EXECUTIVE SUMMARY

BIOLOGICAL MONITORING PLAN

During planning of the Asbury Park to Manasquan Inlet Beach Erosion Control Project, an extensive monitoring program was developed to assess potential impacts of sand dredging and placement operations on biological resources. The Biological Monitoring Program (BMP), sponsored by the U.S. Army Corps of Engineers New York District, responds to specific concerns raised during coordination of the nourishment project with state and federal resource agencies. This report summarizes the findings of the BMP. These findings are intended both to assess impacts associated with the immediate dredging and filling operations, and to evaluate the potential for impacts from subsequent renourishment operations and similar projects in the New York-New Jersey region.

INTERTIDAL AND NEARSHORE BENTHOS

The intertidal benthic assemblage was numerically dominated by rhynchocoels, the polychaetes *Scolelepis squamata, Protodriloides* (LPIL), and *Microphthalmus* spp., oligochaetes, the mole crab *Emerita talpoida*, and a number of haustoriid amphipods. Intertidal abundance was highest in the summer and lowest in mid-winter. The fauna is similar to that of other mid-Atlantic coast sandy beach benthic assemblages.

The nearshore assemblage included many of the same taxa, but was dominated by the wedge clam, *Donax variabilis*, the polychaetes *Magelona papillicornis* and *Asabellides oculata*, the bivalves *Spisula solidissima* and *Tellina agilis*, and the amphipods *Acanthohaustorius millsi* and *Psammonyx nobilis*.

Sediment texture varied between depths, seasons, and years. Sediment grain size became finer with depth with the nearshore sediments being the finest. Seasonally, fine sands dominated fall samples, whereas medium sands dominated spring samples. This pattern reflects the annual cycle of erosion and deposition associated with high-energy sandy beaches.

Beach nourishment resulted in short-term declines in abundance, biomass, and taxa richness. Recovery of intertidal assemblages was complete within 2-6.5 months of the conclusion of filling. Differences in the rate of recovery were most likely due to differences in when nourishment was complete. Recovery was the quickest when filling was completed before the low point in the seasonal cycle of infaunal abundance. Recovery rates are similar to those reported from other studies, particularly where the grain size of the fill material matched that of the beaches to be nourished.

ICHTHYOPLANKTON

Nearshore and surf zone larval fish collections were dominated by a diverse assemblage of fishes representing 33 families. Of these the sciaenids, gadids, engraulids, scombrids and bothids were the most speciose.

Larvae were more abundant in nearshore than surf zone samples and there was no obvious correspondence between larval abundance in nearshore versus surf zone samples.

There were no consistent spatial patterns in larval abundance across years over the 15 km of the study area between Long Branch and Manasquan Inlet.

There were no obvious differences between reference and nourished beaches based on an analysis of a number of parameters (surf zone ichthyoplankton abundance, size and species composition).

POTENTIAL FISH FOOD ITEMS PRESENT IN ICHTHYOPLANKTON SAMPLES AND ON ROCK GROINS

All of the common food items in surf zone fish diets are present in the surf zone plankton.

The most common forms encountered were copepods, megalopal stage crab larvae, and gammarid amphipods although larger organisms such as *Scolelepis squamata* and *Emerita talpoida* were routinely collected.

Sources of food items included both permanent and temporary members of the plankton, taxa dislodged from the bottom sediments, taxa washed off the rock groins, and a few originating on land and deposited by the winds (e.g., flying ants).

SURF ZONE FINFISH

The surf zone finfish community was numerically dominated by silversides, *Menidia* and *Membras* spp. The assemblage was relatively homogeneous in species composition and abundance. Abundance and species diversity were highest at substations closest to the groins.

During nourishment (1997), the surf zone finfish community changed markedly from the baseline years, shifting from an assemblage dominated by silversides to one in which bluefish (*Pomatomus saltatrix*) was the most abundant species. These differences, however, appear either unrelated to the nourishment project or to be short-term responses. For instance, patterns in species numerical dominance appear to reflect natural variation and are observed throughout the study area.

Potential nourishment-related effects include low bluefish abundances in the immediate vicinity of a station being nourished in late September 1997 and the potential attraction of benthic feeders to the

nourishment area. Such responses may be related to resuspended benthic material (e.g., response by silversides in late October 1997) or the general nourished condition (e.g., response by kingfish).

Analysis of the post-nourishment monitoring did not reveal any long-term impacts to surf zone finfish distribution and abundance patterns.

There was no sustained biological indicator, i.e., fish abundance or distribution pattern, that distinguishes nourished from non-nourished beach habitat.

The loss of groin habitat from burial during the fill operation did not affect either the relative abundance of individuals or diversity of species. The number of species captured following beach nourishment in the South Area was roughly equivalent to that of the Reference Area. Following nourishment, however, there was no longer a substantial difference between the number of species caught at the substations nearest the groins and at the mid-groin location. Higher catches near the groins may have reflected a sampling artifact imposed by the presence of the structure, blocked escape routes, or the sequence of substation sampling.

SURF ZONE FISH FOOD HABITS

There were no indications of negative impacts related to beach nourishment for either kingfish or silversides based on the analyses of "prey availability" parameters. The percentage of fish with filled stomachs did not differ for predator species, indicating that foraging success was comparable at the Reference and Beach Nourishment stations.

The relative composition of prey items in rough silversides, Atlantic silversides and northern kingfish did not differ between Reference and Beach nourishment areas within the two year period following completion of the beach nourishment project.

If differences in prey availability were caused by the beach nourishment project, they were short-lived, because no differences in prey biomass/filled stomach were distinguishable for the target predator species in 1998 and 1999.

Kingfish did not exhibit any dietary changes that could be associated with the beach nourishment project, even though their distributions suggested they were attracted to the active beach fill location during some sampling periods.

TURBIDITY AND SUSPENDED SEDIMENT CHARACTERIZATIONS

Effects of beach fill operations on short-term turbidity conditions appear to be limited to a relatively narrow swath of beach front with a lateral extent on the order of several hundred meters. Dispersal of suspended sediments is prominent in the swash zone in the immediate vicinity of the operation, and can be traced into nearshore bottom waters.

Although these surveys did not extend beyond a depth of 3–5 m, observed concentrations appeared to decay rapidly with dispersal through the surf zone. This may reflect simple mixing and dilution of fine sediments derived from the discharges. Another mitigating factor may be the relatively low fractions of silts and clays of the sediments excavated from the borrow areas, generally less than 10 percent by weight.

With the exception of swash zone samples, the magnitude of elevation above ambient conditions appears to be negligible. Measured Total Suspended Solids (TSS) concentrations outside the swash zone seldom exceeded 25 mg/l. This is comparable to concentrations that many of the dominant fish and invertebrate species of the northern New Jersey shore experience in estuaries or during storm-induced resuspension events along the coast.

Wide area surveys show a potential area of elevated turbidities at least one km wide. Another perspective on these data, however, can be observed in the highly variable and scattered occurrences of elevated turbidities at wide area survey stations distant from the filling operations. The maximum NTU values measured near the fill operations do not appear to be outside the range that organisms would be exposed to during periods of high wave energies.

OFFSHORE BORROW AREA BENTHOS

Offshore borrow and reference area infaunal assemblages were characterized by a single community numerically dominated by the archiannelid polychaete *Protodrilus* (LPIL), the amphipod *Pseudunciola obliquua*, and the tanaid *Tanaissus psammophilus*. This assemblage is similar to those described for medium sand habitats in the New York Bight.

Biomass was overwhelmingly dominated by the sand dollar *Echinarachnius parma*. When this species was not present, biomass was dominated either by three bivalve molluscs including the surf clam *Spisula solidissima*, the razor clam *Ensis directus*, and the tellinid *Tellina agilis*, or by a suite of polychaetes including *Magelona papillicornis*, paraonids, cirratulids, and nepthyids.

Dredging of the borrow areas had obvious impacts on the infaunal assemblage including decreases in abundance, biomass, taxa richness and the average size of the biomass dominant, the sand dollar *E. parma*. There were also changes in both species and biomass composition.

Abundance, biomass, and taxa richness recovered quickly after the first dredging operation with no detectable difference between dredged and undisturbed areas by the following spring. Abundance also recovered quickly after the 1999 dredging operation (BBA5), although both biomass and taxa richness were still reduced in May 2000.

Species and biomass composition were altered in similar manners by each operation. Immediately after dredging the relative contribution of echinoderm biomass declined and the abundance of the spionid

polychaete *Spiophanes bombyx* increased.

Changes in biomass composition were longer lasting with the assemblage taking 1.5 to 2.5 years to return to undredged conditions.

OFFSHORE BORROW AREA FINFISH

Taxonomic composition of the finfish assemblage present at the offshore borrow areas was similar in most regards to that described by Grosslein and Azarovitz (1982) for inshore areas between Delaware Bay and Martha's Vineyard.

Dominant taxa in spring collections included winter flounder and herring. Late summer or fall collections were dominated by butterfish, summer flounder, and jacks. Windowpane flounder, skate, smooth dogfish, and searobins were present in abundance throughout the year.

There was no substantive difference in species composition or catch-per-unit-effort among areas within any given collection period. Likewise, no dramatic change in assemblage structure or catch after dredging at any of the sites in 1997 or 1999 was observed.

OFFSHORE BORROW FISH FOOD HABITS

Results of the baseline study of offshore fish food habits established that winter flounder (*Pleuronectes americanus*), summer flounder (*Paralichthys dentatus*), and scup (*Stenotomus chrysops*) were the most common fishes occurring at the borrow areas for which potential food habits and project related effects could be assessed.

Analyses revealed that small winter flounder fed primarily upon polychaetes (primarily large lumbrinerids), anthozoans (mainly cerianthid anemones, cf. *Ceriantheopsis americanus*), and bivalve siphons. Bivalve siphons were especially common in larger winter flounder.

Summer flounder captured at the borrow areas fed on amphipods, squid, fishes, and several large crustaceans, such as stomatopods and brachyuran crabs.

The diet of scup was similar to that of winter flounder, consisting primarily of polychaetes, anthozoans, amphipods, isopods, and crangonid shrimp parts.

Analyses of stomach contents for both winter and summer flounder indicated no substantive change in the diet of either species. Analysis of trophic support for winter flounder indicated that this species continued to feed primarily on anemones, which were not common (as indicated in the benthic data) at any of the borrow areas.

RECREATIONAL FISHING SURVEYS

Recreational fishing data were collected by direct interviews and observations during morning, afternoon, and evening survey periods from May through October between 1995 and 1998. Groin, inlet jetty, and beach area usage, along with the study region, were recorded on questionnaires by interviewers. Anglers were interviewed to obtain the following information: fishing location, fishing duration, target species, creel success, fishing frequency, distance traveled to site, and money spent on the day's trip. Anglers were also asked to compare fishing success to prior years. Observations of area usage during other BMP surveys (intertidal ichthyoplankton and juvenile finfish) were also recorded. The collected raw data (interview sheets) were archived in Excel® spreadsheets and later analyzed.

A total number of 5,216 interviews of anglers utilizing groins, inlet jetties, and beach areas within the nine-mile survey area were recorded during the combined sampling efforts (3,737 interviews pre-construction, 1,092 during construction, 387 after construction).

Anglers fished primarily from the Shark River Inlet North and South Jetties and the Manasquan Inlet North Jetty. They consistently utilized the river inlet jetties because of ease of access. Although groins provide similar habitats, individual groins were used less often than inlet jetties due to slippery footing and general lack of accessibility. Beaches were the least utilized fishing areas.

Striped bass, flounder, and bluefish were the species most targeted by anglers during the sampling periods. A large proportion of anglers (19%) were fishing for "anything that bites." Fall survey efforts performed only during 1996 revealed that striped bass was extensively targeted during October and November (40%).

Interviews revealed that flounder, bluefish, black seabass, kingfish, cunner, and striped bass were the primary catch of anglers during the sampling periods. The majority of anglers had been fishing for 1-4 hrs (60.5%) when interviewed, and were anticipating an additional 1-4 hrs (64.1%) of fishing effort. Most anglers interviewed fished more than 5 times per year (69.1%) in the study area, traveled less than 50 miles to the site (39.2%), and spent less than $10 (68.7%) for a day's fishing effort. A relatively small percentage of anglers (17.0%) believed that fishing was worse after construction surveys when compared to during construction (24.3%) surveys.