method of treating crude oil spills. *Spartina* clipped level with the sediment took 3 growing seasons for biomass to recover to the level of control plots. During the period of recovery, the marsh was subject to increased erosion, although the extent was not quantified in this study. In the clipped plots, the community structure of copepods was affected, with one species decreasing and another increasing, possibly due to changes in the diatom community in response to the altered shading. Mattson, et al. (1977), however, observed "good" regrowth of *S. alterniflora* in New Jersey that was cut as a cleanup measure following an oil spill. Two seasons of bimonthly clipping of *S. alterniflora* to 10-15 cm (4-6 in) had little effect on aboveground net primary productivity (Turner 1987). The response of *Spartina* to mowing must therefore be considered unpredictable.

It would therefore be necessary to monitor the long-term impacts on the vegetation to determine whether the vigor of the *Spartina* is reduced by continual mowing to the point where deterioration of the marsh occurs. De la Cruz and Hackney (1980) indicated that *Spartina cynosuroides* could withstand annual mowing, but whether *S. alterniflora* and *S. patens* would respond similarly is unknown. Certainly, the existence of a long-established salt-hay harvesting industry in the Northeast suggests that cutting of *Spartina patens,* at least can be continued on a sustained basis.

Operating mowing machines (even tracked vehicles designed to produce low pressures) is likely to compact the soft, organic sediments that compose the marsh substrate. This would lower the average elevation of the surface (so that tidal inundation would become more extensive), and also inhibit drainage. The distribution and relative abundance of plant species (which are sensitive to length of inundation and level of soil salinity) would change in response to the changed environmental conditions. Compaction of the sediment could also adversely impact substrate-inhabiting invertebrates. Changes in the plant and invertebrate communities could in turn affect the vertebrate community (e.g., by reducing food sources or nesting habitat).

Even though the *Spartina* may be able to withstand repeated mowing, the annual reduction in biomass available to enter the detritus food web (Turner 1987) may lower the overall productivity of the marsh.

- **Water Quality**

Changing the vegetative cover height by mowing will affect wave energy dissipation, erosion, and sediment trapping on the marsh islands. Ambient water turbidity will likely increase due to a reduction in sediment trapping and to stronger erosive forces resulting from reduced energy attenuation. Pollutants that may be associated with previously buried sediments will now be exposed to processes that could reintroduce them into the water column. Any decrease in sediment trapping capabilities will also interfere with the means by which contaminated suspended sediments transported to these marshes are removed from the water column, i.e., by deposition and burial. Thus, the degree to which these marsh islands are acting as sediment/toxicant sinks in the overall system may be reduced.

Increased quantities of cut grass litter will be washed into the bay. Its decomposition on the bay bottom will affect the dissolved oxygen content of bay waters.

The use of mowing equipment that could leak and introduce petroleum hydrocarbons and other contaminants has the potential of affecting the water quality of the bay. These products could enter the

bay by directly draining off the marsh surface with ebbing tidal waters and rainfall or may infiltrate the surface, adsorb to sediment particles, and later be released to the water column with resuspension or subsurface migration. The dispersal and ultimate fate of these contaminants depends on the specifics of their physicochemical behavior and biological uptake and breakdown.

The magnitude of these impacts would depend upon where the mowing would occur in relation to marsh elevation and flood regime.

Mitigation measures to reduce these impacts would be to collect cut grass litter to be disposed of elsewhere and to limit the area of mowing to those portions of the marsh most widely used by nesting laughing gulls. These are areas of reduced flooding. In addition, the tall form of *Spartina alterniflora* that borders tidal creek margins should not be mowed. This form of *Spartina* specifically acts to trap sediments as waters overflow channel banks and flood the marsh. Montevecchi (1978) found that gulls did not nest in this area along the creeks.

- **Parks and Recreation**

Mowing would temporarily disturb the aesthetic quality of the three marsh areas and possibly also other nearby areas due to noise and human disturbance. Bird watching would be disturbed during the periods of mowing as well, and in subsequent periods due to the potential reduction in bird nesting. However, as mowing is not a continuous measure, these impacts on parklands are not considered permanent.

- **Socioeconomic**

Mowing is not anticipated to result in any major socioeconomic impacts such as displacement of commercial uses or reduction of the economic value of recreation. The sociocultural values people place on the integrity of the marsh ecosystem and the presence of wildlife in these habitats would be temporarily impacted by mowing.

- **Regulatory Compliance**

Mowing the marsh may require the following permits or approvals:

- Tidal Wetlands Permit - NYSDEC
- Protection of Waters Permit - NYSDEC
- Special License for Protected Wildlife - NYSDEC
- Coastal Erosion Hazard Area - NYSDEC
- Coastal Zone Management Program - NYSDOS, NYCPC
- NPS Coordinated 516 DM Review
- NPS Special Use Permits
- Federal Consistency Requirements
- Section 7 FWS Consultation

Because of the substantial potential environmental impacts associated with this alternative, habitat modification through mowing of the vegetation is not advanced for consideration as a preferred alternative.

5.4.2.1.2 Burning

- **Ecological Resources**

Laughing Gulls

The purpose of the burning alternative would be to substantially reduce the vegetation of the subject marshes in order to deter nesting of Laughing Gulls. If the alternative was successful in eliminating Laughing Gull reproduction on JoCo, East High Meadow, and Silver Hole marshes, it would impact the local Laughing Gull population by removing the Laughing Gull as a breeding bird in Jamaica Bay. Unless Laughing Gulls established a nesting colony elsewhere in New York State, it would also be lost a breeding bird in New York. The regional Laughing Gull population would probably not be significantly impacted; modeling results from more severe actions (toxicant of adult Laughing Gulls, etc.) indicate that the annual removal of more than 14,500 adult gulls would be the threshold point beyond which the regional population would be affected. The modification of the marshes by habitat management would not result in the death of the birds, and there is a probability that they would establish nests elsewhere in the northeastern U.S., if not in New York State.

Other Three Gull Species

Herring, Ring-billed, and Great Black-backed gulls do not nest in JoCo, East High Meadow, or Silver Hole marshes (Litwin et al. 1993). The mowing of these three sites would not have adverse impacts on these three gull species. Herring and Great Black-backed gulls nest abundantly elsewhere in Jamaica Bay, and Ring-billed Gulls that occur in the area are non-nesters. Burning the marshes may increase these sites' habitat values for roosting for the three gull species.

Other Wildlife

Burning of the JoCo, East High Meadow, and Silver Hole marshes could have adverse impacts on a number of marsh-nesting bird species, including sharp-tailed and seaside sparrows, willet, clapper rail, American Oystercatcher, and common and Forster's terns. Since these species and others nest in vegetation on coastal salt marshes, and have been recorded as active breeders in Jamaica Bay, they would be affected by the removal of salt marsh vegetation. The loss of nesting substrate and the subsequent growth of a potentially different flora could remove nesting habitat substrate for these species. Since the burning would occur beginning in April, individual birds, could be affected by burning operations.

Animals inhabiting the marsh could be killed by fire. Vogl (1973), however, found no mortality of birds or mammals in an experimentally burned Florida wetland, although some snakes and frogs were killed. In the same study, numbers of individuals and species of birds utilizing burned areas were greater than those on unburned areas. Since the burn should be done when the root zone is flooded to avoid killing the plants (Daiber 1986), substrate-inhabiting animals such as mussels, fiddler crabs, and polychaete worms should not be heavily impacted. No salt-marsh nesting birds would be on nests at the probable early April burn date, therefore it is unlikely that any would be unable to escape the fire.

The temporary loss of habitat intended to affect the Laughing Gulls is also likely to affect other vertebrate and invertebrate organisms inhabiting the marsh. For example, seaside and sharp-tailed sparrow, willet, clapper rail, and meadow vole may be unable to utilize the altered habitat as nesting sites. Additionally, burning the marsh could remove food resources (marsh plant seeds) for sharp-tailed and seaside sparrows.

Vegetation

Unless the burning operations were timed and controlled carefully, the marsh plants could be burned to the roots, killing them (Daiber 1986). Severe deterioration of the marsh would probably ensue. Turner (1987) experimentally burned study plots in *Spartina alterniflora* at low tidal amplitude (midway between full moon and new moon) when low tide occurred at midday, to allow for maximum drying; roots and rhizomes survived the burning under these conditions.

Although the number of plant species that could possibly invade a salt-marsh community is relatively small, changes in the structure or composition of the vegetation community could occur owing to different responses of the several species present. For example, burning and reflooding of a Great Salt Lake marsh eliminated *Distichlis spicata* from sample quadrats (Smith and Kadlec 1985).

If extensive areas of marsh grasses are unintentionally killed by burning, substantial erosion of the organic marsh sediments could occur. Water turbidity would increase at least locally within Jamaica Bay, very large inputs of organic nutrients would occur, and there would be severe loss of habitat for vertebrate and invertebrate organisms.

De la Cruz and Hackney (1980) experimentally burned and cut *Spartina cynosuroides* in winter on the Gulf Coast. Primary production under both types of management exceeded controls, and it was concluded that the *Spartina* could be burned easily and uniformly on an annual basis, since enough litter was produced to support the burn. This tall species of *Spartina* is not a component of the salt-marsh vegetation community in Jamaica Bay. However, the *S. alterniflora* and *S. patens* that do occur here may display similar tolerance to fire. Experimentally burned plots of *S. alterniflora* in Georgia exhibited lower aboveground net primary production that unburned controls, but there was no effect on live rhizome biomass (Turner 1987); the burned *Spartina* exhibited a more dense growth of shorter stems than unburned plants.

The burning of the grass (which would consist principally of the previous year's dead material), will interrupt the detrital pathway by which such material is usually broken down. For at least one season, the normal energy flow of the marsh ecosystem would be markedly altered by the elimination of the starting input of detritus. Populations of detritivores that depend on this energy source will probably be adversely impacted, as will other organisms in the complex food web of the salt marsh. For example, detritus-feeding periwinkle snails (Daiber 1982) were less abundant on experimental plots burned by Turner (1987). The productivity of the entire Jamaica Bay ecosystem could be altered, at least for the short term—which even after a single removal may be a period of several years until the *Spartina* regains its original biomass (DeLaune, et al. 1984). If the marsh is burned annually to deter gulls from nesting, the integrity of the marsh ecosystem is likely to be severely impacted. Although De la Cruz and Hackney (1980) determined that *Spartina cynosuroides* could withstand annual burning, they did not examine the responses of other components of the ecosystem.

- **Water Quality**

The burning of existing vegetation would increase the influx of organic matter to bay waters. This would affect dissolved oxygen content, increase turbidity, and increase the concentration of contaminants associated with the suspended sediment load and the deposits resulting from their settling. These deposits may be resuspended thereby reintroducing the contaminants to the water column.

Similar to mowing, burning would affect sediment trapping and wave energy attenuation erosion on the marsh. The loss of vegetative cover would likely increase ambient water turbidity resulting from a reduction in sediment trapping and stronger erosive forces due to increased energy. Pollutants that may be associated with previously buried sediments would now be exposed to processes that could reintroduce them into the water column. Any decrease in sediment trapping capabilities would also interfere with the means by which contaminated suspended sediments transported to these marshes are removed from the water column by deposition and burial. Thus, the degree to which these marsh islands are acting as sediment/toxicant sinks in the overall system may be reduced.

The magnitude of these impacts would depend upon where the burning occurs in relation to marsh elevation and flood regime. The burning would take several weeks, and a more indirect impact could result from the washout by rainfall of particulates released to the atmosphere by the burning.

Mitigation measures to reduce these impacts would be to limit the area burned to those portions of the marsh most widely used by nesting colonies. These are areas of reduced flooding. In addition, the tall form of Spartina alterniflora that borders tidal creek margins should not be burned. This form of Spartina specifically acts to trap sediments as waters overflow channel banks and flood the marsh.

Monitoring of weather forecasts to avoid burning during times of predicted rainfall would minimize atmospheric washouts.

- **Parks and Recreation**

Similar to mowing, burning would directly affect the use of the three marsh areas as well as nearby areas due to human disturbance and smoke conditions. Depending on the local meteorological conditions, smoke may disturb recreation at several locations in the Bay. The prevailing wind conditions would direct smoke in most cases toward the east, where several residential communities and public parks are located.

For the assessment of the impacts of burning, it is assumed that a total of 281 acres would be burned on the three marshes south of JFKIA at a rate of 10 acres per day, with two or more burns per marsh on an annual basis. Open burning in New York City would be subject to acquisition of city of New York burning permits. The action has to be approved by and conducted under control and supervision of the New York City Fire Department. Permitting may be conditioned upon meteorological factors and other factors as well as federal requirements and those of the New York City Department of Environmental Protection related to emission, smoke, and air quality standards.

The air impacts of burning operations are evaluated for two aspects: the effect on ambient air quality and the effect on airport operation and safety due to reduced visibility resulting from smoke. Air quality impacts are determined by the emission of criteria pollutants relative to current air quality standards. Smoke is a combination of carbon particles and liquid droplets and is usually a product of incomplete

combustion or burning. In the presence of discharging smoke particles, visibility can be reduced and a safety hazard for air traffic at JFKIA could emerge as a result of this.

- **Ambient Air Quality**

Relevant air quality standards for the assessment of air quality impacts include federal and state ambient air quality standards (NAAQS and New York State AAQS) for criteria pollutants (PM-10 and CO) under the federal Clean Air Act and Amendments. The compliance standards of PM-10 are 150 and 50 $\mu g/m^3$ for 24-hr and annual average ambient air concentrations, while those of CO are 35 and 9 ppm for 1-hr and 8-hr concentrations, respectively.

Possible emission factors from prescribed burning were determined by utilizing U.S. EPA recommended procedures which are indicated in the revised report AP-42, "Compilation of Air Pollutant Emission Factors" - Fourth Edition, Section 2.4 emissions for open burning. Using an estimated weight 554 g/m^2 for live biomass and standing dead of *Spartina* vegetation (Turner, 1987) on the islands and those emission factors described in AP-42: 3 kg particulates and 17 kg CO for burning every 1000 kg weeds, a prescribed burning at a rate of 10 acres a day would emit 0.777 g/sec particulates and 4.403 g/sec CO.

Non-Dispersion Conditions

Using the described burning rate, for a typical one hour operation, the affected volume in ambient air will be 3400 m^3 (41 meter x 41 meter x 2 meter flame height). Therefore, the amount of air contamination at the burning site under the non-dispersion condition will be 5.55 g/m^3. The most stringent regulation in New York Administrative Code describes the upper limits for obscurity as 20 percent on ambient air density near the smoke sources, while the average air density is 1170 g/m^3.

Dispersion Conditions

Air impacts on adjacent environments caused by prescribed burning alternatives were evaluated by using ISCST2 prediction model. The 24-hr and annual average PM-10, as well as 1-hr and 8-hr CO impacts are the criteria pollutants to be examined at sensitive receptor locations. The sensitive locations selected in the analysis were: JFKIA, Public School 104 in Far Rockaway—southeast of burning sites; Public school 42—south of burning sites; and Charles Memorial Park in Howard Beach—northwest of the prescribed burning sites.

To evaluate the worst-case concentrations, the maximum monitored short-term and annual average background concentrations were added to the predicted worst-case impacts for PM-10 and CO, respectively. Total concentrations for each criteria pollutants were then compared with NAAQS standards to demonstrate the project compliances.

The impacts of prescribed burning alternatives and their compliances with ambient air standards are presented in Table 5-1.

Table 5-1

Assessed Pollutant Concentrations as a Result of Emission Levels of Burning at Receptor Locations Near Jamaica Bay

Pollutant	Period of Assessment	Receptor Locations	Pollutant Concentration as a Result of Burning	Existing Pollutant Concentration (Background Concentration)	Total Pollutant Concentration	NAAQS Standard for Pollutant Concentrations
PM-10	24 hours	JFK airport	0.41 $\mu g/m^3$	65.0 $\mu g/m^3$	65.41 $\mu g/m^3$	150 $\mu g/m^3$
		Public School 104	0.61 $\mu g/m^3$	65.0 $\mu g/m^3$	65.61 $\mu g/m^3$	150 $\mu g/m^3$
		Public School 42	0.51 $\mu g/m^3$	65.0 $\mu g/m^3$	65.51 $\mu g/m^3$	150 $\mu g/m^3$
		Howard Beach	0.21 $\mu g/m^3$	65.0 $\mu g/m^3$	65.21 $\mu g/m^3$	150 $\mu g/m^3$
	Annual Average	JFK airport	0.034 $\mu g/m^3$	29.0 $\mu g/m^3$	29.03 $\mu g/m^3$	50 $\mu g/m^3$
		Public School 104	0.041 $\mu g/m^3$	29.0 $\mu g/m^3$	29.04 $\mu g/m^3$	50 $\mu g/m^3$
		Public School 42	0.035 $\mu g/m^3$	29.0 $\mu g/m^3$	29.04 $\mu g/m^3$	50 $\mu g/m^3$
		Howard Beach	0.008 $\mu g/m^3$	29.0 $\mu g/m^3$	29.01 $\mu g/m^3$	50 $\mu g/m^3$
CO	1 hour	JFK airport	0.022 ppm	6.70 ppm	6.702 ppm	35 ppm
		Public School 104	0.039 ppm	6.70 ppm	6.704 ppm	35 ppm
		Public School 42	0.030 ppm	6.70 ppm	6.703 ppm	35 ppm
		Howard Beach	0.016 ppm	6.70 ppm	6.702 ppm	35 ppm
	8 hours	JFK airport	0.016 ppm	4.40 ppm	4.402 ppm	9 ppm
		Public School 104	0.030 ppm	4.40 ppm	4.403 ppm	9 ppm
		Public School 42	0.021 ppm	4.40 ppm	4.402 ppm	9 ppm
		Howard Beach	0.011 ppm	4.40 ppm	4.401 ppm	9 ppm

PM 10: Particulate Matter
CO : Carbon Monoxide

Sources of Data:

(a) U.S. EPA, Report AP-42 "Compilation of Air Pollutant Emission Factors" - Fourth Edition, Section 2.4 - "Open Burning"
(b) New York State Department of Environmental Conservation (NYSDEC), Annual Report DAR-92-1, Air Quality
(c) Impact Modeling Results from Industrial Source Complex (ISCST2), Version 92062, U.S. EPA

■ Impacts on Airport Operations and Safety

Visibility Under Non-Dispersion Conditions

Relevant smoke regulations of open burning are indicated in New York City Administrative Code Chapter 24, Subchapter 6. The most stringent smoke emission standard requires that the density or capacity of smoke cannot be darker than value 1 (at an obscurity of 20 percent) standard Ringelmann Smoke Chart for longer than two minutes in the aggregate in any sixty minute period. The density or opacity of an air contaminant is measured at the point of emission.

To be conservative, all emitted pollutants were assumed to produce obscurity on opacity or air density at the burning sites. Comparison of the predicted air contaminations with the regulatory limits 234 g/m^3 (1170 x 20 percent) indicated that the emissions from proposed burning on the three islands would not exceed emission regulation. The density or opacity of air contaminant at the burning sites will not appear as dark or darker than number one on the standard smoke chart.

Visibility Under Dispersion Conditions

The prevailing winds in combination with the location of the prescribed burning site relative to the airport and possible effects on visibility near downwind airport runways and their flight paths due to smoke, make burning unfavorable to maintaining airport operation and safety standards.

The visibility would be affected to some extent when the smoke from burning dispersed over JFKIA region which includes runways, flight paths, and other areas of concern. The visibility is a distance at which it is just possible to perceive an object against the horizon with the sky as a background. The value of visibility can be related to the particulate concentration by the following expression (James P. Tomany, 1975):

$$D_v = 0.74 \times 1000 / C$$

(D_v = visibility, miles; C = particulate concentration, $\mu g/m^3$)

To estimate the particulate concentrations, the updated U.S. EPA Industrial Source Complex (ISCST2, version 92062) model was utilized to predict worst case 1-hour impacts. The actual hourly meteorological conditions at JFKIA during a recent year was used to evaluate smoke impacts.

The areas examined for visibility study and smoke impact were the airport runways, approach zones, and flight paths at several altitudes near JFKIA. Major analyzed runways include Runway #4, Runway #13 (R/L), Runway #22 (R/L), and Runway #31. The locations of these runways and burning sites are presented in Figure 5-1 and visibility impacts are presented in Table 5-2.

■ Coastal Zone Management

Policy 41: Land use or development in the area will not cause national or state air quality standards to be violated.

Any alternatives that seek to alter the marsh will reduce its accessibility during implementation. Alternatives that temporarily but repeatedly limit the public use through spraying, burning, mowing, etc.

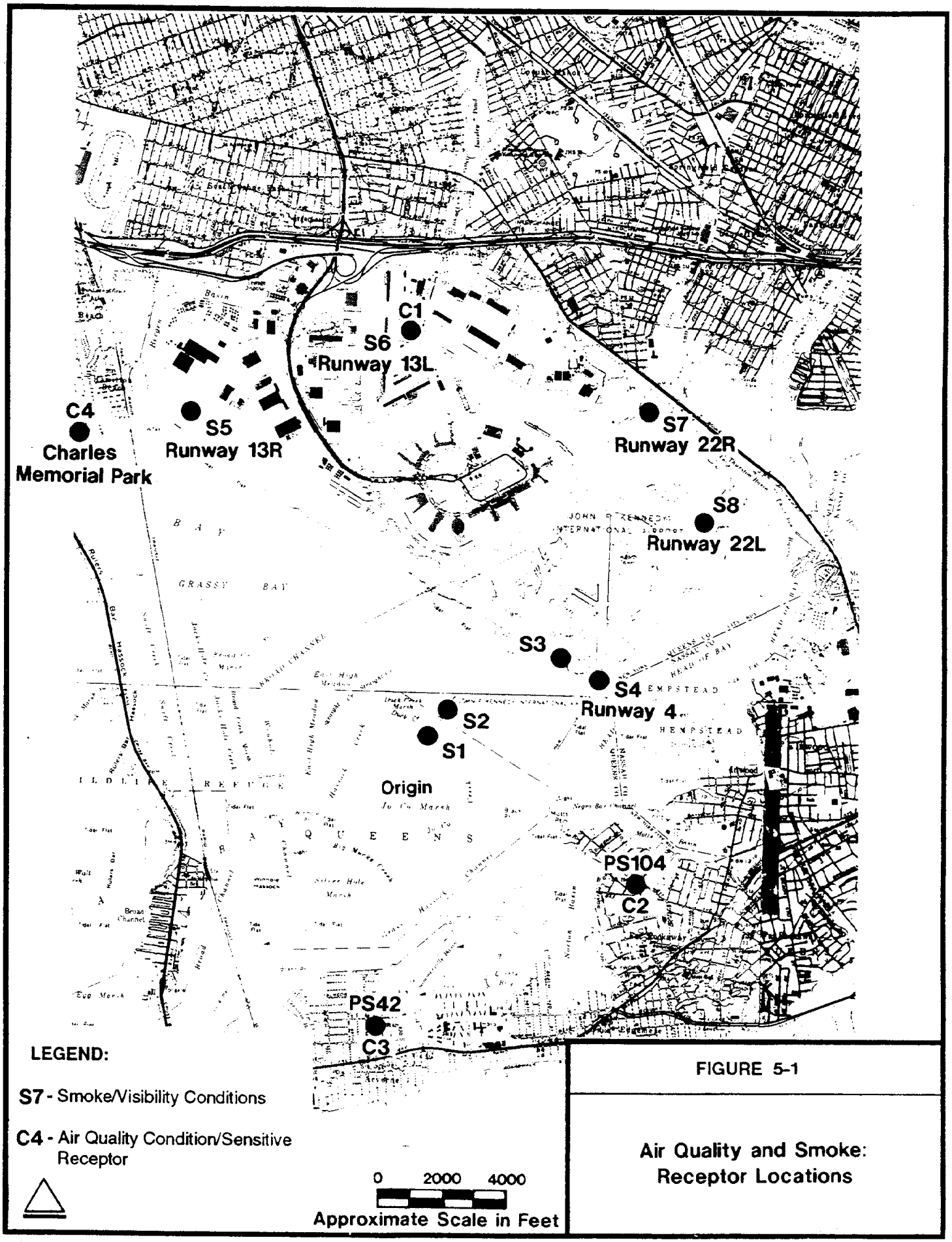


FIGURE 5-1

Air Quality and Smoke: Receptor Locations

Table 5-2

Particulate Concentrations at Runways

Location	Altitude (meter)	Worst Case 1-hr Concentrations ($\mu g/m^3$)	Average Background ($\mu g/m^3$)	Total ($\mu g/m^3$)	Visibility (mile)
Runway 4 Approach zone (200 m SW of runway end)	20.0 40.0 60.0	203.1 72.6 37.3	87.0 87.0 87.0	290.1 159.6 124.3	2.6 4.6 5.9
Runway 4 end	20.0 40.0	116.0 50.6	87.0 87.0	203.0 137.6	3.6 5.4
Runway 31 Approach zone (400 m SE of runway end)	10.0 40.0	13.6 12.0	87.0 87.0	100.6 99.0	7.4 7.5
Runway 31 end	0.0 20.0	17.1 16.4	87.0 87.0	104.1 103.4	7.1 7.2
Runway 22L	0.0 10.0 30.0	3.6 3.6 3.5	87.0 87.0 87.0	90.6 90.6 90.5	8.2 8.2 8.2
Runway 22R	0.0 10.0	3.0 3.0	87.0 87.0	90.0 90.0	8.2 8.2
Runway 13R	0.0 10.0	3.3 3.3	87.0 87.0	90.3 90.3	8.2 8.2
Runway 13L	0.0 10.0	4.5 4.4	87.0 65.0	91.5 91.4	8.1 8.1

Sources of Data:

(a) U.S. EPA, Report AP-42 "Compilation of Air Pollutant Emission Factors" - Fourth Edition, Section 2.4 - "Open Burning"

(b) New York State Department of Environmental Conservation (NYSDEC), Annual Report DAR-92-1, Air Quality

(c) Impact Modeling Results from Industrial Source Complex (ISCST2), Version 92062, U.S. EPA

(d) James P. Tomany, "Air Pollution: The Emissions, The Regulations, and The Controls"

would also reduce the permanent public access. Excavation may render certain parts of the marsh permanently inaccessible to the public due to flooding conditions.

■ **Socioeconomic**

Burning is not anticipated to result in any major socioeconomic impacts such as displacement of commercial uses or reduction of the economic value of recreation. The sociocultural values people place on the integrity of the marsh ecosystem and the presence of wildlife in these habitats would be temporarily impacted by burning, as could the sociocultural values some place on safe aircraft operation (temporary impact).

■ **Regulatory Compliance**

Burning the marsh would require the following permits and approvals:

- Tidal Wetlands Permit - NYSDEC
- Protection of Waters Permit - NYSDEC
- Special License for Protected Wildlife - NYSDEC
- Coastal Erosion Hazard Area - NYSDEC
- Coastal Zone Management Program - NYSDOS, NYCPC
- NPS Coordinated 516 DM Review
- NPS Special Use Permits
- Federal Consistency Requirements
- Section 7 FWS Consultation
- Open Burning Permit (NYC Fire Department)

Because of the substantial potential environmental impacts associated with this alternative, habitat modification through burning of the vegetation is not advanced for consideration as a preferred alternative.

5.4.2.1.3 Herbicide Application

■ **Ecological Resources**

Laughing Gulls

The purpose of the herbicide application alternative would be to substantially reduce the vegetation of the subject marshes in order to deter nesting of Laughing Gulls. If the alternative was successful in eliminating Laughing Gull reproduction on JoCo, East High Meadow, and Silver Hole marshes, it would impact the local Laughing Gull population by removing the Laughing Gull as a breeding bird in Jamaica Bay. Unless Laughing Gulls established a nesting colony elsewhere in New York State, it would also be lost as a breeding bird in New York State. The regional Laughing Gull population would probably not be significantly impacted; modeling results from more severe actions (toxicant of adult Laughing Gulls, etc.) indicate that the annual removal of more than 14,500 adult laughing gulls would be the threshold point beyond which the regional population would be affected. The modification of the marshes by habitat management would not result in the death of the birds, and there is a probability that they would establish nests elsewhere in the northeastern U.S., if not in New York State.

Other Three Gull Species

Herring, Ring-billed, and Great Black-backed gulls do not nest in JoCo, East High Meadow, or Silver Hole marshes (Litwin et al. 1993). The application of herbicides to these three sites would not have adverse impacts on these three gull species. Herring and Great Black-backed gulls nest abundantly elsewhere in Jamaica Bay, and Ring-billed Gulls that occur in the area are non-nesters. Applying herbicides to the marshes may increase these sites' habitat values for roosting for the three non-Laughing Gull species.

Other Wildlife

Removal of marsh vegetation through herbicide treatment could impact local and state populations of other shorebirds that nest in Jamaica Bay due to the removal of nesting substrate. Applying herbicides to JoCo, East High Meadow, and Silver Hole marshes could have adverse impacts on a number of marsh-nesting bird species, including sharp-tailed and seaside sparrows, willet, clapper rail, American Oystercatcher, and common and Forster's terns. Since these species and others nest in vegetation on coastal salt marshes, and have been recorded as active breeders in Jamaica Bay, they may be affected by the removal of salt marsh vegetation. The loss of nesting substrate and the subsequent growth of a potentially differed flora could remove nesting habitat substrate for these species. Seaside sparrows and sharp-tailed sparrows would be negatively affected by the removal of the food resources from marsh plant seeds.

Vegetation

Since herbiciding would intentionally kill all or most of the marsh plants, extensive erosion of the organic substrate of the marsh would undoubtedly occur unless regeneration from the on-site seed bank was extremely rapid. Adverse impacts to local water-quality could result in the loss of habitat for the marsh organisms. Since the herbicide must be applied in midsummer for best results (Monsanto Company 1982), very little regeneration might occur before winter, thus exposing the devegetated marsh to severe weather that would probably accelerate erosion.

Destroying the vegetation on the 114 ha (289 acres) of the JoCo/Silver Hole/East High Meadow/Duck Creek marsh complex would eliminate 18 percent of the salt marsh vegetation in Jamaica Bay (based on NYSDEC Tidal Wetlands Maps). This would undoubtedly result in a marked adverse impact on the productivity of the Jamaica Bay system, and thus on resources such as recreational fisheries that this estuary supports. Additional impacts, such as from increased water turbidity due to marsh erosion, and effects of Rodeo on nontarget organisms such as algae and phytoplankton, would contribute even further to productivity losses.

- **Water Quality**

The application of herbicides would introduce contaminants to the marsh surface that could enter the bay by draining directly off the marsh surface with ebbing tidal waters and rains or may infiltrate the surface, adsorb to sediment particles, and later be released to the water column with resuspension or subsurface migration. The dispersal and ultimate fate of these contaminants depends on specifics of their physicochemical behavior and biological uptake and breakdown.

The alteration of vegetative cover would affect wave energy attenuation, sediment trapping and erosion on the marsh similar to the impacts discussed above. The loss of vegetative cover would likely increase water turbidity because of the reduction in sediment trapping and stronger erosive forces. Pollutants that may be associated with previously buried sediments would then be exposed to processes that could reintroduce them into the water column. Any decrease in sediment trapping capabilities would also interfere with the means by which contaminated suspended sediments transported to these marshes are removed from the water column by deposition and burial. Thus, the degree to which these marsh islands may be acting as sediment/toxicant sinks in the overall system may be reduced.

The magnitude of these impacts would depend upon where the application of herbicides occurs in relation to marsh elevation and flood regime.

Mitigation measures to reduce these impacts would be to limit the area of herbicide application to those portions of the marsh most widely used by nesting colonies. These are areas of reduced flooding. In addition, herbicides should not be applied to the tall form of *Spartina alterniflora* that borders tidal creek margins. This form of *Spartina* specifically acts to trap sediments as waters overflow channel banks and flood the marsh.

- **Parks and Recreation**

Application of herbicides would require aerial spraying which could temporarily affect the use of Jamaica Bay for recreational purposes. Potential impacts on recreational users of Jamaica Bay, airport personnel, or surrounding residential areas may result from direct contact with drifting sprayed material. The manufacturer's directions for use indicate that Rodeo may cause eye irritation and that contact with eyes, skin, or clothing should be avoided. Depending on the meteorological conditions, spraying could affect a smaller or larger area.

- **Socioeconomic**

Due to certain use limitations of Jamaica Bay during spraying of the marsh are with herbicides a potential impact could result from the reduced value of recreation in the area during this period. The potential adverse impacts on nontarget bird species could result in their absence from the list of local breeding birds.

- **Coastal Zone Management**

Policy 30: Municipal, industrial and commercial discharge of pollutants, including, but not limited to, toxic and hazardous substances, into coastal waters will conform to state water quality standards.

The application of herbicides will introduce contaminants to the marsh surface that could enter the bay by draining directly off the marsh surface with ebbing tidal waters and rains or may infiltrate the surface, adsorb to sediment particles, and later be released to the water column. For a more detailed discussion refer to the section on the water quality impacts of this alternative.

Policy 31: State coastal area policies and management objectives of approved local waterfront revitalization programs will be considered while reviewing coastal water classification and while modifying water quality standards; however those

water already overburdened with contaminants will be recognized as being a development constraint.

Major sources of pollutants to Jamaica Bay are the Water Pollution Control Facilities (WPCFs), Combined Sewer Overflows (CSOs), and leachate from three closed landfills that border Jamaica Bay. The existing water quality in Jamaica Bay is recognized as a constraint for herbicide application, as this might contribute contaminants to Jamaica Bay. A discussion of the existing water quality conditions in Jamaica Bay is provided in Section 4.2.2. A discussion of the water quality impacts of herbicide application is provided in the previous section.

Policy 39: The transport, storage, treatment and disposal of solid wastes, particularly hazardous wastes, within coastal areas will be conducted in such a manner so as to protect groundwater and surface water supplies, significant fish and wildlife habitats, recreational areas, important agricultural lands, and scenic resources.

Transport of the herbicide would be conducted in a manner which would not affect groundwater and surface water supplies, significant fish and wildlife habitats, recreational areas, important agricultural lands, and scenic resources.

Because of the substantial potential environmental impacts associated with this alternative, habitat modification through herbicide application to the vegetation is not advanced for consideration as a preferred alternative.

- **Regulatory Compliance**

Application of herbicides to the marsh would require the following:

- Tidal Wetlands Permit - NYSDEC
- Protection of Waters Permit - NYSDEC
- Special License for Protected Wildlife - NYSDEC
- Coastal Erosion Hazard Area - NYSDEC
- Coastal Zone Management Program - NYSDOS, NYCPC
- NPS Coordinated 516 DM Review
- NPS Special Use Permits
- Federal Consistency Requirements
- Section 7 FWS Consultation
- NPS IPM Review

A draft programmatic Environmental Impact Statement for the use of Rodeo and other products as aquatic herbicides has been completed and accepted by the New York State Department of Environmental Conservation (NYSDEC). If aquatic use of this product is eventually approved, application would require a permit from NYSDEC under the Aquatic Herbicide Permit Program pursuant to Environmental Conservation Law § 15-0313(4) and 6 NYCRR Part 327.

5.4.2.2 Landform Alteration

5.4.2.2.1 Excavating Marsh

- **Ecological Resources**

Laughing Gulls

Excavating the Jamaica Bay marsh islands to lower the marsh elevation by 1 foot would remove the site's nesting habitat value for Laughing Gulls. This would affect the local Laughing Gull population since JoCo, East High Meadow, and Silver Hole marshes are the only nesting site for this species in New York. Unless Laughing Gulls nested elsewhere in New York State, they would also be lost as a breeding bird in New York State. Excavation of the marshes would probably not impact the regional population of Laughing Gulls, since this alternative does not cause direct mortality of Laughing Gulls, and many would probably nest elsewhere (in New York or other northeastern states).

Other Gulls

Herring, Ring-billed, and Great Black-backed Gulls do not nest in JoCo, East High Meadow, or Silver Hole marshes (Litwin et al. 1993). The excavation of these three sites would not have adverse impacts on the three other gull species. Herring and Great Black-backed Gulls nest abundantly elsewhere in Jamaica Bay, and Ring-billed Gulls that occur in the area are non-nesters.

Other Birds

Excavation of the colony site would greatly increase the acreage of low salt marsh within Jamaica Bay, but the system's largest area of high salt-marsh community (which supports species such as Seaside and Sharp-tailed sparrows, clapper rail, Common and Forster's Tern, American Oystercatcher, and others) would be lost. This change would undoubtedly have important, possibly adverse effects on the species diversity, trophic structure, and energy flow of the system.

Loss of the high marsh would eliminate what is probably a major roosting area for shorebirds and possibly other species, and would reduce or eliminate hunting areas for raptors such as Northern Harrier and Short-eared Owl.

- **Water Quality**

The lowering of the existing marsh elevation by the excavation of one to two feet will impact water quality due to changes in vegetation and modification of bay hydraulics.

Marsh island sediments in this system are sinks for past pollutants. Contaminants are retained in the sedimentary record. Producing a low marsh habitat by excavation will expose previously buried contaminants to both physical and biological erosion processes during the excavation period. In addition, after a low marsh is established, sediments that were previously too deep to be affected by organisms active in the upper sediment layers at the sediment-water interface, will now be nearer the surface. Bioturbation and sediment disturbance by these organisms is a very substantial process in the marsh environment affected by excavation. This process might introduce deeper, possibly contaminated

sediments to the water column that would not have been subject to bioturbation and consequent exposure previously.

In addition, the hydrodynamics of the salt marsh ecosystem would change. JoCo Marsh, Silver Hole Marsh, and East High Meadow presently store and disperse a given volume of tidal water. Many aspects of bay circulation are determined by the timing and strength of channelized discharge on and off marsh islands. Changes in basin morphology will affect circulation. Changes that would occur in discharge and flow velocities would affect sediment erosion, transport, and deposition patterns. Contaminated previously buried sediments, may be resuspended and pollutants reintroduced to the water column if current velocities increase. Conversely, sedimentation would increase where flow velocities diminish. The residence time of pollutants introduced to the bay may increase or decrease, and the chemical environment modified.

The equipment needed to excavate and grade the marsh could affect water quality as discussed above.

Mitigation to reduce the impacts due to changes in the vegetative community should involve the grading to elevations that would favor the growth of species that would maximize the positive impacts that could occur (as discussed previously) and minimize the adverse impacts. Impacts to the hydrodynamics of the system could be minimized by limiting the area excavated on an individual island to areas that would least impact circulation or excavating just one of the three islands.

- **Parks and Recreation**

Excavation of the marsh would result in a new ecosystem for which a different use designation may be appropriate. Consequently the meaning of the marsh for recreational purposes would most likely change.

- **Socioeconomic**

Excavation of the marsh may change the use and specific attractiveness of this part of Jamaica Bay. If a different use of this area would be determined in the context of the rest of the uses in the GNRA, the impacts of such a use on the socioeconomic environment would need to be addressed.

- **Coastal Zone Management**

Policy 8: Protect fish and wildlife resources in the coastal area from the introduction of hazardous waste and other pollutants which bio-accumulate in the food chain or which cause substantial sublethal or lethal effect on those resources.

As documented in the section on water quality, this alternative could introduce pollutants into the foodchain.

Policy 15: Mining, excavation, or dredging in coastal waters shall not substantially interfere with the natural coastal processes which supply beach materials to land adjacent to such waters and shall be undertaken in a manner which will not cause an increase in erosion of such lands.

Depending on the change in flooding patterns caused by excavation of the marsh, the adjacent areas may become less protected from tidal flooding and more subject to erosion.

Policy 16: Public funds shall be expended for activities and development, including the construction or reconstruction of erosion control structures, only where pubic benefits clearly outweigh their long-term monetary and other costs, including their potential for increasing erosion and their adverse effects on natural protective features.

Although the public benefit of this alternative is the highly effective reduction of the gull-aircraft strike hazard in order to maintain public safety at the airport, excavation might result in substantial increase in the potential for erosion and adverse effects on natural protective features.

Policy 19: Protect, maintain and increase the level and types of access to public water-related recreation resources

Excavation of the marsh would permanently reduce the level of public access to the marsh.

Policy 25: Protect, restore and enhance the natural and manmade resources which are not identified as being of Statewide significance but which contribute to the overall scenic quality of coastal areas.

Excavation of the marsh would substantially alter the aesthetic appearance of the area and as such be detrimental to the scenic resource quality of the area. Furthermore, views of the marsh across Jamaica Bay would no longer be provided.

Policy 30: Municipal, industrial and commercial discharge of pollutants, including, but not limited to, toxic and hazardous substances, into coastal waters will conform to state water quality standards.

The excavation of the marsh could introduce contaminants into the bay. For more detailed information refer to the previous section on the water quality impacts of excavation.

Policy 31: State coastal area policies and management objectives of approved local waterfront revitalization programs will be considered while reviewing coastal water classification and while modifying water quality standards; however those water already overburdened with contaminants will be recognized as being a development constraint.

Major sources of pollutants to Jamaica Bay are the Water Pollution Control Facilities (WPCFs), Combined Sewer Overflows (CSOs), and leachate from three closed landfills that border Jamaica Bay. The existing water quality in Jamaica Bay is recognized as a constraint for excavation of the marsh, as this might contribute additional contaminants to Jamaica Bay. A discussion of the existing water quality conditions in Jamaica Bay is provided in Section 4.2.2. A discussion of the potential water quality impacts of excavation is provided above.

Policy 37: Best management practices will be utilized to minimize the non-point discharge of excess nutrients, organics and eroded soils into coastal waters.

Alternatives that involve excavation could result in erosion and the discharge of excess nutrients, organics and soils into coastal waters.

Policy 44: Preserve and protect tidal and freshwater wetlands and preserve the benefits derived from these areas.

Excavation of the high-marsh areas would result in detrimental impacts to tidal wetlands.

- **Regulatory Compliance**

Excavation of the marsh may require the following permits or approvals:

- Tidal Wetlands Permit - NYSDEC
- Protection of Waters Permit - NYSDEC
- Special License for Protected Wildlife - NYSDEC
- Coastal Erosion Hazard Area - NYSDEC
- Coastal Zone Management Program - NYSDOS, NYCPC
- NPS Coordinated 516 DM Review
- NPS Special Use Permits
- Federal Consistency Requirements
- Section 7 FWS Consultation
- Congressional Approval

Because of the substantial potential environmental impacts associated with this alternative, habitat modification through excavation of the marsh is not advanced for consideration as a preferred alternative.

5.4.2.3 Harassment on Colony Site

- **Display of Synthetic Gull Models**

Displays of gull models would have no adverse impacts on ecological resources, water or air quality, parks and recreation, or socioeconomic, other than a slight decline in the aesthetic values of the marsh (and this would occur only if these items were displayed on posts). Display of gull models in Jamaica Bay could impact gulls by soliciting an avoidance response. The action is unlikely to affect local, state, regional, or federal populations of any wildlife species, or to result in loss of individuals.

Display of Synthetic gull models on the Jamaica Bay Laughing Gull models on the Laughing Gull colony would require the following permits and reviews:

- NPS Coordinated 516 DM Review
- NPS Special Use Permit
- Coastal Zone Management Act
- Federal Consistency Requirements

Because of the low potential environmental impacts associated with this alternative, display of synthetic models representing dead gulls is advanced for consideration as part of a preferred alternative.

5.4.2.4 Reduction of Off-Airport Attractants

- **Aqueduct Racetrack**

The local, state and regional populations of Laughing Gulls and other gulls would not be affected by nonlethal habitat management activities at off-airport sites other than GNRA. However, flight and flocking behaviors might be affected by habitat management activities at these sites.

Measures to reduce the attractiveness of Aqueduct Racetrack to gulls and other birds would have little environmental impact. The three principal measures would be control of bird feeding, exclusion of birds from the freshwater infield ponds with monofilament or wire, and long-grass management in the 40-acre infield.

Curtailing bird feeding by patrons and track employees would probably principally affect Rock Doves, European Starlings, and House Sparrows, and would probably cause no reduction in local populations.

Preventing access to the ponds by large birds (geese and gulls would be mainly affected) would tend to distribute the flocks that utilize Aqueduct to other locations to obtain fresh water for drinking and bathing. Elimination of the feces from geese and gulls would probably improve water quality in the ponds, although as this water is presumably used only for aesthetic purposes (or possibly for track maintenance), such improvement is not a major concern. Birds that disperse elsewhere for fresh water, however, might have undesirable impacts at such alternate sites by depositing droppings on public use areas such as parks.

Long-grass management would have a beneficial impact in that less fuel would have to be used for mowing operations and less air pollution would be generated by mowing machinery.

- **Jamaica Bay Sewage Treatment Plant**

Few adverse environmental impacts would result from installing a gull-exclusion device such as overhead wires or monofilament line at the sewage treatment plant. An occasional bird may become entangled in the lines (Blokpoel and Tessier, 1983). With reasonable monitoring of the system, most such birds could be released unharmed. A monofilament-grid exclusion device over a Ring-billed Gull colony of 4500 pairs in Ontario entangled 14 birds, all of which were released unharmed (Tessier and Blokpoel 1992).

- **Others**

The specific control measures implemented at other off-airport attractants would depend on the type of attractant, therefore any impacts would have to be evaluated for each control situation as it arises. Surveys would be conducted to provide supporting documentation for implementing specific control measures.

Because of the low potential environmental impacts associated with this alternative, reduction of off-airport attractants is advanced for consideration as a preferred alternative.

5.5 Nonlethal Gull Hazard Control: Expansion of JFKIA On-Airport Control Program

The expansion of JFKIA's nonlethal gull hazard control program would most likely not impact local, state or regional populations of any wildlife species, since it consists mainly of habitat management on JFKIA, harassment using primarily nonlethal measures, and insect, water, and sanitation management.

Expansion of the existing on-airport management would be limited to the airport itself and is not anticipated to create major impacts on the socioeconomic environment. Conduct of JFK's current bird control program employs more than 20 full- and part-time employees. Enhanced staffing would create2-6 additional jobs. Increased use by the Bird Control Unit of harassment techniques may increase noise emanating from the airport to a limited degree. This noise, however, would be negligible compared to ambient levels.

The on-airport methods of gull management that would affect the water quality of Jamaica Bay are those that either produce or reduce contaminants or particulate matter that are added to the storm water runoff that empties into the bay.

Because of the low potential environmental impacts associated with this alternative, expansion of the JFKIA on-airport control program is advanced for consideration as a preferred alternative.

5.5.1 Vegetation Management

Maintenance of long grass wherever feasible on the airport would result in lower energy consumption for mower fuel, and less air pollution generated by the mower engines, since many fewer mowing cycles would be required.

- **Water Quality**

Decreased quantities of cut grass litter will enter the Bay during rain events and will a decreased affect on water quality compared to current practice. Because of the low potential environmental impacts associated with this alternative, expansion of the vegetation management component of the JFKIA on-airport control program is advanced for consideration as a preferred alternative.

5.5.2 Water Management

- **Water Quality**

Water management would entail the use of methyl anthranilate (MA) to repel birds from standing pools of water at the airport, as well as other activities to reduce the amount or attractiveness of water on the airport. The expanded use of this chemical will increase its concentration in storm water runoff to the bay. However, MA is registered with the Food and Drug Administration as a human-safe food flavoring (Combings et al. 1991). Therefore, its increase in the bay would most likely not be detrimental.

In contrast, expanding the practice of repaving and resurfacing to eliminate sites of pooling water could have a detrimental impact. The leveling of impermeable paved surfaces increases storm water runoff and the expansion of this practice will increase pollutant loadings to the bay. The magnitude of the impact

to existing conditions will depend on the quantity of increased discharge, the concentration of pollutants, and the degree of mixing that occurs. Impacts could be minimized by instituting appropriate storm water management measures.

Because of the low potential environmental impacts associated with this alternative, expansion of the water management component of the JFKIA on-airport control program is advanced for consideration as a preferred alternative.

5.5.3 Insect Control

Monitoring insect distribution and outbreaks more carefully would not involve any environmental impacts. If insect outbreaks are discovered and must be controlled with chemicals, pesticides would be introduced into the environment. However, the application would be performed in accordance with federal and state regulations to minimize any impacts on nontarget species.

- **Coastal Zone Management**

  Policy 39: The transport, storage, treatment and disposal of solid wastes, particularly hazardous wastes, within coastal areas will be conducted in such a manner so as to protect groundwater and surface water supplies, significant fish and wildlife habitats, recreational areas, important agricultural lands, and scenic resources.

The storage of insecticides and application of insecticides would be conducted in a manner which would minimize the effects on groundwater and surface water supplies, significant fish and wildlife habitats, recreational areas, important agricultural lands, and scenic resources.

Because of the low potential environmental impacts associated with this alternative, expansion of the insect management component of the JFKIA on-airport control program is advanced for consideration as a preferred alternative.

5.5.4 Sanitation

Improving sanitation practices at JFKIA would not affect local, state, regional, or national populations of any wildlife species, and would not result in the take of individuals. Improved sanitation could contribute minimally to the improvement of aviation safety at JFK, and could enhance sociocultural values people place on clean, well-kept public facilities.

- **Water Quality**

When garbage is unavailable to the gulls as a food source, they are unable to redistribute it to noncontained areas where it decomposes and becomes a source of contaminants to storm water runoff. Thus, the expansion of the management of garbage at the airport in this way will improve water quality of the bay by removing it as a source of pollution.

- **Coastal Zone Management**

  Policy 39: The transport, storage, treatment and disposal of solid wastes, particularly hazardous wastes, within coastal areas will be conducted in such a manner so as

to protect groundwater and surface water supplies, significant fish and wildlife habitats, recreational areas, important agricultural lands, and scenic resources.

The storage, transport and disposal of refuse would be conducted in a manner which would minimize the effects on groundwater and surface water supplies, significant fish and wildlife habitats, recreational areas, important agricultural lands, and scenic resources.

Because of the low potential environmental impacts associated with this alternative, expansion of the sanitation management component of the JFKIA on-airport control program is advanced for consideration as a preferred alternative.

5.5.5 Bird Control Unit

Most of the possible actions to improve the Bird Control Unit would not have negative environmental impacts. Enhancement of the Bird Control Unit would not negatively affect local, state, regional, or national populations of any wildlife species, but could result in the increased taking via shooting of individual gulls. At current operational levels, the BCU shoots less than 300 gulls each year; enhanced operations could result in the taking of up to 400 gulls annually. Increased use of pyrotechnics, distress call tapes, and increase of frequency of patrols and sweeps would contribute additional noise and vehicle-generated pollutants into the environment. Enhanced operation of the BCU could result in fewer birds being killed due to collisions with aircraft. There is some potential for the increased harassment of hazardous bird species to have increased negative impacts of less-hazardous species such as terns and upland sandpipers.

Because of the relatively low potential environmental impacts associated with this alternative, improvements to the operation of the Bird Control Unit of the JFKIA on-airport control program is advanced for consideration as a preferred alternative.

5.6 Lethal Gull Control: Off-Airport Alternatives

5.6.1 Laughing Gull Colony Management

5.6.1.1 General Impacts

The following comments apply to **all** alternative methods of eliminating the Laughing Gull colony by lethal means:

- **Laughing Gulls**

As the Jamaica Bay Laughing Gull colony is currently the only known colony in New York State, destroying it could result in the loss of the species from Jamaica Bay and New York's breeding bird populations if surviving colony members do not relocate and form a viable colony elsewhere in New York.

Shooting of 14,191 adult Laughing Gulls at JFKIA in 1991, and 11,847 in 1992 eliminated about 5 to 6 percent of the Maine-Virginia breeding population and about 2-3 percent of the United States breeding population in each of those years (Belant and Dolbeer 1993). Because of the large size of the overall

Laughing Gull population (more than 100,000 breeding pairs in the region and nearly 260,000 pairs in the U.S.), the loss from killing all colony members (which totaled 7629 pairs in 1990), or even the higher numbers taken in 1991 and 1992, are unlikely to have a substantial adverse impact on the ability of the Laughing Gull to maintain its national population.

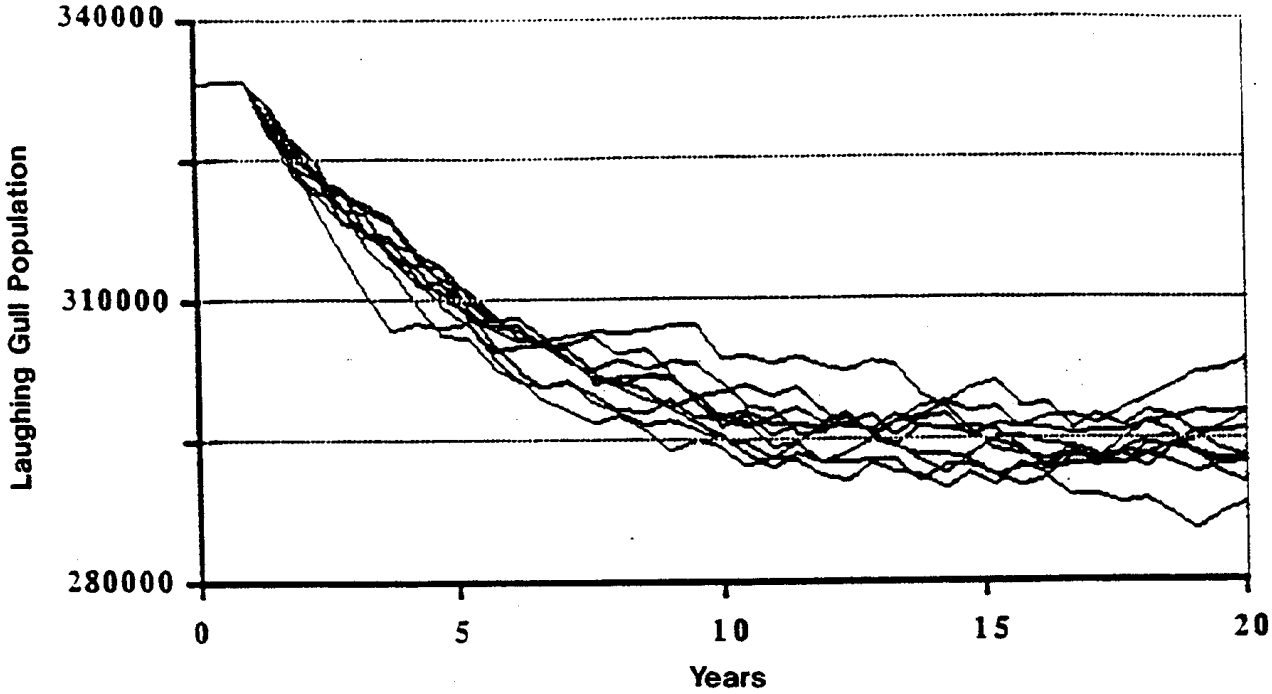
To assess the impacts of lethal alternatives on the regional MA/NY/NJ Laughing Gull population, the dynamics of regional populations were simulated in a computer model. The model constructed to assess the impacts on the regional (MA/NY/NJ) Laughing Gull population was based on the following population estimates: Massachusetts (1,285 nesting pairs), New York (7,629 nesting pairs), New Jersey (58,796 nesting pairs). Total nesting pairs for MA/NY/NJ population was estimated at 67,710 pairs. Estimates were from 1991, 1990 and 1989, respectively (Belant and Dolbeer 1993a). The model was subsequently run in a manner similar to that for the Jamaica Bay Laughing Gull population (see Section 3.1). To estimate the numbers of non-breeding adults in the regional MA/NY/NJ Laughing Gull population, the age class distribution was developed for the regional MA/NY/NJ Laughing Gull population. To initialize the regional model, the age distributions for First Year Birds were set at 73,440 birds (22% of total) and for Second Year Birds at 53,611 birds (16% of total). The same recruitment and survival parameters were used as in the Jamaica Bay Laughing Gull model. Adults were calculated at 206,405 birds (62% of total). The number of breeding pairs in the region was set at 68,000 pairs. The population was simulated for 30 years to derive a stable age distribution. This simulation provided an estimate of 33% of the regional population being non-breeding adults. The total population was 333,456 Laughing Gulls. For simulation purposes, the regional MA/NY/NJ population was considered closed to immigration.

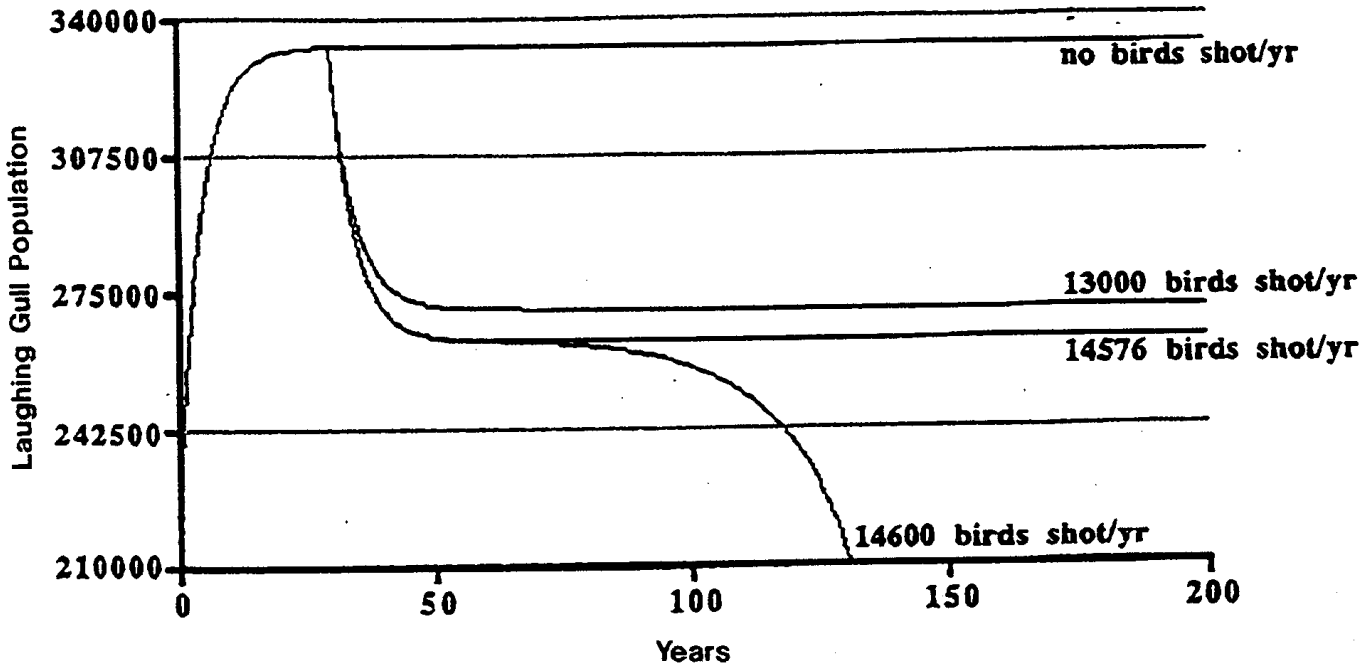
Results of population modeling (see Section 3.1, Figure 5-2) suggest that the current MA/NY/NJ population could sustain a maximum annual loss of approximately 14,500 birds to shooting (or other lethal method) every year. Continued mortality of more than approximately 14,500 Laughing Gulls every year for a period of 50 years could ultimately result in elimination of the MA/NY/NJ Laughing Gull population after a period of approximately 100 years. This simulation result is conservatively based on the assumption of a worst-case scenario in which all Laughing Gulls in the northeastern U.S. region are part of or dependent on the presence of the Jamaica Bay Laughing Gull nesting colony, which may not be the case.

In 1991, the 11,000 Laughing Gulls shot represented approximately 57 percent of the Long Island/Massachusetts/ Maine breeding population. On the other hand, Laughing Gulls not permitted to nest in JBWR could result in increased numbers nesting in Massachusetts and Maine colonies. It is important to note that the northern colonies in MA and ME were established prior to the establishment of the Jamaica Bay Laughing Gull colony. The presence of a large and expanding Laughing Gull population in New Jersey would probably continue to have significant impacts on any management programs in Jamaica Bay relative to Laughing Gulls. Band recovery data collected in 1991-93 indicate that Laughing Gulls are immigrating into Jamaica Bay from New Jersey and further south; these colonies will most likely continue to be a source of immigrants into New York.

- **Other Gulls**

The other three gull species (Herring, Great Black-backed, and Ring-billed) do not nest in JoCo, East High Meadow, or Silver Hole marshes, and their nesting populations would be unaffected by lethal control actions directed at Laughing Gulls there. These three gull species may, however, use the three marshes for loafing and resting, and may be affected by some of the lethal measures (shooting) due to





NOTE: Top graph
Number of birds killed was randomly varied between 4,000 and 13,000.
Ten simulations are shown

NOTE: Bottom graph
Shooting starts at year 30, after population growth levels off

FIGURE 5-2

Simulation of Effects of Annual On-Airport Shooting on the Regional Gull Population (Massachusetts, New York, New Jersey)

noise or nontarget take. Noise impacts, though, would probably be minimal due to the gulls' probable habituation to high levels of ambient noise.

The removal of Laughing Gulls from the three marshes may result in increased use of these sites by the three other gull species. Although the Laughing Gull would be the target species for these activities, there is some chance that individuals from another gull species would be affected by nontarget take. This would be minimized through employment of professional biologists trained in safe and effective use of equipment and in the accurate field identification of birds.

- **Other Wildlife**

The ten other nesting species identified in Section 5.1.1-10 could potentially be impacted by lethal on-NPS alternatives such as shooting, egg and nest destruction, and toxicant (DRC-1339) application. The presence of biologists in the colony on repeated site visits could have trampling and disturbance effects on species such as common tern, Forster's tern, American oystercatcher, and others. Accidental disruption of these species' nests and breeding behaviors could adversely affect their local abundance, and in the case of the rarer species (Forster's tern), could affect the Long Island population of the species.

Nontarget nesting species (such as the state-threatened common tern) would probably be disturbed (i.e., flushed from their nests for lengthy periods) by control activities on the marsh, with possible adverse effects on reproductive success. Nests of secretive species such as salt-marsh sparrows may be trampled inadvertently.

- **Vegetation**

The trampling of the marsh necessary to carry out virtually any control measures could adversely affect vegetation and reduce the physical stability of the marsh. DeLaune, et al. (1984) found "extreme damage" to *Spartina alterniflora* marsh in Louisiana from trampling necessitated by the sampling and monitoring activities associated with experimental plots.

Panic flights by birds alarmed by colony disturbance could temporarily increase the potential for birdstrikes at the airport.

5.6.1.2 Specific Impacts

5.6.1.2.1 Physical Destruction of Nests/Eggs

- **Ecological Resources**

Laughing Gulls

This management technique has the advantage of the direct impact being species-specific—only Laughing Gull nests would be affected.

The Jamaica Bay and New York State Laughing Gull population would not be eliminated by destruction of nests and eggs unless the activities were 100% successful, and there was no immigration into the colony. Records indicate a significant degree of immigration of laughing gulls into the Jamaica Bay colony from colonies in New Jersey and further south. The difficulty of the terrain in jamaica Bay

indicates that 100% efficacy could not be achieved. Figure 3-12 indicates the simulation of the laughing gull population considering 65% success and between 0% and 60% immigration. Assuming 40% immigration, the Laughing Gull population would eventually stabilize at about 45,000 Laughing Gulls associated with the Jamaica Bay colony.

Some nontarget bird species may be affected by disturbance created during conduct of nest destruction activities. It does not require the use of toxicants, or killing of adult birds. If the colony site is canvassed with great thoroughness to detect nests with eggs, relatively few chicks would have to be killed.

Implementation would require several visits to the colony during the nesting season because many adults would attempt to renest after their first clutch was destroyed. Flights by alarmed adult Laughing Gulls during these visits could increase safety hazards at the airport.

Other Gulls

The other three gull species (Herring, Great Black-backed, and Ring-billed) do not nest in JoCo, East High Meadow, or Silver Hole marshes, and their local, state, regional, and national populations would be unaffected by Laughing Gull egg/nest destruction. These three gull species may, however, may increase their use of the three marshes for loafing and resting.

Herring and Great Black-backed gulls may benefit from this alternative due to the increased availability of broken eggs, that would be exploited as a food source by scavenging gulls.

Other Wildlife

The presence of broken eggs/dead chicks could draw other scavenging birds such as crows that could also become a safety hazard. Removing this material from the marsh could present a problem of logistics, transport, and/or disposal.

In the long term, removal of Laughing Gulls may provide more habitat for other marsh-nesting birds (e.g., state-threatened common tern), thus providing their populations an opportunity to increase. Although such increases might in their turn represent an increased safety hazard at the airport, they would be of much less concern because the terns are smaller than Laughing Gulls and seldom overfly the airport.

- **Regulatory Compliance**

Nest/egg destruction may require the following permits or approvals:

- Special License for Protected Wildlife - NYSDEC
- Fish and Wildlife Permit, Special Purpose - USFWS
- Coastal Zone Management Program - NYSDOS, NYCPC
- NPS Coordinated 516 DM Review
- NPS Special Use Permits
- Federal Consistency Requirements
- Section 7 FWS Consultation
- NPS IPM Review
- Federal Consistency Requirements

Because of the moderate potential environmental impacts associated with this alternative, inducement of abandonment of the Jamaica Bay marsh by Laughing Gulls by destruction of their nests and/or eggs is advanced for consideration as a preferred alternative.

5.6.1.2.2 Oiling of Eggs

- **Ecological Resources**

Laughing Gulls

Oiling of laughing gull eggs in Jamaica Bay would not eliminate the local or New York State population unless the technique was 100% successful and there was no immigration. As noted previously, success would be less than 100% and a significant amount of immigration probably does occur into Jamaica Bay from New Jersey and further south. Table 3-3 shows the percent reduction in the Jamaica Bay laughing gull population under various scenarios of success and immigration.

This management technique has the advantage of the direct impact being species-specific—only Laughing Gull nests would be affected. Some nontarget bird species may be affected by disturbance created during conduct of egg oiling activities. It does not require the use of toxicants, or killing of adult birds.

Implementation would require several visits to the colony during the nesting season because some adults may attempt to renest after their first clutch was destroyed. Flights by alarmed adult laughing gulls during these visits could increase safety hazards at the airport.

Egg oiling would involve no mortality of adult Laughing Gulls, but could impact the local (Jamaica Bay) and New York State breeding population of Laughing Gulls. The regional Laughing Gull population would probably remain unaffected by egg-oiling on the Jamaica Bay Laughing Gull colony.

Other Gulls

The other three gull species (Herring, Great Black-backed, and Ring-billed) do not nest in JoCo, East High Meadow, or Silver Hole marshes, and their nesting populations would be unaffected by Laughing Gull egg-oiling.

Herring and Great Black-backed gulls may benefit from this alternative due to the increased availability of abandoned nests and eggs, that would be exploited as a food source by these scavenging gulls.

Other Wildlife

The presence of abandoned eggs could draw scavenging birds such as gulls and crows that could also be a safety hazard. Removing this material from the marsh could present a problem of logistics, transport, and/or disposal.

If egg-oiling reduced the number of Laughing Gulls that nested on the marshes in subsequent years, more habitat may become available for other marsh-nesting birds (e.g., state-threatened common tern), thus providing their populations an opportunity to increase. Although such increases might in turn represent an increased safety hazard at the airport. However, many of the species that may increase, such as terns and sharp-tailed sparrows, would probably not cause hazards to aircraft.

This technique has the advantage of being species-specific—only Laughing Gull eggs would be oiled, so other species nesting on the marsh islands would not be directly affected by this control measure. temporary disturbances caused by the oiling applications could have negative impacts on other non-gull nesting bird species in Jamaica Bay: seaside- and sharp-tailed sparrow, clapper rail, willet, oystercatcher, etc.

Ecosystem

The impact of oil on the marsh ecosystem is not known. At the 50-75 ml/nest applied by Griffin and Hoopes (1991), oiling 7629 nests (the total in 1990) would discharge 381-572 liters (96-151 gal) of oil into the marsh system. The pure mineral oil that would probably be used could have an undesirable effect on at least some nontarget marsh organisms. No studies have been found regarding the biological effects of mineral oil, other than their asphyxiation effects on bird eggs (Christens and Blokpoel 1991). Experimental studies of the application of crude oil to Louisiana marshes (DeLaune, et al. 1984, Crow et al 1986) and a study of a crude-oil spill in a Georgia marsh showed little negative impact on marsh biota. However, in studies of spills of No. 2 fuel oil in Massachusetts, Sanders, et al. (1980) found an immediate die-off of macrofauna with recovery not complete after five years, and Hampson and Moul (1978) also found dead and moribund epifauna. Christens and Blokpoel (1991) considered Daedol® 50 to be nonpolluting to the environment. Morris and Siderius (1990) cautioned that petroleum products used for egg-oiling "in broad-scale application, would likely contaminate the immediate environment."

The Laughing Gull nest is generally a fairly bulky structure of dead plant material; it may be up to 46 cm (18 in) wide and 10 cm (4 in) or more tall (Harrison 1975). The nest material itself would probably absorb most of any oil that ran off the eggs, and retain it until it was degraded by physical and biological processes. Any oil that soaked through the nest would not impact living vegetation, but could possibly affect organisms living in the underlying sediments. Oil washed from the eggs or nest by precipitation or tidal flooding could impact organisms in a wider area.

Killing eggs by oiling with petroleum products causes eventual rotting and leakage of the egg contents (Thomas 1972, Morris and Siderius 1990). This may attract scavengers (e.g., gulls and crows) to the vicinity of the colony, thus temporarily increasing the birdstrike hazard.

Some nontarget bird species may be affected by disturbance created during conduct of egg-oiling activities.

- **Water Quality**

It is projected that 96 to 151 gallons of oil would be required to oil all laughing gull eggs on the colony. Mineral oils could be used and may need to be applied for a number of years. Pure mineral oils are nontoxic (Christens and Blokpoel, 1991).

The risk of an adverse impact due to the washing off of oils is low because the oiled eggs would probably always be incubated and not exposed. However, some oil will adhere to adult birds and may contaminate marsh grasses. In addition, excess oil may spray onto the ground or drip from the eggs when applied. This oil could wash off the marsh or infiltrate sediments. The degree to which the oil would affect water quality would depend upon where oiling occurs in relation to marsh elevation and flood regime, and the specific chemical properties of the chosen oil (e.g., solubility, toxicity).

Potential adverse impacts can be minimized by using nontoxic mineral oils and taking especial care not to spray excess oil during the application.

- **Parks and Recreation**

This alternative would result in temporary but repeated disturbance of the colony, during which times recreational use would be modified or eliminated. The leaking and rotting of eggs on a large scale may cause odors which reduce enjoyment of the marsh environment for recreational purposes.

- **Coastal Zone Management**

Policy 33: Best management practices will be used to ensure the control of storm water runoff and combined sewer overflows draining into coastal waters

As discussed under water quality, egg-oiling has a very limited potential for detrimental impacts on water quality.

- **Regulatory Compliance**

Nest/egg destruction may require the following permits or approvals:

- Special License for Protected Wildlife - NYSDEC
- Fish and Wildlife Permit, Special Purpose - USFWS
- Coastal Zone Management Program - NYSDOS, NYCPC
- NPS Coordinated 516 DM Review
- NPS Special Use Permits
- Federal Consistency Requirements
- Section 7 FWS Consultation
- NPS IPM Review
- Federal Consistency Requirements

Because of the moderate potential environmental impacts associated with this alternative, inducement of abandonment of the Jamaica Bay marsh by Laughing Gulls by preventing hatching of their eggs by oiling is advanced for consideration as a preferred alternative.

5.6.2 Adult Population Reduction

5.6.2.1 Toxicant Application

Toxicant application to Laughing Gulls would involve using DRC-1339 on bread baits. The bread bait would be hand-placed in the Laughing Gull nest. It is slow acting with death usually occurring 2 to 4 days after ingestion (Woronecki et al. 1989 cited in USDA, 1993). DRC-1339 is completely metabolized by the gull (USDA, 1993). Unaccepted bread baits would be collected and disposed of according to label directions.

■ Ecological Resources

Laughing Gulls

Application of an avicide such as DRC-1339 would probably have an impact on the local and New York Laughing Gull population, since it could result in the loss of more than 10,000 birds, and could cause the abandonment of the only known Laughing Gull nesting colony in New York State. A one-time application of DRC-1339 would drastically reduce that year's Laughing Gull population in Jamaica Bay, but the population would rebound to 50 percent of its initial level in 6-8 years, and would be back to its initial level in 20 years. The regional Laughing Gull population would not be affected by a one-time application of DRC-1339, but could be affected by an annual application program conducted over many years, which would be required to achieve substantial results. The long-term effects on the MA/NY/NJ Laughing Gull population would be identical to those of other adult reduction alternatives such as on-colony or on-airport shooting (see Section 5.6.1.1 - General Impacts of All Lethal Alternatives).

Other Gulls

The absence of nesting Laughing Gulls might result in an increased number of other gulls using the site as roosting habitat.

There is some possibility that species other than Laughing Gulls could ingest the DRC-1339 baits. However, other species are likely to be other gulls (i.e. Herring, Great Black-backed). As these species also present a strike problem at JFKIA, and because of probable low numbers of these gulls potentially impacted, lethal impacts to a few individuals of these three gull species would not affect these species local, State, regional or national populations, but could slightly reduce gull-aircraft strikes at JFKIA.

Other Wildlife

Due to feeding preferences, it is much less likely that nontarget species which have a much lower strike potential, such as common tern and American Oystercatcher, would ingest toxicant baits. Woronecki, et al. (1989) observed that a few European Starlings consumed alpha-chloralose and DRC-1339 baits intended for Herring Gulls.

- Indirect Impacts

The potential for indirect lethal effects (i.e., to scavengers that could eat carcasses of poisoned gulls) is very low. Because DRC-1339 is a slow-acting toxicant, it is completely metabolized in the body of the consuming individual before death and cannot cause secondary poisoning (Krzysik 1989, U.S. Dept. of Agriculture 1993b). A Great Black-backed Gull, for example, might possibly kill and eat a Laughing Gull immobilized by the toxicant but not yet dead, and thus be affected. However, since the toxicant is likely to be at least partly metabolized, it is unlikely that the predator gull would ingest a fatal dose.

Assuming that approximately 12,000 Laughing Gulls would be subject to lethal toxicant application, leaving this many carcasses to decay on the marsh could affect water quality in the area. Also, the carcasses would attract many scavenging birds and many insects (possibly enough to affect shoreline communities or the airport). They could also discharge a large amount of nutrients to the marsh/bay system. As part of the toxicant application alternative, large numbers of gull carcasses would have to be disposed of. Disposal would be conducted as per FWS permit requirements (Depredation Permit or

Special Purpose Permit); either by incineration or burial. In the event of burial this would also require a solid waste permit.

- **Water Quality**

Tidal flows and rain can wash DRC-1339 off the bait and introduce it to the water column. Because the gulls fully metabolize DRC-1339, the decay of a dead bird will not release this toxic chemical to the sediments or tidal waters. However, as many as 12,000 gulls could be killed. The natural decay of carcasses would introduce decomposition products to the biogeochemical cycle of the marsh, and ultimately, to the water column. In addition, the elimination of this many birds from the area will decrease the contribution of fecal matter directly to bay waters and to the salt marsh surface. Hik and Jefferies (1990) show that waterfowl faeces play an important role in nutrient cycling in salt marshes. The loss of substantial quantities of gull faeces from the nutrient cycle on the marsh islands will affect nutrient concentrations and distribution in the bay.

Adverse impacts to water quality could be reduced by removal and controlled disposal of bird carcasses. If the reduction of faecal matter is found to be detrimental to the bay/marsh system, the lessening of its impact could be attained by limiting application of DRC-1339 to selected areas. The reduction in gull faecal matter will partially be compensated for by any replacement of gulls with other bird species. Baits, if left uneaten, would be removed to avoid impacts to water quality.

- **Impacts on Airport Operations and Safety**

The presence of baits may attract scavenging birds to the colony site, thereby increasing the strike hazard at the airport.

- **Coastal Zone Management**

Policy 30: Municipal, industrial and commercial discharge of pollutants, including, but not limited to, toxic and hazardous substances, into coastal waters will conform to state water quality standards.

To a very minor degree, toxicant application could result in some discharge of toxic substances into Jamaica Bay. However as discussed under the water quality impacts of this alternative in section 5.4.2.1, these impacts are anticipated to be minimal, if any.

Policy 31: State coastal area policies and management objectives of approved local waterfront revitalization programs will be considered while reviewing coastal water classification and while modifying water quality standards; however those water already overburdened with contaminants will be recognized as being a development constraint.

Major sources of pollutants to Jamaica Bay are the Water Pollution Control Facilities (WPCFs), Combined Sewer Overflows (CSOs), and leachate from three closed landfills that border Jamaica Bay. A discussion of the existing water quality conditions in Jamaica Bay is provided in Section 4.2.2. The existing water quality in Jamaica Bay is recognized as a constraint for toxicant application. However, as the potential of this alternative to contribute contaminants to Jamaica Bay is relatively low, this constraint

is considered moderate to low. A discussion of the potential water quality impacts of toxicant application is provided above.

■ **Regulatory Compliance**

Use of toxicants may require the following permits or approvals:

- Special License for Protected Wildlife - NYSDEC
- Fish and Wildlife Permit, Special Purpose - USFWS
- Coastal Zone Management Program - NYSDOS, NYCPC
- NPS Coordinated 516 DM Review
- NPS Special Use Permits
- Federal Consistency Requirements
- Section 7 FWS Consultation
- NPS IPM Review
- Federal Consistency Requirements

Because of the moderate potential environmental impacts associated with this alternative, inducement of abandonment of the Jamaica Bay marsh by Laughing Gulls by toxicant application to adult Laughing Gulls is advanced for consideration as a preferred alternative.

5.6.2.2 Shooting Adult Birds on the Colony Site

■ **Ecological Resources**

Laughing Gulls

Population modeling simulations detailed in Section 3.5.2.2 for on-colony shooting are essentially the same as those for toxicant application. Modeling results indicate that on-colony shooting could result in declines in the Jamaica Bay and New York Laughing Gull population, but that the population would quickly rebound once shooting was discontinued (Figures 3-13 - 3-15).

Shooting of Laughing Gulls on the colony could have a number of different effects on Laughing Gulls, depending on the birds' responses to shooting activity. If Laughing Gulls are removed through harassment and respond by towering, the local, state and regional populations would probably be unaffected, although the strike hazard would increase. If Laughing Gulls are not removed through harassment and do not tower, large numbers of Laughing Gulls may be taken with some effect on the local and New York State population, unless another New York colony site is subsequently exploited. Unless this action resulted in the annual take of more than 14,500 Laughing Gulls (see Section 5.6.1.1 - General Impacts of Lethal Alternatives), the Massachusetts/New York/New Jersey Laughing Gull population would most likely not be affected. Laughing Gulls would be the target of this action.

Other Gulls

Other gull species would not be affected to any great degree by the shooting of Laughing Gulls on JoCo, East High Meadow, and Silver Hole marshes, since they do not nest there, and use the site occasionally as a roost area. Scavenging gulls such as Herring and Great Black-backed may be attracted by the

carcasses of the shot Laughing Gulls, and may exploit them as a food source. This impact could be minimized, however, by the collection of Laughing Gull carcasses.

Other Wildlife

Other nesting bird species found on the Jamaica Bay marsh islands could be impacted by the disturbance and trampling caused by shooting. Nontarget individuals could possibly be impacted by shooting.

Small numbers of individuals of nontarget species may be killed accidentally, or could be disturbed by noise and trampling. This could include the state-threatened common tern, which nests on all three marshes. Even if they are not killed, the disturbance caused by shooting of gulls could jeopardize the breeding success of nontarget species (Thomas 1972). For example, nests might not receive proper incubation, eggs could be broken or lost during panic episodes, and eggs and chicks could be left vulnerable to avian predation.

Impacts on non-target species as a result of on-colony shooting would be mitigated by the shooting program which will be supervised and conducted by trained wildlife biologists. This will minimize the possibility of misidentification of target species and nontarget take.

Furthermore, prior to initiation of the shooting program, aerial surveys would be conducted to develop nest density maps and determine the prevalent location of Laughing Gull nests. This information would be combined with ground surveys and utilization of expertise of the NYSDEC and the NPS about existing habitats of non-target species. Areas where habitats of target and non-target species overlap would be excluded from implementation of the shooting program.

On-colony shooting would be conducted for a limited period only, during the start of the Laughing Gull breeding season, and would not affect other species during any other time of the year.

Disturbance of nesting of non-target species as a result of the shooting program would be less than of other alternatives. In contrast to these alternatives, which involve people or animals traversing the colony site, the shooting program would be conducted from blinds at fixed locations, and trampling would be kept to a minimum.

- **Water Quality**

Any lethal gull management technique would produce a large number of decaying carcasses and remove fecal matter from the nutrient cycle. As discussed above, the natural decay of carcasses introduces decomposition products to the biogeochemical cycle of the marsh, and ultimately, to the water column. In addition, the elimination of birds from the area will decrease the contribution of fecal matter directly to bay waters and to the salt marsh surface. Waterfowl feces play an important role in nutrient cycling in salt marshes and the loss of great quantities of gull feces from the nutrient interactions on the marsh islands would affect nutrient concentrations and distribution in the bay. Shooting would be conducted with 100% steel shot and no release of lead into Jamaica Bay would occur.

Mitigation measures to minimize adverse impacts would include the removal and controlled disposal of bird carcasses. Disposal would be conducted as per FWS permit requirements (Depredation Permit or Special Purpose Permit); either by incineration or burial. In the event of burial this would also require a solid waste permit. If the reduction of fecal matter is found to be detrimental to the bay/marsh system,

the lessening of its impact could be attained by limited shooting. The reduction in gull fecal matter will partially be compensated for by any replacement of gulls with other bird species.

■ **Regulatory Compliance**

Shooting on the marsh may require the following permits or approvals:

- Special License for Protected Wildlife - NYSDEC
- Fish and Wildlife Permit, Special Purpose - USFWS
- Coastal Zone Management Program - NYSDOS, NYCPC
- NPS Coordinated 516 DM review
- NPS Special Use Permits
- Federal Consistency Requirements
- Section 7 FWS Consultation
- Federal Consistency Requirements

Because of the moderate potential environmental impacts associated with this alternative, inducement of abandonment of the Jamaica Bay marsh by Laughing Gulls by shooting adult Laughing Gulls on the marsh is advanced for consideration as a preferred alternative.

5.7 Intensive On-Airport Shooting

■ **Ecological Resources**

Laughing Gulls

Conduct of the on-airport shooting program could reduce the local and state laughing gull population to zero only if immigration did not occur, and more than 14,500 Laughing Gulls are shot each year. If between 4,000 and 13,000 Laughing Gulls are shot each year, and if the immigration rate is 40%, the Jamaica Bay Laughing Gull population would fluctuate around 35,000 birds.

As the Jamaica Bay Laughing Gull colony is currently the only known colony in New York State, destroying it could result in the loss of this breeding species from Jamaica Bay and New York State, unless laughing gulls relocate and form a viable colony elsewhere in New York.

Shooting of 14,191 adult Laughing Gulls at JFKIA in 1991, and 11,847 in 1992 eliminated about 5 to 6 percent of the Maine-Virginia breeding population and about 2-3 percent of the United States breeding population in each of those years (Belant and Dolbeer 1993). Because of the large size of the overall Laughing Gull population (more than 100,000 breeding pairs in the region and nearly 260,000 pairs in the U.S.), the loss from killing all colony members (which totaled 7629 pairs in 1990), or even the higher numbers taken in 1991 and 1992, are unlikely to have a substantial adverse impact on the ability of the Laughing Gull to maintain its national population. Results of population modeling (Section 3.6.12, Figure 5-2) suggest that the current Massachusetts/New York/New Jersey population could sustain a maximum annual loss of approximately 14,500 birds to shooting (or other lethal method) every year. Continued mortality of more than approximately 14,500 Laughing Gulls every year for a period of 50 years could ultimately result in elimination of the Massachusetts/New York/New Jersey Laughing Gull population. This simulation result is conservatively based on the assumption of a worst-case scenario in

which all Laughing Gulls in the northeastern U.S. region are part of or dependent on the presence of the Jamaica Bay Laughing Gull nesting colony, which may not be the case.

Laughing Gulls not permitted to nest in JBWR could result in increased numbers nesting in Massachusetts and Maine colonies. It is important to note that the northern colonies in Massachusetts and Maine were established prior to the establishment of the Jamaica Bay Laughing Gull colony. The presence of a large and expanding Laughing Gull population in New Jersey will continue to have significant impacts on any management programs in Jamaica Bay relative to Laughing Gulls. Band recovery data collected in 1991-93 indicate that Laughing Gulls are immigrating into Jamaica Bay from New Jersey and further south, and will present a constant source of growth for the New York colony.

Other Gull Species

The impact of the intensive shooting program on gulls other than Laughing Gulls would be minimal. During 1991, a total of 508 Herring Gulls, 128 Great Black-backed Gulls, and 59 Ring-billed Gulls were shot; in 1992, the numbers of these species shot were 1,338, 150, and 131, respectively; in 1993, the numbers were 554, 121, and 169. Belant (1992) notes that the northeastern U.S. and Atlantic Province regional populations of these other three gull species are stable or increasing, and expanding in distribution. The number of each of these species shot each year represents less than 1 percent of their regional populations. Similarly, the New York State populations of these three species are not affected by the removal of this many birds each year. The numbers taken each year represent, at most, 3 percent of the Long Island nesting Herring Gull population, and 11 percent of the Long Island nesting Great Black-backed Gull population. The Ring-billed Gulls taken represent less than 1 percent of the New York State nesting population. These percentages represent conservative estimates of impacts, since they are based on nesting populations only. As there are undetermined numbers of hatching year, subadult, and nonbreeding adult birds also present in these species' populations that were unsurveyed, actual impacts are likely to be less than those conservatively estimated.

Other Wildlife

On-airport shooting in 1991-93 did not impact nontarget bird populations. There is the potential for a low level of nontarget take, but this is minimized by conducting the on-airport shooting program according to a protocol that includes the following measures: 1) do not shoot over mud flats exposed at low tides, 2) shoot only gulls, and 3) shoot only when the gull is within range. These measure minimize the possibility that nontarget birds will be disturbed by noise, or be taken as nontarget losses.

- **Socioeconomic**

The conduct of the intensive on-airport shooting program could adversely affect people's enjoyment of the Jamaica Bay environment. Direct observation of the shooting program or interaction with dead or injured gulls could reduce the quality of their experience in visiting Jamaica Bay. Additionally, the death of gulls would adversely impact animal rights values, and other related beliefs. The conduct of the on-airport shooting program would benefit others' social values placed on safe air travel and human safety.

- **Coastal Zone Management**

Policy 39: The transport, storage, treatment and disposal of solid wastes, particularly hazardous wastes, within coastal areas will be conducted in such a manner so as

to protect groundwater and surface water supplies, significant fish and wildlife habitats, recreational areas, important agricultural lands, and scenic resources.

The transport, storage and disposal of gull carcasses will be conducted in a manner which will minimize the effects on groundwater and surface water supplies, significant fish and wildlife habitats, recreational areas, important agricultural lands, and scenic resources.

- **Regulatory Compliance**

Intensive shooting would require the following permits or approvals:

- Fish and Wildlife Permit, Special Purpose - USFWS
- Depredation Permit - NYSDEC
- Coastal Zone Management Program - NYSDOS, NYCPC
- Solid Waste Management Facility - NYSDEC

Because of the relatively low potential environmental impacts associated with this alternative, direct reduction of the gull hazard by elimination of only those gulls in JFKIA airspace through shooting is advanced for consideration as a preferred alternative.

5.8 Integrated Management Program (IMP)

5.8.1 Components of the IMP

The IMP seeks to find the best achievable balance between the highest level of effectiveness in reducing the birdstrike hazard on both the short and long term with the lowest relative level of environmental impacts. A general determination was made in Section 3 of this report (Evaluation of Feasibility and Effectiveness of Alternatives) of the elements that could be included in the IMP, given their technical implementation feasibility and anticipated effectiveness.

Based upon the assessment of environmental impacts of different measures, the following specific components are proposed as part of the Proposed IMP:

1. Continued Development of JFK's On-Airport Program
2. Reduction of Off-Airport Bird Attractants
3. On-Airport Shooting of Gulls
4. Laughing Gull Nest and Egg Destruction
5. Shooting Adult Laughing Gulls on the Jamaica Bay Colony
6. Harassment of Laughing Gull by Placement of Gull Models

These six components could be accomplished independently of each other. Each one of them would require a different set of permits, authorizations, licenses, reviews, and landowner permission. The U.S. Department of the Interior (U.S. FWS and NPS) has significant regulatory and decision-making authority for IMP components that would occur on the Gateway National Recreation Area. The FWS, additionally, has regulatory authority over permits required to shoot birds on the airport.

Pursuant to stated USDI policy regarding the gull hazard reduction program for JFKIA, the components of the IMP are divided into two Categories:

Category 1

1. Continued Development of JFK's On-Airport Program
2. Reduction of Off-Airport Bird Attractants
3. On-Airport Shooting of Gulls

Category 2

4. Laughing Gull Nest and Egg Destruction.
5. Shooting Adult Laughing Gulls on the Jamaica Bay Colony.
6. Harassment of Laughing Gull by Placement of Gull Models.

As per USDI policy, Category 1 components would first have to be employed and proven ineffective before Category 2 components would be pursued. If the potential risk to the flying public has been shown not to be reduced to acceptable levels, as determined through annual reviews of the Bird Hazard Task Force and other appropriate agencies, the NPS would initiate implementation of Category 2 components within the Jamaica Bay Laughing Gull nesting colony. If initiation of Category 2 components is justified, the NPS would define appropriate actions, analyze impacts and environments, and document its decision within the context of its legal authorities and management policies. Within this process, a number of permits and authorizations would be required from a variety of local, state and federal agencies.

All components of the integrated management program would be monitored and evaluated at least annually by the Bird Hazard Task Force.

5.8.2 Environmental Impacts of the IMP

The environmental impacts of the six proposed IMP components are enumerated here and in greater detail in the components' proceeding discussion. In general, these components are already those which are expected to have the least environmental impacts among all alternatives considered. Furthermore, the effectiveness of one component could reduce the extent to which another needs to be implemented. Therefore, the environmental impacts of the IMP could be lower than the sum of the environmental impacts of its constituting elements.

5.8.2.1 Impacts of All Six Components

The impacts from all six proposed IMP components are listed here.

- **Ecological Resources**

Cumulative Impacts

Figure 3-19 and section 3.6.2 enumerate the impact of on- and off-airport shooting and nest and egg destruction on the Jamaica Bay laughing gull population, and indicate that these activities would result in a rapid decline in the population to about one-third of its original level within 5 years.

All elements which seek to eliminate the presence of the Laughing Gull colony in Jamaica Bay by lethal means could result in the loss of the species from the New York State's breeding avifauna, if remaining colony members do not relocate and form another viable colony within the state. Lethal elements of the IMP include egg/nest destruction, on-colony shooting and on-airport shooting of adults.

Section 7 presents a program to mitigate impacts to the New York State Laughing Gull population. This mitigation program seeks to induce Laughing Gulls to nest at another New York State site that is sufficiently far from JFKIA to preclude impacts on aviation safety.

Simulation of the colony's population characteristics and the effect of population reduction measures thereon by means of a computer model indicated that a population reduction of up to approximately 14,500 adults could be sustained by the regional gull population. Although this would reduce the regional population by approximately 14 percent, it would not eliminate this population even if 14,500 gulls were eliminated annually on an indefinite basis. Substantial impacts on the regional population of lethal colony management measures are therefore not anticipated on the basis of modeling analysis.

However, if the Jamaica Bay Laughing Gull colony were determined to be an important source of immigrants to colonies further north, its elimination could result in either one of two scenarios: 1) Laughing Gulls that would have nested in Jamaica Bay continue migrating northward to nest in Massachusetts and other New England states, or 2) Laughing Gulls that would have nested in Jamaica Bay do not nest at all and either remain near Jamaica Bay or move north/southward. Local, state, regional, or national populations of Herring, Ring-billed, and Great Black-backed gulls are not likely to be affected by conduct of IMP activities.

Induced Impacts

Common terns, a New York State-threatened species, could benefit by the removal of Laughing Gulls from the Jamaica Bay Laughing Gull population, through removal of competition and harassment. Safety hazards as a result of increase in these species' population would be less as common terns have been much less likely to overfly the airport and are less hazardous to aircraft.

Egg/Nest Destruction

The advantage of physical destruction of nests and eggs over other lethal measures, such as toxicant application, is that it is species-specific as only Laughing Gull nests would be affected. No direct impacts on non-target species would occur. Impacts on non-target nesting species would consist of disturbance of nests, with possible adverse effects on reproductive success. Nests of secretive species such as salt-marsh sparrows may be trampled inadvertently.

Negative impacts associated with egg/nest reduction measures include the negative effects on the vegetation by trampling and the possible degradation of the physical stability of the marsh.

Shooting On-Colony

A small number of non-target species may be killed inadvertently, including the state threatened common tern. Shooting could also disturb nesting, and result in breeding failure of nontarget species (Thomas 1972). Carcasses of killed adults would have to be disposed of. Removal and disposal of bird carcasses would be conducted off-site in accordance with federal and state regulations.

Intensive On-Airport Shooting

Similar to shooting on-colony, a very small number of non-target species may be killed inadvertently by on-airport shooting. The possibility that this would happen is less likely for the on-airport shooting program compared to on-colony shooting, because the presence of birds at the airport is less than at the colony, which is a nesting habitat for a variety of bird species.

Expansion of Existing On-Airport Program

Intensified insect control measures would introduce more chemicals into the environment that could affect non-target species. Application of such chemicals would be conducted in accordance with all applicable regulations to minimize any impacts on non-target species.

Reduction of Off-Airport Attractants

Measures to reduce off-airport attractants would consist of elimination of bird-feeding, exclusion of birds from freshwater ponds with wires, and long-grass management in the 40-acre infield of Aqueduct Racetrack. These measures would have very few environmental impacts.

None of the components of the IMP would have significant impacts on the local, state or regional populations of Ring-billed, Herring, or Great Black-backed gulls.

- **Water Quality**

All Lethal Colony Management Measures

Water quality impacts are associated with all lethal colony management measures that seek to eliminate the Laughing Gull colony. Substantial reduction or elimination of the Laughing Gull population would result in reduced discharge of nutrient-rich feces to the bay waters and salt marsh surface. This could affect nutrient concentrations and distribution in Jamaica Bay. However, the deficit in nutrient concentration could be compensated by the discharge of replacement species into the marsh environment.

Egg/Nest Destruction

The destruction of eggs would result in the decomposition of eggs and the discharge of decomposition products to the marsh and bay environment.

Shooting On-Colony

This measure would result in the initial presence of decaying carcasses. The natural decay of carcasses introduces decomposition products to the biogeochemical cycle of the marsh and ultimately to the water column.

Intensive On-Airport Shooting

As dead carcasses would be removed from the airport on a regular basis, decomposition would not occur and no substantial impacts to the water quality of Jamaica Bay are anticipated.

Expand Existing On-Airport Program

Water management at the airport would involve the use of methyl anthranilate to repel birds. Since this substance is approved by the Food and Drug Administration (FDA) as human safe food flavoring, it would not have adverse impacts on the water quality. Measures to repave and level hard surfaces to avoid standing water could result in increased discharge of pollutant loadings into the bay. However, given limited occurrence of standing water as is and the presence and future expansion of the airport's storm water drainage system, any impacts are anticipated to be minimal. The increased use of insecticides in order to intensify insect control measures could reduce water quality to some degree. Water quality may improve as a result of sanitation management that reduces the possibility of gulls redistributing refuse and entering decomposed refuse into the storm water discharge system and ultimately into the bay.

- **Parks and Recreation**

Reduced use of the colony site for recreational purposes, when the on-colony management alternatives are in effect. Additionally, the presence of synthetic models resembling dead gulls, demolished nests and eggs or observation of the on-airport shooting program could detract from the aesthetic experience of the marsh for recreational purposes.

- **Ambient Air Quality**

Minor impacts are associated with shooting measures, either on-airport or off-airport for deterrence or lethal purposes. However, against background air quality conditions these impacts are not substantial to warrant extensive analysis.

- **Noise**

Minor impacts to noise conditions may result from shooting on the airport or in Jamaica Bay. In the absence of sensitive receptors, such as residential areas, schools, etc., such impacts would be limited to the recreational users of Jamaica Bay.

- **Airport Operations and Safety**

Egg/Nest Destruction

Panic flights by birds alarmed by colony disturbance could temporarily increase the birdstrike hazard .

The presence of broken eggs and dead chicks could attract scavenger birds, which would increase the birdstrike hazard.

Shooting On-Colony

Shooting on-colony from blinds could result in some degree of towering and thus in a temporary increase in birdstrike hazard. However, as the shooters would not be visible, the level of disturbance would not be as substantial as that resulting from alternatives that require people or animals to roam around the colony. Similar to egg/nest destruction, the presence of dead gulls on the colony could attract scavenger birds which would increase the birdstrike hazard.

- **Coastal Zone Management**

All policies relevant to the constituting components of the IMP apply.

Policy 39: The transport, storage, treatment and disposal of solid wastes, particularly hazardous wastes, within coastal areas will be conducted in such a manner so as to protect groundwater and surface water supplies, significant fish and wildlife habitats, recreational areas, important agricultural lands, and scenic resources.

The storage of insecticides and application of insecticides; the storage, transport and disposal of refuse; and the transport, storage and disposal of gull carcasses would be conducted in a manner which will minimize the effects on groundwater and surface water supplies, significant fish and wildlife habitats, recreational areas, important agricultural lands, and scenic resources.

- **Other Impacts**

No substantial other impacts cumulative or indirect, or inconsistencies with applicable policies, such as Coastal Zone Management Regulations, are anticipated as a result of the Integrated Management Program. The New York State Office of Parks, Recreation, and Historic Preservation determined that the gull management activities in the IMP would have no impact on those characteristics of the property which would qualify it for inclusion in the State and National Registers of Historic Places (Appendix E.5).

5.8.2.2 Category 1 IMP Impacts

A thorough analysis of the three Category 1 components' environmental impacts are listed in previous sections of this chapter under each individual component section. A summary of the Category 1 IMP components' (on-airport shooting, expansion of on-airport bird control program, and reduction of off-airport attractants) impacts are listed here:

Population modeling indicates that the Jamaica Bay Laughing Gull population would probably fluctuate around 35,000 birds if on-airport shooting were conducted each year. Simulation of the colony's population characteristics and the effect of population reduction measures thereon by means of a computer model indicated that a population reduction of up to approximately 14,500 adults could be sustained by the regional gull population. Although this would reduce the regional population by approximately 14 percent, it would not eliminate this population. Substantial impacts on the regional population of lethal colony management measures are therefore not anticipated on the basis of modeling analysis.

Other gull species' local, state, regional and national populations would not be adversely affected by conduct of Category 1 actions.

- **Expansion of Existing On-Airport Program**

Intensified insect control measures would introduce more chemicals into the environment that could affect non-target species. Application of such chemicals would be conducted in accordance with all applicable regulations to minimize any impacts on non-target species.

- **Reduction of Off-Airport Attractants**

Measures to reduce off-airport attractants would consist of elimination of bird-feeding, exclusion of birds from freshwater ponds with wires, and long-grass management in the 40-acre infield of Aqueduct Racetrack. Any of these measures would have very little environmental impacts.

- **Intensive On-Airport Shooting**

Similar to shooting on-colony, a very small number of non-target species may be killed inadvertently by on-airport shooting. The possibility that this would happen is less likely for the on-airport shooting program compared to on-colony shooting, because the presence of birds at the airport is less than at the colony, which is a nesting habitat for several bird species.

None of the components of the IMP would have significant impacts on the local, state or regional populations of Ring-billed, Herring, or Great Black-backed gulls.

- **Socioeconomic**

The conduct of the intensive on-airport shooting program could adversely affect people's enjoyment of the Jamaica Bay environment. Direct observation of the shooting program or interaction with dead or injured gulls could reduce the quality of their experience in visiting Jamaica Bay. Additionally, the death of gulls would adversely impact animal rights values, and other related beliefs. The conduct of the on-airport shooting program would benefit others' social values placed on safe air travel and human safety.

- **Regulatory Compliance**

Regulatory compliance requirements for conduct of Category 1 of the IMP are the sum of the requirements listed for each individual component. They include acquisition of State and Federal Fish and Wildlife Permits, Solid Waste Management review, Coastal Zone Management Program review, and others.