FEASIBILITY REPORT

for

New York and New Jersey Harbor Navigation Study

VOLUME I

Main Report

Final Environmental Impact Statement (FEIS)

Appendix - A

Pertinent Correspondence & Public Involvement

December 1999

US Army Corps of Engineers®
New York District

Book 2 of 2

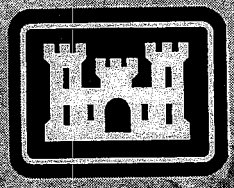
FEASIBILITY REPORT

for

New York and New Jersey Harbor Navigation Study

FEIS Appendices

December 1999



US Army Corps
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New York District

FEIS APPENDIX A

CORRESPONDENCE AND PROJECT COMMENTS

FEIS APPENDIX A-1.1

COOPERATING AGENCIES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

APR 07 1999

Roselle Henn, Chief
Environmental Assessment Section
Department of the Army
New York District, Corps of Engineers
Jacob K. Javitz Federal Building
New York, New York 10278-0900

Dear Ms. Henn:

The Environmental Protection Agency (EPA), as a cooperating agency in the preparation of the environmental impact statement (EIS) for the NY/NJ Harbor Navigation Study (Study), has reviewed the draft Without-Project Conditions Report (W/OPCs Report). The W/OPCs Report was prepared for eventual inclusion in the EIS for the proposed project. Based on our review, we offer the following comments.

EPA is concerned with assumptions made in the W/OPCs Report regarding the nature and extent of future port facility development projected to occur regardless of whether the Port's channels are deepened to 50 feet. The expansions envisioned in the Report are, at this point, only proposed. The proposed port expansions will themselves result in significant environmental impacts. Of particular concern is the significant amount of fill (500-800acres) that is required in the Harbor to realize port facility expansions envisioned in the W/OPCs Report. In light of the highly controversial nature of such fill activities, and the fact that these actions have not gone through the required regulatory processes, we believe it is inappropriate to use these projections as a baseline.

According to the definition of scope as found in 40 CFR 1508.25 (a)(1), actions are connected if they: "(ii) Cannot or will not proceed unless other actions are taken previously or simultaneously." Based on discussions at recent project meetings, it has become apparent that the Corps will not proceed with deepening channels to 50 feet until such time as infrastructure and port facility improvements warrant it. Further, the channels proposed for deepening will have a direct and immediate impact on the nature, timing, and degree of future port facility expansions. As indicated in both the January 7, 1999 Infrastructure Workgroup (IWG) Meeting and the January 29, 1999 NY/NJ Port Authority (PA) Master Plan Briefing hosted by the PA, port developers will likely invest in infrastructure changes differently depending on whether a 50 foot channel to their facility would occur sometime in the future or not. Both the presentation by the IWG and the PA showed that port facilities would be expanded in a different sequence under 45 foot and 50 foot depths. This information indicates channel depth will play a role in determining when and which port facilities are expanded. Consequently, 50 foot channel deepening and port facility expansions are clearly connected; the port facility expansions must be evaluated within the scope of this EIS.

FILE No.101 08/25 '99 09:35 ID:Planning Division FAX:12122646040 PAGE 2

EPA believes the scope of the comprehensive EIS should include water access (through channel deepening), cargo handling (through port facility expansion), Port Information Network Systems (PINS), cargo inland transportation (through the Port Inland Distribution Network [PIDN]), and increases in overall port efficiency. As a consequence of the expanded scope for this project, we believe that additional elements should be included in the comprehensive EIS as follows:

- The comprehensive EIS should evaluate a no-action alternative that does not include port facility or infrastructure expansions as these expansions would now be part of the project scope. In a related matter, at several project meetings, the Corps and it's contractors have mentioned that if port development does not occur (no action), regional goods will need to be supplied via inland transportation. Accordingly, a detailed analysis of the environmental impacts (e.g., air quality) should be considered with this alternative. Particular attention should be given to the fact that the distribution network would, to a large extent, originate outside the local NY/NJ Harbor Complex and, therefore, cause a different set of potential impacts from the port development alternatives.

- Each alternative analyzed in the comprehensive EIS should consider the full range of the National Environmental Policy Act requirements as criteria for determining the preferred alternative for each option including potential social, cultural, and ecological impacts, as well as economic impacts. In this regard, the comprehensive analysis should consider:

  - Possible alternatives for avoiding and minimizing fill under Section 404 of the Clean Water Act. This needs to be fully discussed for each proposed fill location, such as (but not limited to) the purchase of surrounding upland areas, the removal of uplands, or the relocation of upland structures to accommodate port expansion.

  - Both regional and local air impacts pursuant to the Clean Air Act. This needs to be fully evaluated including appropriate modeling for carbon monoxide, nitrogen oxides, volatile organic compounds, and particulates.

  - Environmental Justice concerns for minority and low income populations pursuant to Executive Order 12898. This needs to be considered for locations that would be impacted by port and infrastructure development.

In addition to the general comments we have outlined above, we have provided an enclosure which outlines our specific comments and concerns with the W/OPCs Report.

EPA is aware of the time constraints associated with the release of the draft EIS and Feasibility Study later this year. As a result, we would like to offer our assistance as a cooperating agency in helping you understand our concerns, in generating additional ideas to meet specific time critical needs you may have, and by continuing to review reports prior to their public release. As always, we look forward to working with you throughout this project.

Thank you for the opportunity to comment. Should you have any questions concerning this letter, please contact me or Grace Musumeci at (212) 637-3504 and (212) 637-3738 respectively.

Sincerely yours,

Robert W. Hargrove, Chief
Strategic Planning and Multi-Media Programs Branch

Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

RCUD 5/29/97 MMB

MAY 23 1997

cooperating agency

Stuart Piken, Chief
Planning Division
U.S. Army Corps of Engineers
CENAN-PL-EA
26 Federal Plaza
New York, New York 10278-0090

Attn: Mark H. Burlas

Dear Mr. Piken:

The Environmental Protection Agency has reviewed the November 1996 Fact Sheet and January 6, 1997 letter concerning the proposed comprehensive study of the Port of New York-New Jersey. Both documents discuss the deepening of existing channels to depths of 50 feet or greater, to provide economically efficient and environmentally sound navigation to meet current and future requirements.

The proposed study is authorized by Section 435 of the Water Resources Development Act (WRDA) of 1996. The study area is the Port of New York-New Jersey, including: the Ambrose and Anchorage Channels; the New York and New Jersey Channels; the Kill Van Kull and the Arthur Kill Channels; Newark Bay Channel; Hudson River Channel; the Bay Ridge and Red Hook Channels; Port Jersey Channel, Claremont Channel, and Buttermilk Channel. Channels within the Harbor range in depths from 30 to 40 feet. Several shipping lines are constructing vessels with drafts exceeding 45 feet and have expressed a strong interest in entering the Port with these new vessels. We understand that the U.S. Army Corps of Engineers (USACE) will perform an expedited reconnaissance study to develop the requirements and costs for the feasibility phase of the project during fiscal year 1997. The feasibility phase will also be initiated in fiscal year 1997 and is scheduled to be completed in December 1999. The States of New York and New Jersey, New York City, and the Port Authority of New York and New Jersey all support the study.

On January 17, 1997, EPA participated in an interagency coordination meeting (ICM), which was an initial step in the scoping process for the development of an environmental impact statement (EIS) for the subject project. The meeting enabled the USACE, EPA, Maritime Administration, U.S. Fish and Wildlife Service, and the New Jersey Department of Environmental Protection to discuss economic and environmental concerns related to the proposed project, and to suggest analyses and methodologies for detailed studies and identify sources of relevant data to be addressed in the feasibility

study for the EIS. As indicated in the aforementioned January 6, 1997 letter, and again stated at the January 17 ICM, the USACE is seeking to identify federal partners who wish to cooperate in the development of a NEPA document for the subject project. Based on our review of the January 6 letter, project fact sheet, and participation at the January 17 ICM, we offer the following comments.

In response to the USACE's invitation, EPA would be pleased to serve as an informal cooperating agency on the preparation of the EIS for the proposed project. In this capacity, EPA will review appropriate preliminary drafts and provide technical comments on project studies that will be included in the USACE's EIS. Moreover, EPA will participate in any additional interagency meetings that may be established to resolve issues that are within EPA's jurisdiction. Joseph Bergstein will serve as EPA's point-of-contact for our cooperating agency efforts; he can be reached at (212)-637-3890. Please note that our status as a cooperating agency does not affect our independent responsibilities under Section 309 of the Clean Air Act to review and comment on the project's EIS.

With the understanding that the USACE will be initiating the feasibility phase of the project in the near future, EPA recommends that the following issues be evaluated:

- the effect of channel deepening on existing estuarine salinity patterns. At a minimum, the analysis should assess the potential for changes in the distribution of marine species, including the possible introduction of exotic species.

- the proposed project's potential impacts to any sole source aquifers (i.e., the Coastal Plain Sole Source Aquifer is located west/southwest of the center of the Arthur Kill Channel) that are located within the project area.

- the available dredging methods and the reasons why certain technologies would be utilized along certain alignments of the project. In a closely related matter, if noise and blasting will be considered associated with channel dredging activities, an assessment of the potential impacts should be made in coordination with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service during the development of the EIS.

- the impact of channel deepening on the short- and long-term fate of toxic contaminants in the Harbor and Bight. To this end, we recognize that time frames may not allow the undertaking of a comprehensive toxics monitoring and modeling effort. We recommend that the USACE consider supplementing existing monitoring and modeling efforts under the New York-New Jersey Harbor Estuary Program to help address this item.

- the potential water quality impacts resulting from the resuspension of contaminated sediments. This analysis should include a discussion of the potential for the transfer of toxics to the water column during dredging and blasting.

- the sediments to be dredged by the proposed project in terms of grain size and sediment chemistry. At a minimum, the study should provide information on the potential volumes of category I, II, and III material to be excavated from the harbor complex in developing this project. The project documentation should provide a discussion of the potential disposal sites that would be considered for the material generated by the proposed deepening. This discussion should also provide a projection of the amount of maintenance dredging that will be needed to maintain the 50 ft. Channel depth after the initial deepening effort is completed.

- the potential impacts of the proposed deepening project on dissolved oxygen conditions in the Harbor, Bight and western Long Island Sound.

- the potential air and noise impacts that may be posed by trucking material generated from the construction of the proposed project to an appropriate upland disposal location. Further, consideration should be given to the location of sole source aquifers, flood plain areas, federally protected wetlands, and hazardous/solid waste sites in the development of upland disposal facility alternatives.

- a comprehensive analysis of the potential environmental impacts of the no-action alternative should be conducted to support the proposed project's purpose and need. Towards this end, we recommend that the analysis of the no-action alternative evaluate the potential for ships calling on the Port with less than full loads, lightering of ships (with associated potential for spills), and a switch to other freight modes. With this in mind, the potential for increased air/noise pollution, traffic congestion, and energy consumption should be evaluated under the no-action scenario.

- an assessment of channel deepening on mudflat/and or wetland areas. This study will involve identification of these environments along the proposed project alignment and an evaluation of the potential for subsidence caused by project construction close to shore.

- an assessment of the indirect and secondary impacts. In particular, this analysis should evaluate the potential impacts associated with infrastructure improvements in surrounding communities that are needed to support the proposed deepening of the Port.

- an assessment of the potential for the discovery of shipwrecks or historic period buried deposits.

- an evaluation of the current usage figures along the reaches of the harbor to be developed and the projected increase in ship traffic anticipated to result from the proposed deepening project should be included in the EIS. With respect to the land-based infrastructure related to the proposed deepening, the document should provide a projection of the volume of increase in the land transportation of goods, discussion of the routes and mode(s) of transportation being considered for the distribution of goods and the potential for increased air/noise pollution, traffic congestion, and energy consumption.

Thank you for the opportunity to comment. Should you have any questions concerning this letter, please contact Joseph Bergstein, of my staff, at (212)-637-3890.

Sincerely yours,

Grace Musumeci for

Robert W. Hargrove, Chief
Strategic Planning and Multi-Media Programs Branch

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Habitat and Protected
Resources Division
James J. Howard Marine
Sciences Laboratory
Highlands, New Jersey 07732

RCVD
3/24/97
MHB

March 21, 1997

Mr. Stuart Piken, Chief
Planning Division
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278-0900

Dear Mr. Piken:

Thank you for the opportunity to participate as a cooperating agency on the comprehensive study of the navigational needs for the Port of New York and New Jersey. We look forward to assisting the Corps of Engineers in their efforts to assess the impacts of deepening the Port's channels and anchorages on living marine resources. As requested at the interagency meeting held in the Corps' offices on January 17, 1997, we have prepared a general list of concerns and information needs that should be included in the reconnaissance and feasibility reports for this project.

In order to assess fully the impacts of port deepening on fishery resources, the Corps must investigate physical and biological impacts associated with dredging the channel and berthing areas. This will require completing a comprehensive examination of direct dredging impacts as well as associated, secondary impacts related to the new navigation configurations. In particular, we are concerned that physical and hydrodynamic changes may modify important aquatic habitat in the greater New York Metropolitan Area, to the potential detriment of fishery resources and their forage. Accordingly, it will be necessary to determine how the physical properties of the Port's aquatic environment would be influenced by the deepening proposals.

A successful study must include examination of near and far field impacts to the following physical parameters: salinity regime; location and persistence of the salt wedge; changes in tidal flows or stands, local currents and sedimentation rates or patterns. Intensive geological characterization of the materials proposed for removal should be undertaken as well as evaluations of how the material would be removed and disposed. In addition, opportunities for beneficial use of stone, gravel and other suitable clean material as artificial reefs or low profile benthic enhancements that benefit key species should be explored. Due to the magnitude of the proposal and the importance of marine and estuarine resources dependent on local habitats, it may

be necessary to expand the study zone to include far field impacts in the Hudson River, Brooklyn waterfront as well as river components north and west of Port Newark/Port Elizabeth.

The general study area provides important spawning, nursery, migration, feeding and other seasonal concentration areas used by fishery resources, marine wildlife and their forage. While significant, generic information is available describing regional habitat use by many species of concern, many data gaps must be resolved to complete the National Environmental Policy Act (NEPA) evaluation. This will require that the habitat needs of many marine, estuarine, anadromous and Endangered Species Act resources be described as comprehensively as possible. We will work together with representatives of the Planning Division to identify key study species and conduct ESA Section 7 consultations that relate to the proposed activities. At a minimum, we expect that the following types of activities must be included in the NEPA study:

1) Evaluate available forage opportunities and habitat use patterns by sea turtles using standard benthic resource techniques and satellite telemetry.

2) Determine key concentration areas and other essential fish habitat for selected fishery resources including winter flounder, striped bass, bivalve mollusks, lobster, blue crab, black sea bass and river herring.

3) Inter-relate changes in the physical characteristics of the expanded study area to the habitat requirements of species of concern and identify if unacceptable conditions might be created.

4) Identify opportunities for beneficial use of materials generated from relatively clean port reaches and determine how dredging and disposal will be managed for contaminated reaches.

5) Define the actual scope of work, including identification of the areas that **will** be deepened (to what depths and lateral dimensions), how and when the materials will be extracted (using explosives, types of dredges, etc.) and a brief evaluation of expected impacts (using the biological assessment and opinion prepared for the Port Authority's dredging at Port Newark as a model).

Our agency may be able to provide some information about particular local areas within the Port region with existing data or with data that is being gathered to address our essential fish habitat (EFH) mandates. It may be desirable for our agencies to work together on particular studies, but a separate MOA should be developed to this end. We have been coordinating with Corps of

Engineers staff to develop this MOA. Please contact me or any of the people listed at the end of this letter if you wish to discuss this matter further.

In your December 11, 1996 correspondence, you requested initiation of a Section 7 Consultation under the Endangered Species Act. We look forward to coordinating with you on this effort. However, it will not be possible to assess probable impacts until the project scope is better defined and more local information is collected with respect to availability of forage and use by ESA-listed species. Some of our primary concerns relate to the disposal of contaminated sediments, potential use of explosives and loss of benthic habitat.

Thank you for the opportunity to comment on the scope of work for the reconnaissance and feasibility portions of the harbor deepening evaluation. We look forward to participating in this project evaluation to the extent that our human and financial resources permit. Should you wish to discuss this matter further, please contact Ms. Karen Greene at (908) 872-3203, Mike Ludwig (203) 783-4213, or Ms. Diane Rusanowsky at (203) 783-4261.

Sincerely,

Stanley W. Gorski
Field Offices Supervisor

kmg:nynjnav3.sty

cc: F/NEO2 - Milford, Gloucester
NEFSC- J. Cross
A. Studholme
S. Wilk
FWS - Pleasantville
Islip
EPA - Region II
NJDEP - Fish and Game
NYDEC
ACOE- M. Burlas

MHB

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
Region One - New York Division
Leo W. O'Brien Federal Building, Room 911
Albany, New York 12207

March 7, 1997
IN REPLY REFER TO:
HA-NY

Colonel Gary Thomas, District Engineer
United States Army Corps of Engineers
Jacob K. Javits Federal Building
26 Federal Plaza
New York, NY 10278-0090

Dear Colonel Thomas:

We are pleased to participate as a cooperating agency for the study of the navigational needs of the Port of New York-New Jersey. The study will address improvements to the Port that are required to provide economically efficient and environmental sound navigation to meet current and future needs.

Through discussions with Mr. Mark Burlas of your office, we understand our role is to assist the U. S. Army Corps of Engineers with the analysis of the effects of the potential changes in the traffic volume and patterns associated with the subject project in New York City. Additionally, we expect to attend meetings as required and review the environmental documents. We will expend our own funds in accordance with the Council on Environmental Quality Regulations 1501.6(b)(5).

The New York State Department of Transportation has several projects contemplated for the project area. We suggest that they be asked to be a cooperating agency. This is allowed under 23 Code of Federal Regulation 771.109(3). The appropriate official to contact is as follows:

Mr. Richard Maitino, Regional Director
New York State Department of Transportation, Region 11
Hunters Point Plaza
47-40 21st Street
Long Island City, NY 11101

If you have any questions, please contact Mr. Michael Canavan at (518) 431-4125 extension 249.

Sincerely,

/s/THOMAS E. WATERS

Thomas E. Waters,
Chief, Planning and Program Development

cc:
Mr. Mark Burlas, CENAN-PL-EA, 26 Federal Plaza
New York, NY 10278-0090

FEIS APPENDIX A-1.2a

DEIS COMMENTS AND RESPONSES

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
408 Atlantic Avenue - Room 142
Boston, Massachusetts 02210-3334

F1

REF: ER 99/890

November 22, 1999

Colonel William H. Pearce
District Engineer, New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, New York 10278-0090

Dear Colonel Pearce:

The Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (DEIS) entitled, *New York and New Jersey Harbor Navigation Study* (Study) and is providing the following comments pursuant to the National Environmental Policy Act (83 Stat. 852; 42 U.S.C. 4321 *et. seq.*). The U.S. Army Corps of Engineers (Corps) proposes to deepen the following channels within the New York and New Jersey Harbor (Harbor) to 50 feet or more: Ambrose; Anchorage; Port Jersey; Kill Van Kull; Newark Bay; Elizabeth; South Elizabeth; Bay Ridge; and, Arthur Kill. Dredged material will be disposed of in a variety of ways, which are discussed in detail in the Corps Dredged Material Management Plan for the Port of New York and New Jersey.

GENERAL COMMENTS

Port Facility Expansions

The Corps has determined that no expansion of port facilities can be directly attributable to the recommended plan. The Corps determination is based on economic forecasts that project an increase in Port commerce regardless of whether navigation channel improvements are implemented. However, the discharge of fill material into waters of the United States associated with port facility expansions could be extensive; the Port Authority of New York and New Jersey (PANYNJ) previously identified the filling of 1,350 acres to accommodate port facilities expansions within the Harbor (Port Authority of New York and New Jersey, 1998). We feel that the impacts of port facility expansions should be thoroughly addressed in this DEIS for two reasons: (1) port facility expansion is an indirect effect associated with the proposed project, as the deepening of channels will affect the location, timing, and, therefore, amount of fill in aquatic habitats within the Harbor; and , (2) port facility expansions are "cumulative" and "similar actions" (40 CFR 1508.25) and, therefore, fall within the scope of the environmental impact statement.

F1-1

We understand that the Corps, the U.S. Environmental Protection Agency, and the PANYNJ are near agreement on a memorandum of understanding to begin a long-term port planning study that would be known as the "Comprehensive Port Improvement Plan." While the Department supports comprehensive planning efforts, we feel that separating the issue of port expansion from channel deepening circumvents the NEPA review process, and reduces opportunities to avoid or minimize impacts to fish and wildlife resources, by eliminating potential design options. The NEPA review should include evaluation of the least environmentally damaging alternatives for port facilities expansion for compatibility with the proposed channel deepening plan. Additionally, the NEPA regulations (40 CFR 1508.25) state that an agency should analyze "similar actions" in one environmental impact statement when it is the best means of adequately assessing the combined impacts. The Department recommends that the Corps revise the DEIS to incorporate a thorough evaluation of the potential impacts to fish and wildlife resources associated with port facility expansions. F1-2

Alternative Sites

On page 2-2 of the DEIS, the Corps notes that a category of non-structural alternatives to channel deepening would be "...alternative ports especially those with naturally deep harbors and delivery to the New York and New Jersey area by rail or truck." However, in paragraph 2.9 on page 2-2, the Corps states that "the non-federal partners have not identified any alternative sites." The Department feels that the Corps has responsibility to evaluate the feasibility of using alternative sites, including existing ports on the east coast of the Untied States. Disregarding this alternative evaluation with a statement that non-federal partners have not identified alternative sites does not fulfill NEPA requirements. As the alternatives discussion is considered the "heart of the environmental impact statement" (40 CFR 1502.14), the Department recommends that the Corps evaluate the feasibility of using alternative ports including Philadelphia, Baltimore, and Norfolk. Such an evaluation would provide a clear basis for choice among options and would more thoroughly fulfill NEPA requirements. F1-3

Compensatory Mitigation

The Corps proposes compensating for impacts to fish and wildlife resources by purchasing and enhancing a total of 13 acres of wetlands in Staten Island, New York and Woodbridge, New Jersey. Since direct impacts to shallow water habitats (0-15 feet deep) would total nearly 49 acres, the proposed out-of-kind compensatory mitigation would be insufficient. The U.S. Fish and Wildlife Service (Service) recommended in its Fish and Wildlife Coordination Act report (August 1999) that the Corps evaluate the feasibility of purchasing and enhancing wetlands within the Hackensack Meadowlands, should insufficient opportunities in the Harbor exist. The DEIS contains no documentation that the Corps evaluated restoration opportunities within the Hackensack Meadowlands. Therefore, the Department recommends that the Corps identify areas within the Hackensack Meadowlands that could be used as compensatory mitigation if compensatory opportunities in the Harbor are limited. F1-4

Transportation Impacts

The Corps addresses impacts associated with dredging; however, potential impacts to the human environment associated with the transportation of dredged material from dredge sites to disposal sites are not addressed. Potential impacts associated with the transportation of dredged material must be evaluated, as associated adverse impacts could significantly affect fish and wildlife resources. Additionally, transportation of dredged material could have other effects related to the quality of the human environment, such as noise and adverse impacts on environmental justice, aesthetics, safety, and marine traffic. F1-5

Impacts to Groundwater

The DEIS does not contain a discussion of the proposed project's potential impacts on the interaction of groundwater and surface waters within the Harbor. Specifically, such a discussion should be included in Section 6.1 (Direct Impacts) of the DEIS under the heading Hydrodynamics and Water Quality. F1-6

Impact Assessment

The DEIS does not contain a discussion of how the Corps calculated potential impacts on various habitats. For example, it is not clear if impacts were calculated using only the footprint of proposed channel deepening and widening or if impacts would include any areas that might be affected post-construction by slumping of channel slopes or secondary impacts such as prop wash from larger vessels. Such a discussion would assist in better understanding potential impacts of the proposed project. F1-7

SPECIFIC COMMENTS

The Department recommends including a section in Chapter 8 of the DEIS to discuss best management practices to reduce impacts to nesting birds. The Department recommends including the Service's recommendations (contained in the August 1999 Fish and Wildlife Coordination Act report) that: no dredging or blasting occur within 1;000 feet of Shooters Island between March 1 and August 31 of any given year; and that the Corps avoid illuminating Shooters Island if dredging and blasting occurs as night. F1-8

The Department notes that the Corps frequently mentions the "disturbance of" habitat (e.g., page 2-7) when discussing the conversion of habitat types. Also, we note the use of the phrase "influence is projected" on page 2-8 (paragraph 2.34) in reference to the loss of mud flats. This wording is not sufficiently descriptive; the description of impacts that would occur as a result of implementing the proposed project should be more specific and as quantitative as possible. F1-9

On page 2-8 (paragraph number 2.34) the Corps states that "... no long-term or mitigatible influence is projected" with regard to impacts associated with dredging the Port Jersey Channel. We recommend justifying this statement. F1-10

On page 3-11 the Corps states that none of the alternatives will directly impact intertidal wetlands. We feel that a brief discussion of potential indirect impacts should also be included. F1-11

We recommend stating, on page 3-103, paragraph 5.491, that the northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*) is federally listed as threatened. F1-12

Figure 3.2-1 (locations of areas to be blasted) does not clearly indicate where blasting would occur. Additionally, figures 3.2-3 through 3.2-15, which show detailed locations of blasting sites, are also difficult to interpret. The use of additional labels and geographic references would make these figures easier to interpret. F1-13

Table 5.4-4 (page 2 of 5) appears to have an error; "white flounder" should instead read "winter flounder." F1-14

Tables 5.4-25 through 5.4-28, which display aquatic sampling data, should reference an appropriate figure depicting sample locations. F1-15

Thank you for the opportunity to provide these comments. Should you have any questions regarding the above comments and recommendations, please contact Clifford G. Day of the U.S. Fish and Wildlife Service, New Jersey Field Office, 927 North Main Street, Building D, Pleasantville, New Jersey 08232, (609) 646-9310.

Sincerely,

Darrell L. Robertson

for Andrew L. Raddant
Regional Environmental Officer

RESPONSE TO COMMENTS

F1 U.S. Department of the Interior

F1-1

The non-Federal partners have indicated that they expect to increase productivity and expand terminal yard area with or without deeper channels. As indicated in Table 7 on page 42 of the Report the proposed Without-Project terminal configurations/expansions do not involve waterfront fill. This proposed reconfiguration of terminals is presented as the Without-Project Future Condition. The Recommended Plan was formulated upon the same productivity increases and area expansions as described in the Without-Project Future Condition. Thus, the productivity, terminal area, and throughput are the same in both the With- and the Without-Project Condition and neither requires fill in open waters. Further expansion of the Port is not needed to justify this project. The terminal expansions are not an indirect effect, or a "cumulative" effect of this project, but rather an independent action that may or may not take place and certainly not in the near future.

While the EPA letter dated 7 April 99 states that the local partners have indicated that investment in port development is likely to change depending on the existence and/or timing of the proposed project, it is a basic premise of this feasibility report, as stated in paragraph 128, that "none of this contemplated increase in capacity, however it is to be accomplished, is necessary to justify improving any of the Port's channels" and the decision to go forward with such further expansions will be driven by increased demand predicted by macroeconomics. Therefore, future terminal expansions, as envisioned by the local partners in the CPIP, are not driven by channel deepening and are not connected actions.

F1-2

See response to F1-1

F1-3

Alternative sites refer to inter-Harbor and intra-Harbor alternative sites. The initial quote referenced by the commentator refers to the inter-Harbor issue, *i.e.*, the use of an alternative deepwater port and using rail and truck to ship back into the New York and New Jersey area. The second quote regarding the non-Federal partners' inability to identify alternative sites refers to the intra-Harbor issue and was not intended to mean no sites outside the Harbor could be identified. An analysis of the inter-Harbor issue showed that the cost to ship to another port and then back to the New York/New Jersey area is cost prohibitive. Paragraph 2.9 of the EIS has been revised as follows:

> "2.9 Another common navigation project non-structural plan involves the transport of cargo to an "alternative delivery site". This measure generally refers

to an alternative site either within or outside the port. Sites outside the Port would require transportation back to the region by other means. A preliminary analysis of goods being shipped by water to Baltimore and then transported by land back to the New York/New Jersey area revealed that this alternative was not cost-effective. In addition, air quality analyses showed this solution would have significantly greater impacts than deepening the Harbor. Thus this alternative was dropped from further consideration. The non-Federal partners have not identified any alternative sites within the Port. Existing sites within the Port are usually being used for other types of transportation. Furthermore, construction of new terminals requires previously developed land redevelopment and conversion of the sites presently serving other purposes. Channels to allow..."

F1-4

The mitigation plan has been described in detail in Section 7 of the FEIS. A number of in-kind and out-of-kind mitigation sites were identified in the vicinity of the project area. Therefore, it was not necessary to include restoration opportunities in the Hackensack Meadowlands in the mitigation plan.

F1-5

The environmentally responsible handling of dredged material during dredge and transportation operations is part of the Best Management Practices and Construction Monitoring and Management Plan to be applied to the project if it is constructed. Where necessary, these sections will be expanded to include a discussion of environmentally safe transportation practices. This subject has been discussed briefly in the Appendix on Dredged Material Disposal Options.

F1-6

The impacts to ground water are discussed in paragraph 6.44 on page 6-10 of the EIS. As indicated in the discussion there are no anticipated impacts. Groundwater flow through bedrock is unlikely to be affected. Though possible effects of removal of the sediment blanket over artesian aquifers needs to be further investigated as geologic data becomes available, no continuous water-bearing, unconsolidated formations are expected to be disturbed or exposed as a result of the project. The two principle aquifers, the Magothy and the Raritan Formations, appear to be overlain by a considerable thickness of Pleistocene and more recent sediments.

F1-7

The disturbed area estimate of 6.26 acres of littoral zone and 42.03 acres of sublittoral zone areas of disturbance resulting from navigation channel improvements represents all the littoral and sublittoral habitat that will be deepened directly as a result of channel deepening. The channels were designed to accommodate side slope slumping. The side slope stability analysis is presented in Appendix F, paragraph F28 through F32.

As stated in paragraph 6.11 of the DEIS, not all of the 6.26 acres will be lost as littoral zone habitat; some portion will still be in the littoral zone range (0 to 6 ft below MLW) but will be deepened (say from 2 ft to 4 ft below MLW) as a result of the project. Paragraph 6.11 has been reworded to make this more clear. Results of a coastal erosion modeling effort (*see FEIS App. B-1.1 Hydrodynamic, Water Quality and Coastal Zone Erosion Modeling*) concluded that no impacts to littoral zone wetlands or to sublittoral areas due to prop wash by the larger vessels are anticipated.

F1-8

The Department's recommendations have been noted in Section 8 of the FEIS.

F1-9

Impacts related to navigation channel improvements were projected based on hydraulic and water quality changes, and habitat disturbances related to construction. Hydraulic and water quality changes due to deeper channels were determined to be minimal and would not result in impacts to intertidal wetlands. The FEIS indicates that approximately 6.3 acres of littoral zone wetlands will be disturbed as a result of channel improvements with a non-quantifiable portion of this area changed into deeper water habitat. There will also be some bottom disturbance to sub-littoral areas. The area disturbed is quantified; however, what the actual impacts are is non-quantifiable. Sections 6 and 7 of the FEIS text have been edited to provide more precise descriptions of the projected habitat impacts. See also response to comment F1-7.

F1-10

Text in DEIS paragraph 2.34 expanded as suggested.

F1-11

Text in DEIS paragraph 6.11 edited as suggested.

F1-12

Text in DEIS paragraph 5.491 has been edited as suggested.

F1-13

The information presented in the EIS on subsurface rock blasting, methods and locations, is not based on detailed blasting plans: detailed blasting plans will be prepared following project authorization. The EIS information is presented to indicate the general area where subsurface rock blasting is anticipated and not to show actual areas, which are not available at this time.

F1-14

Table 5.4-4 (2 of 5) has been edited as suggested.

F1-15

A Sample location figure depicting Benthic Grab Stations has been included in Appendix B-1.2, Summary Report Baseline Biological Monitoring Program.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
New York Division
Leo W. O'Brien Federal Building, Room 911
Albany, New York 12207

F2

November 15, 1999
IN REPLY REFER TO:
HPD-NY

Mr. Thomas J. Shea, III
Project Planner
Flood Control & Navigation Section
New York District, USACE
26 Federal Plaza, Room 2145
New York, NY 10278-0090

Ms. Jenine Gallo
Project Biologist
Environmental Analysis Section
New York District, USACE
26 Federal Plaza, Room 2145
New York, NY 10278-0090

Dear Mr. Shea and Ms. Gallo:

The following comments pertain to the *FEASIBILITY REPORT for* **New York and New Jersey Harbor Navigation Study (DRAFT)** dated September 1999.

The scope of the study has been limited to the impacts associated with deepening the Harbor. Recognizing the importance of the Comprehensive Port Improvement Plan (CPIP) and its Environmental Impact Statement in analyzing the environmental impacts related to further expansion of the Port's terminals, we have been in contact with the Environmental Protection Agency regarding the CPIP. F2-1

Since release of the Draft, the Cross Harbor Freight Movement Major Investment Study Steering Committee has recommended that the combination rail/truck tunnel option be dropped from further consideration. This option is mentioned in several locations in the Draft (pages 11, 39, 1-4, and C14). These references should be updated in the Final document. F2-2

If you have any questions, please contact Mr. William Gates at (518) 431-4125 extension 257.

Sincerely,

Jonathan D. McDade, Chief
Planning and Program Development

RESPONSE TO COMMENTS

F2 U.S. Department of Transportation, Federal Highway Administration

F2-1

Comment noted.

F2-2

Reference to the rail/truck tunnel has been deleted from the Feasibility Report and the EIS.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Habitat Conservation Division
James J. Howard Marine
Sciences Laboratory
74 Magruder Road
Highlands, New Jersey 07732

F3

November 15, 1999

Mr. Frank Santomauro, P.E.
Project Biologist, Environmental Analysis Section
New York District, USACE
26 Federal Plaza, Room 2162
New York, New York 10278-0090

Attn: Ms. Jenine Gallo

Dear Mr. Santomauro:

We have reviewed the published version of the Feasibility Report for New York and New Jersey Harbor Navigation Study (Draft) Volume I, Main Report, and Draft Environmental Impact Statement (DEIS) dated September 1999. For a number of reasons, the publication of the DEIS appears premature. For example, the discussions of resource impacts, circulation modeling, mitigation/compensation and employable methodologies to avoid, minimize or mitigate construction impacts are only now being finalized or advanced. As a result, the DEIS does not address adequately all of the potential environmental impacts of the proposed harbor deepening. The following paragraphs provide some specific guidance.

At the State/Federal Environmental Working Group meeting for the New York & New Jersey Harbor Navigation Study, held November 9th in New York City, the group was offered the listing of mitigation options. While the listing was certainly comprehensive, a number of the options are already scheduled for use in association with other projects. Some of the other options lack feasibility or lack sufficient description to determine feasibility. The resolution of these complications will protract the time between the closing of the DEIS response period and the availability of these critical components of the project. Closer coordination with the cooperating agencies at an early period in the review process might have resolved the problem, but the needed engineering and modeling information was not available. While we have every confidence that these problems can be overcome, and will probably be documented in the FEIS, the opportunity to evaluate such information in a DEIS format is no longer available. This shortcoming is a significant problem with the present DEIS and the compressed production schedule for the document. The publication and review period for the Project should have been designed to accommodate the production of these documentation elements.

F3-1

An additional concern must be raised regarding the Memorandum of Understanding between the Environmental Protection Agency, the New York District, Army Corps of Engineers and

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the non-Federal partners. The nature and character of this "understanding" is critical to the evaluation as resource issues must be assessed within a framework that includes public benefit. Without knowledge of the document or an appreciation of the contents of the Memorandum of Understanding, at least this resource agency and potentially, the Public at-large, are deprived of information and insights necessary to assessing if the DEIS meets the goals and objectives of the National Environmental Policy Act. This specific issue has been repeatedly raised by our staff in consort with our State and regional counterparts.

F3-2

We have not been afforded the opportunity to view fully the modeling products or the complete spectrum of assumptions that were used to develop it. However, several recent investigations, including one at the entrance to New York Harbor indicate that flushing, circulation and the basic nature of estuarine systems themselves are greatly influenced by the subtidal topography of these systems. Deepening central entrance channels may induce changes in the mixing characteristics of that system and change it, permanently. In the case of the Port of New York and New Jersey, the deepening of the entrance channels has proceeded from the natural depth of 19 feet to something approaching 50 feet presently and, the preferred alternative (presented in the subject DEIS) encourages increasing the depth to 53 feet.

F3-3

The use of Acoustic Doppler Current Profiling in the last decade has led to remarkable insights in water movement. Of particular concern is the physical isolation of saline and fresher waters resulting from the concentration of the high saline waters in channels. The isolation reduces the mixing interface of the two water masses and limits the estuarine environment. These insights are proving to be extremely useful and accurate. In this regard, two papers merit consideration in the EIS: "THE EFFECTS OF CHANNELS AND SHOALS ON EXCHANGE BETWEEN THE CHESAPEAKE BAY AND ADJACENT OCEAN" by Valle-Levinson and Lwizain in the Journal of Geophysical Research, vol.100 no. C9 pages 18,551 through 18,563 and "ON THE INFLUENCE OF DOWNWELLING WINDS ON THE CHESAPEAKE BAY OUTFLOW" in Physics of Estuaries and Coastal Seas by the same authors [DRONKERS and SCHEFFERS Eds.] ISBN 90-5410 964 3) pp247 through 256. These two papers and some work now in pre-publication on the same topic for New York Harbor (Bohlen, Bokuniewicz, and Lwiza) indicate that the use of models without this level of insight does not accurately represent the conditions within the water column. **IF** deepening the channels will concentrate high saline waters within their confines to the exclusion of the more typical saltwedge mixing interfaces, the circulation pattern and the character of the estuary could be altered. This **may** justify our concern that the EFH within the Harbor is at risk, and that the phrase repeatedly used in the DEIS, "... long-term changes to water quality are unlikely to occur ..." is incorrect. As a result, changes to the estuary which are unanticipated, not fully understood and, ultimately, detrimental to fishery resources within the lower Hudson/Raritan estuary.

F3-4

Blasting has the potential to disrupt all forms of organisms in the water column. Similarly, dredging fine grained, highly hydrated sediments has the potential to interfere with feeding, predation avoidance and migratory movements on the pelagic community members. It's not as clear cut as an impact/no impact scenario that the DEIS invokes to address these proven, adverse impacts to living aquatic resources. Both these topics merit a more thorough discussion in future versions of documents regarding the deepening of the navigation channels. Of particular concern

F3-5

is the potential for blasting to adversely affect federally protected species such as sea turtles and marine mammals. Additional coordination under Section 7 of the Endangered Species Act is necessary.

The shortnose sturgeon is generally a riverine species. It has adapted to periods of elevated levels of suspended sediment. Any impacts associated with the dredging may cause some difficulty in feeding, but this impact will be temporary and localized, affecting only sturgeon that are in the immediate vicinity of the dredging equipment. Sturgeon prefer deep channel habitats, and may actually gain habitat through the deepening project. F3-6

Of greater concern is the potential for the harbor deepening to adversely affect sea turtles and marine mammals. In recent years more data has become available on the habitat use of sea turtles in the New York Bight Apex. This information indicates that there is a potential for interactions between these federally protected species and dredges. Hopper dredges conducting maintenance dredging in the federal navigation channels in Delaware Bay and in the Southeast demonstrated that hopper dredges can lethally take sea turtles. In August 1997, a loggerhead sea turtle was taken lethally by a hopper dredge conducting beach nourishment off Monmouth County, New Jersey. The presence of sea turtles in the New York Bight Apex and the documented takes of sea turtles by hopper dredges requires that observers and other special conditions be used during hopper dredging in this region. We have received the Biological Assessment prepared for this project, and are in the process of reviewing it for completeness. We will continue to coordinate with your office on this issue. However, it is premature to reach any conclusions concerning the impacts of this project on endangered species until our review of the Biological Assessment has been completed. F3-7

Finally, the DMMP *Beneficial Uses* document considers the implications of modifying one aquatic habitat type for another. It concludes that the "trade-off costs" merit a thorough evaluation as does the modification of shallow water habitats to deep water habitats. We find it inappropriate to disregard the impacts of deepening more than forty acres of habitat in favor of focusing on a more modest approximately 6.5 acres of littoral zone habitat that may be forfeit. The tradeoff "costs" to all habitats and resources require evaluation as the project options and alternatives are discussed. F3-8

Should you wish to discuss these comments, please contact Michael Ludwig at (203) 579-7004.

Sincerely,

Stanley W. Gorski
Field Offices Supervisor

RESPONSE TO COMMENTS

F3 U.S. Department of Commerce, NOAA, National Marine Fisheries Service

F3-1

The purpose of presenting the list of potential mitigation sites at the November 9th Environmental Work Group (EWG) meeting in New York City was to obtain input from the EWG members as to any concerns or issues related to the potential mitigation sites that had been selected. Concerns related to site selection that were expressed during the meeting included the following issues: 1) the installation of dikes around the eastern side of Shooters Island may not be feasible due to a lack of foundation on the southern, northern and western sides of the island, 2) the availability of four of the proposed littoral zone mitigation sites, as well as the Shooters Island site, because these four sites were already being considered for the New York Harbor Collection and Removal of Drift Removal Project, and 3) the availability of the littoral zone mitigation site south of the Goethals Bridge, because the construction of another bridge has been proposed in this area.

Issue # 1 was resolved in discussions by the District subsequent to the Nov. 9 EWG meeting; it was determined that sufficient foundation exists to the east of Shooters Island for the installation of dikes in this area. Issue # 2 was resolved by the District involved in the Drift Removal Project. It was determined that, since no definitive decisions have yet been made regarding the sites identified under the Drift Removal Project, it was considered appropriate to include these sites in this mitigation plan. Finally, regarding Issue # 3, since the construction of an additional bridge just south of the Goethals Bridge has not been approved and, if approved, would not happen in the forseeable future, the potential mitigation site proposed for just south of the Goethals Bridge was deemed appropriate for inclusion in the mitigation plan. The process for selecting and screening the mitigation sites are described in Section 7 of the FEIS and in the Mitigation Alternatives Report.

F3-2

The final MOU has been included as Appendix B-1.8 of the FEIS.

F3-3

The hydrodynamic and water quality modeling has incorporated results from Acoustic Doppler Current Profiling (ADCP) technology. Specifically, the hydrodynamic model was verified using ADCP measurements. With regard to "physical isolation of saline and fresher waters resulting from the concentration of the high saline waters," it should be noted that the model used for this study was a three-dimensional model that is capable of accurately modeling the complex interactions of salt and fresh waters. For example, the model did a very good job of reproducing the measured changes in levels of Hudson

River stratification that occur during the spring-neap tidal cycle. As a consequence, it is judged that the model represents the salt/freshwater dynamics of the study area in a way that is consistent with prior measurements and is suitable for evaluating potential impacts of the deepening.

F3-4

See the response to Comment F3-3.

F3-5

The discussion of the impacts of blasting has been expanded in the FEIS. The potential impacts of dredging fine-grained sediments on the pelagic community are discussed in Section 6.4, Essential Fish Habitat (paragraph 6.86).

F3-6

Comment noted.

F3-7

Hopper dredges will be used only in the Ambrose Channel. Adherence to any agency-recommended Special Conditions (dredge windows, use of observers) incorporated into the state and Federal dredge permits will minimize the potential for encounters with sea turtles. We anticipate and will respond to questions/comments on this issue through the permitting process and the review of the Biological Assessment.

F3-8

Impacts to the sublittoral zone (6 to 15 ft below MLW), where anticipated, are discussed throughout the document along with impacts to the littoral zone (0 to 6 ft below MLW). For example, in Section 6 of the DEIS, sublittoral impacts are mentioned along with littoral zone impacts in paragraphs 6.11, 6.12, 6.13, 6.18, 6.24, and 6.28.

Littoral zone disturbances require compensatory mitigation due to the fact that they are defined as wetland habitat in Title 6 § 661.2 (b) and (e) of the Official Codes of Rules and Regulations of New York State. USACE guidance ER 1105-2-100, Paragraph 7-25 describes its requirements related to mitigation for wetlands as follows:

> "g. Wetlands. District commanders shall ensure that adverse impacts to wetland resources are fully mitigated. Mitigation shall be accomplished through appropriate actions taken to avoid, minimize, and compensate for unavoidable losses as required to clearly demonstrate efforts made to meet the administrations goal of no net loss of wetlands...."

Requirements for compensatory mitigation for disturbances to sublittoral habitat are not required in the USACE guidance document. In fact, the guidance states:

> "c. Separable Features. Full credit shall be given to the beneficial aspects of an alternative plan, or project, before consideration is given to adding separable mitigation features. The significance of fish and wildlife resources affected by an alternative plan/project, and the significance of adverse impacts to these resources shall be evaluated to determine the need for separable mitigation features."

Beneficial use will be a priority for the management of dredged materials from this project. Given the volume of dredged material projected to be created from the project (approximately 51 million cubic yards from the initial construction alone), the anticipated benefits from the beneficial use of such material are great and include the construction of artificial reefs. These reefs will provide habitat, refuge and additional food sources for Harbor biota. Furthermore, the acreage of wetland habitat that will be created or restored in the recommended mitigation plan exceeds that requirement to compensate for the littoral zone disturbances. While it is impossible to directly compare the impacts associated with the sublittoral disturbances with the benefits obtained from beneficial use of dredged material and the additional wetland compensation, it is believed that the net beneficial effects resulting from these factors outweigh the disturbances to 42.03 acres of sublittoral habitat.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

F4

NOV 22 1999

Class: EO-2

Roselle Henn, Chief
Environmental Analysis Section
Department of the Army
U.S. Corps of Engineers, New York District
Jacob K. Javits Federal Building
26 Federal Building
New York, New York 10278

Dear Ms. Henn:

The Environmental Protection Agency (EPA) has reviewed the draft environmental impact statement (EIS) for the New York and New Jersey Harbor Navigation Study (HNS) (CEQ# 990348). This review was conducted in accordance with Section 309 of the Clean Air Act, as amended (42 U.S.C. 7609 12 [a] 84 Stat. 1709), and the National Environmental Policy Act (NEPA).

The U.S. Army Corps of Engineers (USACE) New York District, pursuant to Section 435 of the Water Resources Development Act of 1996, is studying the navigation needs at the Port of New York and New Jersey, including the possible deepening of existing channels to depths of 50 feet or greater. The study considers the following channels for deepening: Ambrose, Anchorage, Bay Ridge, Red Hook, Buttermilk, the Kill Van Kull, Claremont, Port Jersey, Newark Bay, and the Arthur Kill to Gulfport, as well as the anchorages at Stapleton, Red Hook Flats, and Gravesend Bay. The draft EIS evaluates the no action alternative, non-structural alternatives, and structural alternatives. The document identifies a preferred alternative for the project, which calls for navigation improvements to nine channels to permit access by larger, deeper draft vessels to four main container terminals. The proposed improvements consist of channel deepening, channel realignment, turning basin construction, and berth deepening.

EPA Region 2 agreed to serve as a cooperating agency in the development of the EIS for this project on May 23, 1997. As a cooperating agency, EPA attended monthly meetings to assist the USACE and the Port Authority of New York and New Jersey (PA) in the development of the environmental documentation for the project. During the development of the EIS, it became apparent that there would be upland impacts associated with the project that were not being considered. As such, EPA sent a comment letter on December 4, 1998 on the draft Existing Conditions Report, in which we outlined the air analyses that would be required to evaluate the upland impacts associated with the project. EPA also sent a letter on April 7, 1999 documenting

some of the elements that need to be considered as part of the analysis of the no action alternative for the project. Finally, we sent a letter on May 27, 1999 discussing the need for a cumulative impacts analysis, which would examine the past, present, and reasonably foreseeable future actions within the Port area. Our initial review of the draft EIS found that these issues were mentioned in the document, but the analysis to support statements made in the document were not included. As such, we requested additional supporting documentation, which your staff provided. With this in mind, our comments address the draft EIS as well as the supplemental information. Our review of the additional materials occurred under EPA's role as a cooperating agency, which was outside the formal review process. As such, the final EIS must include all of the supplemental information supplied to EPA so that it is available for public review. Based on our review of the draft EIS and the supplemental information, EPA has the following comments.

According to the draft EIS, the primary purpose of the HNS is to identify and evaluate the navigation channel modification alternatives and develop the National Economic Development plan to meet the trend towards larger cargo vessels in the world fleet. Under this scenario, cargo movement within the New York Harbor port complex would increase from its current level (2.4 million twenty foot equivalent units [TEUs]) to 9.6 million TEUs by 2040. The document argues, however, that this projected increase in cargo movement will occur with or without channel deepening. With this in mind, impacts associated with the land-side improvements (e.g., transportation infrastructure and operational efficiencies) needed to realize the cargo handling goals were to have been evaluated in the cumulative impacts analysis, as required by 40 CFR 1508.25. F4-1

In any event, the draft EIS (page 45, paragraph 147, of the main report) clearly establishes that the HNS is a prerequisite (among other actions) to the achievement of the PA's goal of capturing 19.1 million TEUs of cargo by 2060. As such, the impacts associated with the other actions needed to achieve this goal (e.g., expansion of current port facilities) should have been included as indirect/cumulative impacts in the HNS. Several months ago, it became apparent that there is a great deal of uncertainty as to what other actions will be needed to achieve the 19.1 million TEU goal. With this in mind, EPA proposed a larger study, now called the Comprehensive Port Improvement Plan (CPIP), to evaluate impacts associated with capturing the additional 9.5 million TEUs between 2040 and 2060; the USACE, PA, and other port interests agreed to this proposal. Unfortunately, at this time, the memorandum of understanding (MOU) establishing the CPIP has not been signed. Without a commitment to develop the CPIP prior to the completion of the NEPA process for the HNS, the HNS EIS will have to fully evaluate impacts of capturing 19.1 million TEUs associated with the implementation of the HNS. The draft document indicates that up to 500 acres of fill at the various port facilities could be required to realize the goal of achieving 19.1 million TUEs. In the absence of an appropriate analysis supporting this amount of fill, EPA strongly objects to this quantity of fill in the harbor area. Therefore, we believe it is utmost importance to have a signed CPIP MOU that would commit to examining alternatives to fill, as well as well as the impacts to other resources in the harbor area associated with achieving the goal of 19.1 million TEUs. Moreover, without a signed CPIP MOU, all of the analyses in the final EIS for the HNS would need to be based on the achievement of 19.1 million F4-2

TEUs. With this in mind, EPA's objections with the HNS could be addressed by the proposed CPIP. As such, we strongly recommend that the ACE formally commit to the CPIP MOU prior to the release of the final EIS for the HNS

Cumulative Impacts

According to 40 CFR 1508.7, a cumulative impact is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. EPA is concerned that the draft EIS does not consider reasonably foreseeable future actions which are not projects within the ACE's jurisdiction, yet are likely to impact specific resources such as wetlands, air quality, and water quality in the vicinity of the Port. F4-3

According to the information reviewed by EPA, efficiencies are going to occur within the port that allow for more commerce, regardless of whether the channels are deepened or not. With these efficiencies, there will be an increase in goods coming into the harbor and moving through the port. A large percentage of these goods will end up leaving the immediate vicinity of the port through the land transportation network. Unfortunately, the draft EIS provides no analysis of whether or not the current transportation network would be able to accommodate the increase in commerce. However, the draft EIS does state that the land transportation network is expected to develop concurrently with the increase in commerce, whether the proposed project is implemented or not. The draft EIS also indicates that this work would be carried out by agencies other than the USACE. The supplemental information provided to EPA contains traffic analyses that indicate that only local roadway improvements would be required to accommodate the future increase in commerce. EPA finds this conclusion problematic in light of the fact that there are several large scale transportation projects currently under consideration that will address future capacity issues in the Port's vicinity. Some of these transportation projects are currently in Transportation Improvement Plans (TIPs), and some are not. These projects include: the Gowanus Expressway Improvements, the Twinning of the Goethals Bridge, Portway, the Expansion of the New Jersey Turnpike, the Cross Harbor Freight Tunnel, and the Staten Island North Shore Railway. The cumulative impacts analysis in the final EIS should discuss the potential impacts to specific resources such as wetlands, water quality, and air quality from the aforementioned projects as well as the impacts associated with the localized roadway improvements identified in the supplemental traffic analyses. Please note that the supplemental information provided to EPA adequately characterizes the potential impacts from the larger scale projects mentioned above, but does not address the impacts associated with local road improvements in the immediate vicinity of the port facilities. Therefore, EPA strongly recommends that the final EIS include all of this information in order to adequately determine impacts associated with roadway improvements needed to accommodate the predicted future level of commerce. F4-4

EPA also recommends that the final EIS consider other reasonably foreseeable future actions that would accompany the anticipated increase in goods moving through the harbor. Specifically, the analysis should consider the potential changes in the tug fleet that would occur, and how that might impact specific resources. Additionally, the analysis should consider whether there will be an increase in the likelihood of accidents and fuel spills associated with the increase in commerce. F4-5

Additionally, the draft EIS does not mention past actions within the harbor area which have had impacts to specific resources over time (loss of wetlands and their functions, loss of littoral zones, upland habitats, etc). This information is the key to understanding how the local environment has changed over time. This also gives an accurate picture of the incremental changes to specific resources over time, and how future projects could influence these resources even more. F4-6

No Action Alternative (Without Project Conditions)

The draft EIS does not evaluate what the impacts to various resources (air, water, uplands, etc.) would be if the proposed project is not implemented (no action). There is also no analysis or discussion as to what the future transportation needs would be, and the infrastructure changes required to accommodate the increase in cargo coming into the harbor even without the project. The no action alternative is meant to be a type of baseline, to which the with-project impacts would be compared. The draft EIS contains an insufficient analysis of the no action, and thus, a comparative analysis with the recommended plan is not possible. Without a complete no action alternative analysis, the project's overall alternatives analysis is inadequate. Therefore, we recommend that the final EIS include an analysis of the impacts that the no action alternative would have on specific resources in the project area. F4-7

Air Quality Impacts

While the analyses in the draft EIS and supplemental information investigate air quality and traffic impacts on micro- and mesoscale bases, they are deficient in a number of aspects, the most egregious of which is the lack of a general conformity analysis. Under the general conformity rule (40 CFR 93.150), the USACE is required to determine whether the project conforms to the New York and New Jersey State Implementation Plans (SIPs) such that the project does not cause a new violation or contribute to or increase the frequency or severity of an existing violation of the national ambient air quality standards. Based on the regional pollutant loadings presented in Table 14 of the Air Quality Analysis, the project appears to be above de minimus levels for at least oxides of nitrogen (NOx). (Note: in addition to those quantified in Table 14, emissions for CO must also be presented.) The final EIS needs to present emissions data for the no action and action alternatives in 2005 and 2007, the attainment year for which the NY and F4-8

NJ SIPs are required to establish emissions budgets for CO and ozone, respectively. These are the years for which the general conformity analysis will be required. Since only emissions in 2030 and 2060 are presented, the above de minimus level conclusion is not certain. These emissions estimates must include those from waterway vessels (non-road) and land-side transfer equipment from terminal operations (off-road). Most of the direct impacts of this project may well be during construction activities, rather than after construction. Consequently, while those related impacts might indeed be considered temporary, these temporary emissions associated with all project alternatives must also be considered in assessing the air quality impacts of this project and its potential interim effects on the attainment status of area.

Additionally, for the microscale analysis, the intersections modeled must be consistent with those modeled in the NY and NJ, CO and PM10 SIPs. All intersections must be modeled using predictions of traffic conditions associated with the baseline, no action, and action alternatives. All impact assessments must follow *EPA's* Guideline on Air Quality Models (40 CFR Part 51 Appendix W) and Guideline for Modeling Carbon Monoxide from Roadway Intersections (November 1992, EPA-454/R-92-005) and employ the latest vehicle emissions model (currently MOBILE5b for NY and MOBILE5ah for NJ) with appropriate inputs (reformulated gasoline, inspection and maintenance, etc.).

HNS will be considered a "Regionally Significant Project" as defined in 40 CFR 93.101 for the purposes of transportation conformity. While transportation conformity does not apply to the channel deepenings, it behooves the US Corps of Engineers to share the emissions estimates with the North Jersey Transportation Planning Authority (NJTPA) and the New York Metropolitan Transportation Council (NYMTC). According to the transportation conformity rule (40 CFR 51 Subpart T and 40 CFR 93 Subpart A), both NJTPA and NYMTC will be required to include all emissions from this project in the conformity analysis on their next Long Rang Plans. Consequently, emissions estimates must be quantified for 2007, 2010, 2012, 2015, 2020, and 2025.

In July, 1997, EPA promulgated national air quality standards for fine particulate matter (PM2.5) and ozone. In May, 1999, the US Circuit Court of Appeals for the District of Columbia Circuit issued an opinion which affects the implementation of those standards. EPA is pursuing an appeal of this opinion to the US Supreme Court. In the interim, EPA is continuing to prepare for the implementation of these revised standards by establishing a national PM2.5 monitoring system and developing guidance for the modeling evaluation of air quality impacts. The PM10 emissions estimates presented in the Air Quality Analysis are expected to be mostly PM2.5. Therefore, in the anticipation of a decision in the near future of the fate of the fine particulate standard, EPA strongly suggests the US Corps of Engineers quantify the PM2.5 emissions associated with this project accordingly.

Based on our review and in accordance with EPA policy, we have rated this draft EIS as EO-2, indicating that we have environmental objections to the project based on the significant adverse impacts that could result from the expansion of port facilities, and related infrastructure, that would be associated with achieving the PA's goal of increasing cargo movement in the Port to 19.1 million TEUs by 2060. Additionally, the final EIS should include the requested information on cumulative impacts, the no action alternative, the required air analyses, as well as all of the previously mentioned supplemental information provided to EPA through our role as a cooperating agency. Please note that a formal commitment by the involved agencies to move forward with the CPIP EIS would likely address many of our objections with the draft EIS, and this would be reflected in our rating of the final EIS.

Thank you for the opportunity to comment. Should you have any questions concerning this letter, please contact Ms. Grace Musumeci, Chief of the Environmental Review Section at (212) 637-3738.

Sincerely yours,

Robert W. Hargrove, Chief
Strategic Planning and Multi-Media Programs Branch

cc: CEQ
L. Barrone, PANY&NJ

F4 U.S. Environmental Protection Agency

F4-1

All traffic, air quality, and noise supplemental information is included in the FEIS: Appendix B1.8, Traffic; B1.9, Air; and B1.10, Noise.

The EPA comment letter attempts to distinguish between the system throughput capacity of 9.6 million TEU's per year which is within the grasp of the project sponsors to achieve by facility optimization and use of existing land, and the 19.1 million TEU unconstrained commerce forecast based on world trade. EPA correctly identifies two levels of criticism applicable to this study. At the higher level, the EPA has identified regional and site specific issues which must be fully addressed to satisfy the concerns over a Harbor-wide, comprehensive plan, including secondary and cumulative impacts, both landside and waterside. On the other hand, they recognize the limitations of the existing system (9.6 million TEUs throughput), and the more limited impact that deepened channels will have when applied to that system. In order to fully address the ultimate uses of the deepened channels, unconstrained by terminal space, EPA has demanded a high level of comprehensive documentation. They recognize that many of the issues raised will be addressed in the CPIP, and accede that this high level of criticism can be reduced at the present time in deference to the completion of such study.

The Corps agrees with this position, and has provided preliminary analyses of landside impacts, specifically traffic, noise and air quality to begin the more detailed evaluation of site specific impacts which will be completed in the CPIP and site specific permitting actions.

The non-Federal partners have indicated that they expect to increase productivity and expand terminal yard area with or without deeper channels. As indicated in Table 7 on page 42 of the Report the proposed Without-Project terminal configurations/expansions do not involve waterfront fill. This proposed reconfiguration of terminals is presented as the Without-Project Future Condition. The Recommended Plan was formulated upon the same productivity increases and reconfigurations of existing terminal areas as described in the Without-Project Future Condition. Thus, the productivity, terminal area, and throughput are the same in both the With- and the Without-Project Condition and neither requires fill in open waters. Further expansion of the Port is not needed to justify this project. The impacts associated with the terminal expansions are included in the cumulative assessment provided in Section 6.3 Cumulative Impacts.

Cargo handling efficiencies and improvements in the landside transportation infrastructure will occur whether or not the proposed action is implemented (Note

transportation issues are addressed more extensively in the response to comment F4-4). Since a cumulative impact is defined as an impact which results from the project when added to the impacts of other projects, the Corps' believes, in the first instance, that the implementation of such efficiencies are not project impacts, and, therefore, are not cumulative impacts.

Notwithstanding this position, cargo efficiencies, which are expected to occur in the future, are expected to take the form of the following improvements:

- Number of berths at the terminal
- Number and type of cranes employed
- Terminal yard area and storage technology
- Utilization of terminal area
- Container dwell time
- Gate Operations
- Scheduling.

For the most part, the implementation of these improvements is not expected to have significant adverse environmental impacts. The addition or modification of berths may result in short term water quality effects through removal of sediments and disturbances to the existing bulkheads. Such temporary impacts can be mitigated through conventional erosion control and containment measures. Extending the hours of gate operation can potentially impact noise levels along access routes and will reduce the peaking of traffic associated with the terminal operation. Other productivity improvements consist of internal site alterations, equipment changes, and operational changes which are not expected to have significant impacts.

F4-2

The Final Comprehensive Port Improvement Plan (CPIP) Memorandum of Understanding (MOU) is included as Appendix B-1.8 of the FEIS.

F4-3

Cumulative impacts to wetlands, water quality, and air quality arising from future port expansion and transportation are addressed in Section 6.3 of the FEIS.

F4-4

The FEIS includes an appendix detailing traffic analyses that show local roadway improvements (Appendix B.1-9).and potential impacts associated with these. The additional projects are identified in Section 6.3; however, few of them have developed designs that are detailed enough to identify impacts to wetlands, water quality, and air quality.

Since a cumulative impact is defined as an impact that results from the project when added to the impacts of other projects, the Corps' believes, in the first instance, that this project will not have a cumulative impact on the inland transportation infrastructure. Since the cargo throughput level associated with the Project (9.6 million TEU/year) is the same as for the "Without Project" condition, there is no incremental impact resulting from this project.

Notwithstanding the above position, the Corps' has conducted traffic analyses in order to develop a preliminary overview of the traffic impact associated with this activity, even though it does not believe that such impact is attributable to this action. This traffic analysis has indicated that traffic capacity deficits will be experienced in the region over the next 60 years, unless improvements to the roadway system are implemented. This observation is certainly to be expected, given the growth potential of a 60 year time frame. It is important to note that these deficits will be experienced even without consideration of traffic associated with future increases in cargo throughput. Therefore, the need for transportation improvements is not triggered by the increased cargo throughput. Obviously, any additional truck trips on a roadway, which is projected to experience a capacity deficit will only increase the deficit, even if such increases are not significant in an overall context.

EPA indicates that the supplemental information provided adequately characterizes potential impacts associated with a number of the large scale regional transportation improvement projects, but not the potential impacts of local roadway improvements associated with each terminal facility.

The supplemental information provides as much information as is presently known about impacts which may result from local roadway improvements. It is expected that more detailed studies will be performed in connection with further terminal improvement plans and/or in connection with the proposed traffic improvements themselves. For the most part, it is not anticipated that regulatory or environmental obstacles will prevent the implementation of these improvements. If any particular local improvement cannot be implemented due to environmental or other concerns, it is believed that an alternative project configuration can be developed to resolve the access issue.

F4-5

Analysis of future with-project conditions indicates there will be fewer vessel movements with the proposed channel improvements. Accordingly, it has been concluded that there will be less tugs under with-project conditions. Similarly, fewer vessel movements mean that there will be less risk of navigation accidents. Specific data on potential changes in the tug fleet are not available.

F4-6

Information on past actions that have resulted in the loss of wetlands have been added to the Cumulative Assessment Section (Section 6.3) of the FEIS.

F4-7

As indicated in the No Action Alternative section of the DEIS, Port commerce is projected to increase in the foreseeable future with or without the project. Operators of the Port's marine terminals indicate that they can accommodate this projected increase with increases in facility efficiencies and changes in facility operational parameters, such as:

- Number of berths at the terminal
- Number and type of cranes employed
- Terminal yard area and storage technology
- Utilization of terminal area
- Container dwell time
- Gate Operations
- Scheduling

There are no increases in facility size between the with- and without-project scenario. The increase in Port commerce, as well as an increase in consumer demand will result in an increase in truck and rail traffic into and out of the Port vicinity. Air quality and noise impacts will be associated with the increase in truck and rail traffic. A cumulative impact evaluation of the upland impacts associated with the projected increase in Port commerce has been prepared and is included in the FEIS, Section 2.2.

F4-8

The proposed navigation channel deepening, which will be accomplished in this project is associated with the movement of 9.6 million TEUs of cargo in the year 2060. If this action is not taken, the volume of cargo processed through the Port will also be 9.6 million, since it has been established that this level of throughput is not constrained by the channel depths. Therefore, since this project will not increase the level of cargo throughput, it is not expected to have an impact on the air quality emissions which result from landside transportation or handling of cargo, which are assumed to be the major source of emissions associated with this activity. Since the project will not increase air emissions as compared to the "without project" condition, it is in conformance with the New York and New Jersey State Implementation Plans.

To further substantiate this conclusion, if the inevitability of future cargo throughput levels were ignored, and all increases in cargo were attributed to this project, then increased air emissions would also (albeit incorrectly) be associated with this project. Several evaluations can be made on this basis. First, to satisfy the region's demand, it was assumed that increases in cargo throughput would be routed through other ports. The supplemental information provided included a mesoscale analysis in which it was assumed that cargo would be routed through Baltimore (the best alternate). When compared to routing via New York, it was determined that emissions associated with the New York route were significantly lower than for Baltimore. The reductions in

emissions associated with routing cargo through New York were as follows (for year 2060, total demand 19.1 million TEU):

VOC – 2.0 tons per day
NOx – 12.0 tons per day
PM10 – 80.7 tons per day

On this basis (attributing increases in cargo to this project), the regional emissions would be lower for the proposed action (New York routing) than for the no action alternative (Baltimore routing), hence the project is in conformance with the State Implementation Plans.

On a microscale basis, and again attributing increases in cargo throughput (to 9.6 million TEU) and associated traffic to the proposed action, critical intersections near each of the proposed terminal sites were modeled for CO, using the protocols and guidance listed in the EPA comment letter. These analyses show that the increased level of traffic associated with the increased cargo throughput does not violate applicable air quality standards for CO. Therefore, this increase in cargo throughput and traffic is in conformance with the State Implementation Plans.

EPA has also requested emissions estimates for the years 2005 and 2007. The Draft EIS indicates that the demand for cargo throughput will increase from 3.0 million TEU in 2000 to approximately 4.0 million TEU in 2007, a 33% increase. While emissions estimates for 2007 had not been developed, they can be approximated from the emissions estimates provided in the Supplemental Information (Air Quality Appendix). The mesoscale analysis quantifies emissions for a 12.0 million TEU throughput level in 2030, in which approximately 8.7 million TEUs is routed through New York and 3.3 million TEUs is routed through Baltimore. The analysis also shows that routing through Baltimore results in greater emissions than routing through New York. Therefore, to estimate the emissions associated with the year 2007 (4 million TEUs), we can ratio down the 2030 emissions level, and estimate the 2007 emissions as follows:

VOC – 2.0 tons per day
NOx – 11.7 tons per day
PM10 – 78.9 tons per day

Emissions in 2005 will be approximately the same. It should be noted that 75% of these emissions are already included in existing (year 2000) conditions. Further, these estimates are probably overstated for two reasons. First, the original mesoscale analysis assumed that 25% of the cargo was routed through Baltimore which overstates the vehicle miles traveled. Second, the original estimates were for a 14 state "region" which encompassed a 260 mile radius from New York. Only a portion of these emissions would be discharged within the local Air Quality region. On the other hand, emission factors for NOx and CO are expected to decrease approximately 13% between 2007 and 2050. This would indicate that the NOx emissions given above would be slightly higher than that calculated above via linear proportion. However, we expect that this is

significantly outweighed by the first two factors cited above. Finally, it is our opinion that these emissions are not associated with the proposed project, but would occur in any event.

The following discussion on vessel and ship emissions is included in the FEIS, Para's 6.115 – 6.119:

6.115 The proposed navigation channel improvements will be carried out in phases under a number of separate construction contracts and over a period of several years. Construction activities will involve the use of hydraulic and mechanical dredges, support vessels, and other items of equipment that generally run on diesel power. Emissions from diesel engines have the potential to impact air quality. Any air quality impacts; however, would be short-term and localized. Moreover, these localized potential impacts would occur over a relatively wide area that is characterized by coastal winds that are expected to rapidly disperse the emissions. Furthermore, these emissions can be reduced through the use of low sulfur fuels and through the phasing of construction.

6.116 The proposed navigation channel improvements will not increase the amount of cargo through the Port, but will permit the movement of the cargo in larger containerships. Consequently, the volume of containers that flows through the Port can be carried by fewer, larger ships relative to the without-project condition. This less total time in the Port can be roughly translated into fewer total tonnes of fuel burned by containerships in the port. With the navigation improvements in-place, there will be a reduction of approximately 665,000 tonnes of fuel burned in the Port over a thirty-year period. This fuel savings stems from the increased transport efficiency of the largest containerships. Because the larger ships will burn less fuel in the Port than smaller ships carrying the same total volume of cargo, the total air emissions for the with-project condition is expected to be less than for the without-project condition.

6.117 The 665,000 tonne fuel savings is derived from estimates of reductions in fuel burned by ship's main engines and auxiliary engines. Approximately 415,000 tonnes of fuel savings are attributed to main engines and 250,000 to auxiliary engines. Main engine fuel savings are based on the assumption that each vessel uses its main engines for four hours during each vessel call (two hours getting in and two hours getting out). USACE Economic Guidance Memorandum 99-05, Deep Draft Vessel Operating Costs was used as the source of information for hourly tonnes of fuel burned for containerships of various sizes. For each year, 2010-2040, the projected number of vessels calls for each vessel size was multiplied by the corresponding tons of fuel burned to arrive at an annual total tonnes burned in the Port. These calculations were performed under both the with- and without-project condition. The difference between total annual main engine fuel consumption under the with- and without-project condition indicates an overall 30-year fuel savings of 415,000 tonnes under the with-project condition.

6.118 In-Port auxiliary engine fuel savings are based on annual projections of the number of TEUs transported by each vessel size under both the with- and without-project condition. The auxiliary engines were assumed to be running only during the time that

the vessel was alongside the dock. The amount of time spent alongside the dock was calculated as the time required to load and unload Port TEUs at a rate of 40 TEUs per hour. Auxiliary engine fuel consumption for the various vessel sizes was similarly taken from the Economic Guidance Memorandum 99-05, Deep Draft Vessel Operating Costs. As with the main engine calculations, annual auxiliary engine fuel consumption for each vessel size was calculated under both the with- and without-project condition. The difference between total annual auxiliary engine fuel consumption under the with- and without-project condition indicates an overall 30-year fuel savings of 250,000 tonnes under the with project condition.

6.119 As part of its SIP process, the NYCDEC has estimated emissions from marine traffic in New York using calculations in which emissions were estimated from fuel consumption. The proposed action will result in the use of fewer, larger ships and these ships will be both newer and more fuel efficient than the older, smaller containerships which they will ultimately replace. Therefore, since the cargo throughput is equivalent for the proposed action and "without project" condition, it is expected that overall emissions will be lower for the proposed action, since the fleet will be dominated by the larger, newer, more fuel efficient vessels. On this basis, the project is expected to conform to the State Implementation Plans.

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DEPARTMENT OF STATE

George E. Pataki
Governor
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Secretary of State

Division of
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S1

November 22, 1999

Ms. Jenine Gallo
Environmental Analysis Branch
Department of the Army, CENAN-PL-EA
New York District Corps of Engineers
26 Federal Plaza
New York, New York 10278-0090

Re: New York/New Jersey Harbor Navigation Study
Draft Feasibility Report
and Environmental Impact Statement

Dear Ms. Gallo:

Thank you for the opportunity to comment on the New York/New Jersey Harbor Navigation Study Draft Feasibility Report and Environmental Impact Statement. The Department of State has reviewed the Draft Feasibility Report and Environmental Impact Statement for the New York/New Jersey Harbor Navigation Study and would like to offer the following comments:

The federal and non-federal sponsors of the New York/New Jersey Harbor Navigation Study are preparing to execute a memorandum of understanding (MOU) with the US Environmental Protection Agency regarding a comprehensive port development study (the Comprehensive Port Improvement Plan - CPIP) intended to assess potential upland development and cumulative impacts which result from the navigational improvements recommended in the Navigation Study Feasibility Report. In order to conduct its review of the New York District's consistency determination, and determine the coastal zone effects of the proposed Navigation Study on the land and water uses and natural resources of the State's coastal area, the Department of State is unable to commence its review of the New York District's consistency determination for the New York/New Jersey Harbor Navigation Study until the proposed memorandum of understanding is executed and all other necessary data and information are submitted, including a final Navigation Study EIS and Feasibility Report. Upon implementation of the selected alternative(s) of the New York/New Jersey Harbor Navigation Study, all planned improvements will be subject to independent consistency review when the details of such improvements are known.

S1-1

The statement is made in the third paragraph on page B-1.7a-1, Appendix B: "The consistency evaluation is provided to enable New York to consider the effect of the project on its coastal zone resources." In keeping with the intent of the consistency regulations for federal activities in the coastal zone, we suggest modifying this statement to read: "This consistency evaluation is being provided in order to: 1) support the Corps of Engineers' consistency determination, pursuant to 15 CFR Part 930 Subpart C, regarding the consistency of the activity with the NYS Coastal Management Program; 2) enable New York to consider the effects of the proposed project on the land and water uses and natural resources of its coastal area; and, 3) for New York to agree or disagree with the Corps' consistency determination pursuant to 15 CFR Part 930 Subpart C."

S1-2

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The Department would like to make the following comments regarding the DEIS document's coastal policy analysis in Appendix B:

In the analysis of New York State Coastal Management Program (NYS CMP) and New York City Local Waterfront Revitalization Program (NYC LWRP) Policy #2, the New York District should describe how channel improvements could assist placement of water-dependent facilities adjacent to coastal waters. There appears to be insufficient substantiation of the District's statement that channel improvement would assist placement of water-dependent facilities and further elaboration is needed. Additional information provided in the statement of consistency with NYS CMP Policy #2 should also demonstrate how the preferred alternative would be consistent with this policy by including cross-references to the body of the DEIS and by identifying additional studies (including the anticipated CPIP) which may identify water-dependent maritime development in areas to be served by improved federal channels (e.g. the NYC Economic Development Corporation's Strategic Plan for the Redevelopment of the Port). S1-3

NYS CMP and NYC LWRP Policy #3: While no direct development plans are included in the feasibility report, or the preferred alternative, for the New York/New Jersey Harbor Navigation Study, the Reauthorization Amendment of the CZMA (1990) specifically requires that cumulative and secondary effects be considered in determining the consistency of an action with a state's approved coastal management program. It is possible that any federal navigation improvements in New York Harbor will result in collateral upland development of water-dependent maritime land and water uses. This potential should be further explored and the District should consider expanding its analysis of the consistency of the proposed activity with NYS CMP and NYC LWRP Policy #3. S1-4

NYS CMP and NYC LWRP Policy #4: The statement, " ... keeping the Port of New York and New Jersey the dominant center for the receipt and shipment of petroleum and container cargo on the east coast." precludes identifying the Port of New York as a "small harbor," as defined by the NYS Coastal Management Program. Therefore, Policy #4 does not apply to the Navigation Study, however, the analysis used for Policy #4 could be incorporated into the District's analysis of Policy #3. S1-5

NYS CMP and NYC LWRP Policy #5: The improvement of federal navigation channels will result in sustaining and improving the movement of cargo (primarily) into the Port of New York. The existing infrastructure in New York will be required *cet. par.* to accommodate existing levels of cargo movement, as well as, future increases in cargo movement volume that are directly or indirectly attributable to improvement in navigation facilities and at existing port facilities, expanded facilities, new facilities and within the surrounding upland cargo transportation system. Projects and activities which result in an increase in port facilities' capacity for cargo, or the improvement in the movement of cargo into the Port, which cannot be supported by the existing infrastructure system may not be consistent to the maximum extent practicable with NYS CMP and NYC LWRP Policy #5. This issue needs to be explored in much greater detail. The New York District may wish to cite existing or proposed plans and studies which attempt to address the infrastructure shortcomings in the Harbor such as the Cross Harbor Freight Movement Major Investment Study (MIS) in its evaluation of NYS CMP and NYC LWRP Policy #5. S1-6

NYS CMP and NYC LWRP Policy #12: The last sentence in the District's assessment of Policy #12 should be revised to include references to applicable New York State standards and regulations (where appropriate) for the mitigation of potential project impacts to natural protective features as well as proposed mitigation plans for shoreline stabilization. S1-7

NYS CMP and NYC LWRP Policy #14: The intent of Policy #14 is to prevent increases in potential damage which may result from flooding and erosion due to any development activities, and not solely as a result of the construction or reconstruction of flooding and erosion protection structures. If flooding and erosion increases result in damage from development which was directly attributable to federal navigation improvements, Policy #14 requires that such measurable increases not be allowed to occur. Erosion from larger vessels which may use federal navigation facilities after deepening must be addressed in the context of Policy #14. S1-8

NYS CMP and NYC LWRP Policy #15: Wherever possible, and in conformance with the strategies and methodologies identified in the Dredged Material Management Plan for the Port of New York, suitable material removed from the federal channels during deepening operations may be beneficially reused for beach nourishment and re-introduction into the littoral transport system. S1-9

NYS CMP and NYC LWRP Policy #17: The District's policy assessment should also consider the effects of vessel wakes on undeveloped shorelines and how any adverse impacts of vessel wakes may be mitigated by non-structural measures to control flooding and erosion. Such measures may include limits on vessel speeds in certain areas, or the enhancement of vegetated shorelines as identified in preliminary mitigation proposals. S1-10

NYS CMP and NYC LWRP Policy #19: The Corps' policy evaluation should provide additional detail on how the recommended plan would not interfere with, or reduce, the existing levels of access to public, water-related recreation resources and facilities throughout the Harbor. Public recreational access includes boating within the Harbor in addition to shorefront access for passive public recreation such as fishing, and active shorefront access such as swimming. An assessment of each type of recreational access should be included. S1-11

NYS CMP and NYC LWRP Policy #24: New York Harbor does not feature designated Scenic Areas of Statewide Significance (SASS). Therefore, Policy #24 does not apply at this time. The statements made for CMP Policy #24 could be used in determining the consistency of the proposed Navigation Study with NYS CMP Policy #25, which states: "Protect, restore, or enhance natural and man-made resources which are not identified as being of statewide significance, but which contribute to the overall scenic quality of the coastal area." S1-12

NYC LWRP Policy B: The assessment of this policy states that " ... no specific land use and development projects are associated with the proposed channel improvements." But, the substantial federal navigation improvements evaluated in the New York/New Jersey Harbor Navigation Study will likely result in additional, indirect upland development at certain locations. The Congressional conferees' report on the Coastal Zone Act Re-authorization Amendment of 1990 stresses that a federal agency determination of potential effects to a coastal state's land and water uses and natural resources should be "construed broadly" to determine effects which the federal agency may reasonably anticipate as a result of its [proposed] action, including cumulative and secondary effects (emphasis added). S1-13

The Department of State would also like to use this opportunity for suggesting that the improvement and expansion of public use of the shoreline and water in New York Harbor be considered as potential mitigation of project impacts in addition to the functional value replacement mitigation already under consideration.

When a Final EIS and Final Feasibility Report are prepared and submitted to the Department of State, together with the New York District's complete consistency determination and an executed memorandum of understanding for the undertaking of a study of comprehensive port development, the Department of State will review the proposal for its consistency with the New York State Coastal Management Program, and agree or disagree with the Corps' consistency determination.

If you have any questions, please feel free to telephone me at (518) 402-3399.

Sincerely,

Vance A. Barr
Coastal Resources Specialist

VAB/jma

cc: NYS DEC II - C. deQuillfeldt
NYC WRP - W. Woods
NYS ESDC - J. Hector
NYS DEC - J. Ferguson

RESPONSE TO COMMENTS

S1 New York State Department of State, Division of Coastal Resources

S1-1

Comment noted.

S1-2

The statement in the third paragraph on page B-1.7a-1, Appendix B has been modified to read as recommended.

S1-3

As recommended, cross-references to the body of the EIS and additional Port improvement and planning studies have been identified to help demonstrate the proposed project's consistency with this policy. The policy evaluation has been updated to describe how channel improvements could assist placement of water-dependent facilities adjacent to coastal waters.

S1-4

Cumulative impacts are addressed in Section 6 of the FEIS. The policy evaluation has been expanded to include this material.

S1-5

As recommended, the statement "...keeping the Port of New York and New Jersey the dominant center for the receipt and shipment of petroleum and container cargo on the east coast" has been removed and incorporated into the NYS CMP Policy #3 evaluation. The NYS CMP Policy #4 evaluation has been updated to reflect that this policy does not apply to the proposed project.

S1-6

Additional information on plans and studies that address infrastructure shortcomings in the Harbor is provided in the discussion of Cumulative Impacts (Section 6).

S1-7

The policy evaluation has been revised to include references to mitigation requirements specified under the Council on Environmental Quality (CEQ) Regulations for Implementing NEPA (40 C.F.R §1500-1508) and paragraph 7-35 of USACE Engineering

Regulation (ER) 1105-2-100. Reference to mitigation requirements, as discussed in the Mitigation Alternatives Report summarized in Section 7, has been added.

S1-8

As recommended, the statement "The proposed project does not include the construction or reconstruction of erosion protection structures." has been removed. Bank/wetland erosion is not expected to increase as a result of the proposed project. Under future with project conditions the impact of ship wakes may, in fact, decrease due to the overall decrease in the number of ship calls over the life of the project. The policy evaluation has been updated to reference the discussion of analytical modeling results of projected ship generated waves for larger draft vessels found in Appendix B-1.1.

S1-9

Beach nourishment and shoreline stabilization were identified as potential beneficial-use alternatives of excavated material from the proposed project (see Section 7). The policy evaluation has been updated to reference this discussion.

S1-10

The policy evaluation has been updated to consider the effects of vessel wakes on shoreline erosion and references the discussion of analytical modeling results of projected ship generated waves for larger draft vessels found in Appendix B-1.1.

S1-11

The proposed plan recommends deepening of existing channels. The deeper channels are not expected to impact recreation. The CMP document includes additional information.

S1-12

As recommended, the policy evaluation has been edited to reflect the lack of scenic areas of statewide significance in New York Harbor. Statements evaluating potential impacts to the overall scenic resources and quality of the project area have been incorporated into the NYS CMP Policy #25.

S1-13

The likely cumulative and secondary impacts are discussed in Section 6. This discussion also identifies other proposals concerning Harbor infrastructure. The relationship between these effects and those that will be addressed in the CPIP is described in the CMP document.

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John P. Cahill
Commissioner

November 19, 1999

S2

Thomas J. Shea, III
Project Planner, Flood Control & Navigation Section
New York District, USACE
26 Federal Plaza, Room 2145
New York, NY 10278-0090

Re: Draft Feasibility Report and Draft Environmental Impact Statement
New York and New Jersey Harbor Navigation Study

Dear Mr. Shea:

The Department of Environmental Conservation provides the following comments on the referenced documents:

Main Report

Page 104, Section 288:

The fourth sentence of Threatened and Endangered Species, refers to suspended sediment as a temporary potential impact and asserts that removal of contaminated sediment can offset this effect. The impact to the final resting place of such re-suspended sediments should be given equal consideration. S2-1

Page 107, Section 308:

The observation is made here that re-suspended sediments from dredging may not be very different than typical Harbor re-suspension events caused by storms. It should be noted that storms typically re-suspend surficial sediments, while dredging activities can re-suspend deeper and potentially more contaminated sediments. S2-2

Environmental Impact Statement

Page 2-7, Section 2.29:

In this section of the Projected Environmental Impacts which addresses the KVK there is a littoral zone impact, and yet this paragraph has the same wording as the previous section following the description of the Ambrose Channel, which has no associated tidal wetlands impacts. For project areas where there is an expected impact, the ensuing paragraph should specifically describe the potential impact. S2-3

Page 6-2, Section 6.5:

This section states that the predicted water surface elevation change will be ≤0.4" (~10mm). (the description of how this value was derived was cited as being in Appendix B, which is not available for review at this time) No discussion of impacts from this increase are presented. This represents a significantly greater increase in local sea level than would ordinarily occur from ongoing sea level rise (~3mm/yr). Impacts, particularly to vegetated wetlands, should be discussed. S2-4

Pages 6-2 and 6-3, Sections 6.7 and 6.8:

These sections discuss shoreline erosion from wind generated waves and vessel wakes. Again, the conclusions are supported by studies that are attributed to Appendix B, which was unavailable for review. The prediction in Section 6.8 that there may be a reduction in wake energy, is based not only on the unavailable modeling, but also on a claim of reduced number of vessel trips, which is also apparently supported in Appendix B. S2-5

Page 6-4, Section 6.13:

Until the issues of surface level rise and wake erosion are fully described, the claim in this section of no impacts to Arthur Kill wetlands is unsupported by data. This should be reevaluated when the above two comments are addressed. S2-6

Page 6.8, Section 6.37:

Cites DOH health advisories closing commercial and recreational crab and shellfish fisheries in the study area, and specifically in the KVK and Arthur Kill. This is an inaccurate statement: the Kills are closed to shellfishing as they are classified as uncertified waters by DEC. The Kills are not closed to recreational crabbing, but DOH does recommend limiting consumption of crabs taken from these waters. S2-7

Page 7-1, Section 7.2:

Again, claims of no impacts to intertidal wetlands are unsupported and should be reevaluated when the issues of surface level rise and wake erosion are fully described. S2-8

Seasonal Restrictions

Section 7.8 in the Mitigation Techniques chapter generally describes a number of resources that may require imposition of a seasonal restriction. Section 8.6 discusses BMPs for project implementation, and again recognizes the possibility that multiple restrictions may be applied. However, in Section 9.1 (the chapter on State Permits and Approvals) the Corps concludes that no seasonal restrictions will be required, citing, among other things, a detailed review of data collected for this study. This data has not been made available for review. DEC's determination concerning the necessity for dredging windows will come after an opportunity to review all available information. S2-9

Chapter 7 - Mitigation

The adequacy of the Corps' mitigation proposals cannot be fully determined until we've had an opportunity to review the Mitigation Alternatives Report, expected out in the coming weeks. S2-10

Page 8-2, Section 8.6, Bullets on Dredging Practices and Barge-Overflow:

These refer to operational restrictions that may be employed under certain conditions. These conditions will be similar in each case (i.e., when handling fine-grain, contaminated material), but these bullets use different language to indicate when these restrictions would be implemented ("unconsolidated sediments" for dredging vs. "contaminated material" for overflow). This inconsistency should be removed. S2-11

Page 8-3, Section 8.6, Bullet on Dredging Inspector:

In addition to the responsibilities of the inspector at the HARS, the Inspector will also be required to monitor activities at the dredging site to ensure all BMPs and Water Quality Certificate conditions are followed. S2-12

Section 8.4:

This section should include post-construction monitoring to verify the predictions of the various models (i.e., surface water elevations, water quality, wake impacts). S2-13

Page 8-5, Section 8.13:

The first statement states that the existing information to define pre-project conditions is considered to be sufficient. Yet, further down in 8.14, it is stated in the *Preconstruction* bullet that baseline information will include ongoing studies and monitoring. Since DEC has not yet seen the results of these studies, and project-specific plans have not yet been prepared, we would like to have the opportunity to review the adequacy of the pre-project condition information at that time, and have the EIS so provide. S2-14

Page 9-2, Section 9.5, 3rd bullet on page:

Continue the last sentence to include, "and broken down into the estimated amounts of each sediment type (i.e., by grain size and classification)." S2-15

The Department appreciates the Corps' efforts in coordinating preparation of the Harbor Navigation Study and we encourage the Corps to continue this as development of specific aspects of the study takes place. If you have any questions regarding these comments please contact me at 518/457-0782, or Steven Zahn at 718/482-6464.

Very truly yours,

John J. Ferguson
Environmental Analyst 3

cc: S. Zahn

RESPONSE TO COMMENTS

S2 New York State Department of Environmental Conservation

S2-1

The impact to the final resting place of re-suspended sediments is discussed in the FEIS under "Biological Exposure Potential." The document states, "In the areas adjacent to the channels, where suspended sediments from dredging are expected to be deposited, exposure of benthic invertebrates is also not expected to increase significantly since the sediments in the channel bottoms are expected to be similar to or cleaner than the surrounding sediments." The Environmental Analysis section of the Main Report is only intended to provide a summary of the environmental impacts. Since the details of the environmental analysis are contained in the FEIS, no revisions to paragraph 288 have been made.

S2-2

Again, the intent of the Environmental Analysis section of the Main Report is to provide a brief summary of the environmental analysis; the details are provided in the EIS. In paragraphs 6.53 through 6.55 of the FEIS, a study conducted at Howland Hook is summarized, in which TSS measurements in the Arthur Kill directly after the passage of barge traffic were similar to or higher than TSS measurements during dredging. In addition, in paragraphs 6.62 through 6.64 of the FEIS, two additional studies are summarized in which contaminant profiles of sediment cores collected from channel bottoms in the Harbor indicate that contaminant concentrations remain constant or decrease below the mudline. Therefore, no revisions were made to paragraph 308.

S2-3

The impact has been described in the FEIS.

S2-4

Appendix B was included in the DEIS submitted (DEIS Appendix B Technical Appendices) and was available to the commentor.

The FEIS text will be revised to reflect the model results that actually only show a rise of 5mm or less under a low flow condition. The statements included in the DEIS were only intended to communicate that the elevation changes are relatively small. We acknowledge that the upper limit of changes are on the order of the yearly sea level rise of 3mm/year. However, the reported increases are only for a few locations and for a specific hydrologic condition. Additionally, some model runs have been made for other flow conditions that show little or no changes in water surface elevation.

Even if the water surface elevations did change as much as 5mm/year in some distinct locations, this change would constitute only a slight acceleration in the inevitable sea level rise (.i.e. the changes in water surface elevation due to sea level rise would occur 1 to 2 years earlier than without the project). This change is judged to have a very minor impact on vegetated wetlands.

S2-5

Appendix B of the DEIS was included in the DEIS submitted (DEIS Appendix B Technical Appendices) and was available to the commentor.

S2-6

See response to S2-5.

S2-7

Although it is true that the NY Department of Health recommends limiting the consumption of crabs taken from the Kills, the NJ Department of Environmental Protection prohibits consumption of crabs taken from these waters. A conservative statement with regard to this topic was considered prudent, however the difference in advisories according to state jurisdiction has been noted in the FEIS.

S2-8

This subject is covered in Appendix B-1.1 and under item S2-4 above.

S2-9

Information and the assessment of seasonal restrictions on deepening activities have been updated to include information from the Biological Monitoring Program completed in September 1999. See Appendix B-1.2 for a summary report on the baseline Biological Monitoring Program. Preliminary conclusions in the draft document are based upon historical seasonal restriction practices in the harbor.

S2-10

The FEIS provides discussion of the preliminary mitigation plan. The mitigation plan has been completed and will be discussed with the resource agencies.

S2-11

The text has been edited as suggested.

S2-12

The HARS inspectors are specifically trained and hired for a specific task. BMP's and WQC constraints are ensured by enforcement of the contract, where the Contract will specifically require these items. The Contractor is required to implement a quality control program to ensure the contract is met. The Corps of Engineers has the responsibility to inspect the contractors quality control program and take appropriate actions as needed for failure to comply with the contract. Text in Section 8.6 changed to read "enforcement of the use of Best Management Practices and Water Quality Certificate conditions will be accomplished by including them in the construction contract, which is enforced by the Corps of Engineers." In addition, the Districts own Quality Control Plan requires that the Planning Division review each set of construction plans and specifications to ensure that all applicable permit requirements have been incorporated,

S2-13

Inasmuch as physical parameters are commonly collected during biological surveys, verification of the modeling predictions can be incorporated in the Biological Monitoring program. The data will be collected and consolidated into a single document for use by future models

S2-14

The Pre-Project condition information is provided in Appendix B-1.2, a summary report on the baseline Biological Monitoring Program. This information has been updated to reflect completion of the program in September 1999.

S2-15

The text has been edited as suggested.

State of New Jersey
Department of Environmental Protection

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

November 22, 1999

S3

Mr. Frank Santomauro, Chief
Planning Division
U.S. Army Corps of Engineers, New York District
Jacob K. Javits Federal Building
New York, New York 10278-0090

RE: Draft Feasibility Report for New York and New Jersey Harbor Navigation Study and Draft Environmental Impact Statement (September 1999)

Dear Mr. Santomauro:

The Office of Coastal Planning and Program Coordination and the Office of Dredging and Sediment Technology of the New Jersey Department of Environmental Protection have completed an initial review of the Draft Feasibility Report for New York and New Jersey Harbor Navigation Study (HNS), and its associated Draft Environmental Impact Statement (DEIS) and Technical Appendices (TA). This review was conducted pursuant to the requirements of the National Environmental Policy Act.

The New Jersey Department of Environmental Protection (Department) remains committed to maintaining the viability of the Port of New York and New Jersey (Port), and permitting necessary and environmentally sound expansion. This goal is clearly articulated in the eight basic coastal policies that guide the Department's federally approved Coastal Zone Management Program. However, the HNS and the DEIS lack sufficient detailed information in several key areas to allow a comprehensive review of the potential benefits and adverse impacts of the proposed project.

Without Project Condition

The basic premise of the HNS is that the Port will continue to expand at a rate of 2 to 3 percent per year over the planning horizon (Year 2060), with or without the proposed 50-foot deepening project. Therefore, it is concluded that the 50-foot deepening project will not induce additional commerce to the Port. The proposed 50-foot deepening project would allow larger container vessels to navigate the harbor fully loaded, resulting in a calculated per container cost savings when compared with existing shipping practices. Benefits of the project have been assessed by multiplying the per container cost savings by the maximum number of containers that can be accommodated at existing terminal areas, with projected improved container handling efficiencies in the future. This projected scenario raises a number of questions and concerns relating to potential secondary impacts resulting from the proposed project, and the economic justification for the proposed project.

S3-1

The HNS recognizes that the growth in Port commerce projected over the study period in the Without Project Condition would result in a six-fold increase in container vessel transits in the New York Harbor, and that this increase cannot be safely accommodated by the existing channels. It is stated (page 45, para. #147) that such an increase "may not be physically possible and certainly would pose a grave increase in the probability of accidents". It should be noted that this assessment does not substantively consider any additional future increases in petroleum and bulk cargo transits to the Port. The Port of New York-New Jersey is the number one oil and petroleum products port in the nation. The HNS and DEIS only briefly address the potential impacts (positive or negative) on the oil and bulk commodity industries in the harbor that could result from the proposed channel deepening

Thus, given the information presented in the HNS, at the present time the Department can only conclude that additional navigational channel improvements will be needed to safely accommodate the projected increases in vessel traffic in the Port. Therefore, the basic premise of the HNS Without Project Condition is incorrect: if navigation channel improvements are not made, growth in Port commerce will be constrained. Thus, there are potential secondary impacts resulting from landside development induced by the proposed channel deepening which must be evaluated.

Secondary Impacts

The HNS also incorrectly relies on the projected increase in Port commerce in the Without Project Condition, and its conclusion that Port terminal expansion is unnecessary for economic justification, to avoid an analysis of potential secondary impacts which could result from the proposed project. This approach assumes that terminal area is the limiting factor in determining how many containers can move through the Port. As noted above, the capacity of the existing navigation channels also is a limiting factor. In addition, the HNS fails to consider another key component in the movement of goods through the Port that may impose greater limits than the terminal acreage or navigation channels: the regional inland transportation infrastructure system and associated traffic conditions surrounding the port area. In fact, the HNS simply assumes that the "inland transportation network is expected to grow independent of the Harbor deepening, therefore, no additional analyses of inland infrastructure was warranted" (page 4, para. #11).

Using the projections included in the HNS (see Attachment #1), by the year 2060 an additional 19,000 trucks per day would have to be accommodated on the roads leading into and out of the Port's terminals and on the regional transportation system. It should be further noted that these would be one-way trips. The HNS/DEIS has not provided any information concerning the capacity of the regional road network, in and around the Port, to handle this additional traffic. Nor has the HNS/DEIS evaluated the potential air quality impacts of this increase in truck traffic.

S3-2

In several places the HNS and DEIS address the non-Federal partner's concept of capturing additional cargo. In contrast to the assumptions used in the HNS, information previously presented to the Department in various meetings predicted that 50-foot channels would

increase the container traffic through the Port and the demand for terminal acreage. To the extent that the deeper channels contribute to attracting additional commerce which might have gone elsewhere, the secondary impacts induced by that additional cargo including, but not limited to, traffic, air quality, and terminal expansion, must be addressed in the DEIS.

The HNS and DEIS also project that Port terminal expansions will be required at several locations, in both the With and Without Project Condition. Consequently, these expansions are reasonably foreseeable and must be addressed under the federal requirements for assessing cumulative impacts at 40 C.F.R. §1508.7, and the Department's Rules on Coastal Zone Management at N.J.A.C. 7:7E-6.3. Consequently, consistency with New Jersey's federally approved Coastal Zone Management Program cannot be determined until the potential secondary impacts from these terminal expansions have been addressed.

At the present time, the Department is not convinced that the only opportunities for future Port terminal expansion involve filling hundreds of acres of water area. Filling water areas for terminal expansion would only be considered if there were no available alternatives with less environmental impact, and provided that the fill would not result in significant adverse impacts to the estuarine ecosystem. Numerous alternatives to filling water areas presumably exist, including, but not limited to, reconfiguring the Port, reclaiming and utilizing existing brownfields, and short haul rail to central distribution points located west of the Port. The Department has not begun to evaluate the alternatives to in-water fills, nor any potential associated impacts. Consequently, the suggestion that Port terminal expansion can only be accommodated through fills is premature.

"Alternate sites for, or means of, commerce delivery" are briefly addressed in the HNS (page 55, para. #169), where it is simply concluded that implementation of "outside the Port" alternatives is not "likely". The Department agrees with this conclusion regarding the 70% of Port commerce that is distributed within the 31-county metropolitan area. However, approximately 30% of the containers shipped through the Port do not have final destinations within this region. Such containers would not necessarily have to be transported back to the region by road or rail, depending on the economics involved in transporting the containers to their final destinations. The potential use of "inland port" sites should also be addressed in the HNS/DEIS.

Construction Impacts and Dredged Material Management

Neither the HNS nor the DEIS are clear with respect to channel depths and needed "overdredging." The Department understands that the proposed construction depth is 52 feet and the proposed maintained depth is 50 feet. However, it is unclear whether overdredge has been factored into these numbers. Habitat impacts in the DEIS have been calculated based on a -52 foot bottom contour. If an additional 2 feet of overdredge is to be allowed, then the habitat impacts need to be recalculated to account of additional side slope impacts. Hydrodynamic, water quality and sedimentation models seem to have been run using an assumed depth of –50 feet in the with project condition. The rationale for selecting –50 feet appears to be that this would represent the long-term condition as the maintained channel depth. Given the predilection

S3-3

toward overdredging as a means to reduce the frequency and long term costs associated with channel maintenance, the Department questions whether the model is truly representative. Further, if this project is to be constructed at –52 feet plus 2 feet of overdredge, then the impact of an additional four feet of dredging would have to be considered by the model results. Lastly, if overdredging is anticipated, an additional significant volume of dredged material will need to be managed by the proposed New York New Jersey Harbor Dredged Material Management Plan (DMMP). The Department urges the Corps to clearly and consistently articulate anticipated construction depths (including overdredging) throughout the HNS and DEIS, and to assess the project's impacts on that basis.

The HNS/DEIS also references the proposed DMMP as identifying the alternatives that will be implemented to manage the dredged material to be produced as a result of the construction and lifetime maintenance of the proposed deepened channels. Therefore, the HNS/DEIS cannot be finalized until the DMMP has been approved and a Record of Decision issued on its associated Final Environmental Impact Statement. The Department notes that the comment period on the Draft DMMP has been extended until December 3, 1999 (see the November 9, 1999 letter from Lawrence Schmidt). S3-4

The HNS also makes reference to the use of Sub-channel Placement Cells (SPCs) as the preferred method for managing material unsuitable for HARS remediation. This is inconsistent with the DMMP, which recommends beneficial use of dredged material and disposal only of material that cannot be beneficially used. The HNS needs to be revised to reflect current dredge material management practices and ideology. S3-5

A more detailed technical analysis of each of these deficiencies is attached to this letter, together with other technical comments. Additional technical comments may be forthcoming under separate cover. Should you have any questions regarding these comments, please do not hesitate to contact the Office of Dredging and Sediment Technology at (609) 292-8838 or the Office of Coastal Planning and Program Coordination at (609) 292-2662.

Sincerely,

Lawrence Schmidt
Director
Office of Coastal Planning and
Program Coordination

Lawrence J. Baier
Chief
Office of Dredging and
Sediment Technology

c: Frank McDonough, Director, New Jersey Maritime Resources
Beverly Fedorko, Special Assistant to the Commissioner

Attachment #1

Calculation of Future (Year 2060) Increases in Regional Truck Traffic Due to Port Expansion

Assumptions:

- The "region" is defined as the 31-county metropolitan area.
- All containers delivered to an ultimate destination within this region will be via truck.
- 70% of Containers delivered to the Port have ultimate destinations in the region (page 34, para. #119)
- Each container will require one truck.

From page 45, paras. # 144 and #146:

- Existing (Year 1997) containers shipped to the Port = 1,300,000 per year
- Projected (Year 2060) containers shipped to the Port = 11,200,000 per year

Therefore, additional containers to be shipped to the Port = 9,900,000

9,900,000 * 0.70 = 6,930,000 containers

6,930,000/365 days = 18,986 containers/day

Attachment #2

Harbor Navigation Study -Technical Analysis

Secondary Impacts

Both the HNS and the DEIS conclude that secondary impacts, particularly regarding landside improvements, will not accrue from the recommended deepening plan (HNS pages 37, 99, 105; DEIS page ES1-1). The New Jersey Department of Environmental Protection strongly disagrees.

The premise for the argument advanced in the HNS and DEIS is that port commerce will increase at two to three percent per year even if the channels are not deepened, with container traffic through the port reaching 11.2 million containers (19 million twenty-foot equivalent units, TEU) by the year 2060 (HNS page 45). However, the HNS states on page 45:

> *By 2060, the number of vessel passages required to transport cargo through the Port would be six times the number required in 1996 if channels were not deepened and there was no concomitant change in the vessel fleet. Some of the containerships that currently utilize the Port Jersey Channel the Kill Van Kull and the Arthur Kill can do so now only under favorable tide conditions. To increase the number of vessel passages during the period of favorable tide by a factor of six or more may not be physically possible and certainly would pose a grave increase in the probability of accidents.*

[Note: these capacity and safety concerns would be further magnified by increases in petroleum and bulk cargo vessel use of the Port.]

This paragraph gives clear indication that deepening the Port to 50-feet will increase the ability of the Port to handle cargo, and in fact may be required for additional commerce beyond some unidentified level.

At the same time the DEIS states, "Non-federal partners have advanced the concept of capturing additional commerce, which will require expansion of existing terminal areas." (DEIS pages ES1-3, see also page 6-9 and HNS page 99). There is little doubt that offering 50-foot channels in the NY Harbor will give the Port a competitive advantage in its attempt to capture additional commerce. This is further bolstered by Figure 24 on page 71 of the HNS which identifies "Portion of Demand Expected to **Require** Channel Depths >45 ft MLW" (emphasis added). [Note: if this figure is indeed correct and <u>any</u> of the expected demand <u>requires</u> channel depths greater than 45 feet, deepening the channels will induce commerce, and the Without Project Condition is invalid.]

Page 34 of the HNS indicates that 30 percent of the containers moving through the Port originate in, or are destined for, the hinterland region. This cargo is not necessarily tied to the Port by location. Therefore, if the channels were not deepened this volume may go elsewhere in the without project condition. No realistic assessment of this potential has been made.

Based on the above paragraphs, there is little doubt that 50 foot channels increase the ability of the Port to accommodate additional container traffic. Consequently, secondary impacts associated with that increased container traffic must be assessed.

Current growth projections predict that commerce through the Port will double by 2015, from 2.4 million TEU (HNS page 37) to 4.8 million TEU (HNS page 11). The available land area at existing container terminals, including conversion of 200 acres at the Military Ocean Terminal Bayonne (MOTBY) and reconfigurations contemplated at the other Port facilities, yield an available 1677 acres (HNS Table 3, plus Figures 17, 18 and 19). Throughput efficiency is projected to increase by 2 percent per year (HNS page 39) yielding approximately 2018 lifts per acre in 2015 ($1500 \times [1 + .02]^{15}$), or 3430 TEU per acre per year. Based on these projections, the total capacity of existing upland Port facilities in 2015 is projected to be 5.7 million TEU. Consequently, landside facilities at the Port cannot accommodate the projected growth in 2015. In the year 2060 Port demand is projected to increase to 19.1 million TEU, while total capacity of existing upland Port facilities is only 10 million TEU (9.562 million TEU verified in TA Table 30, page D64). These numbers clearly demonstrate that expanding Port acreage may be a significant secondary impact associated with this project. However, neither the HNS nor the DEIS have evaluated these potential impacts.

To further illustrate this point, a previous analysis performed by the Port Authority (presented to the Dredged Material Management Integrated Work Group on May 3, 1999) estimated that 2,000 acres of terminal area would be needed to accommodate container projections for a 45-foot channel in the year 2040, 2,400 acres would be required in 2040 for a 50-foot deep Port, and 2,800 acres would be required for a 50-foot deep Port with a Port Inland Distribution Network (PIDN). It is unclear why this information has been abandoned in the HNS and the DEIS.

Another major secondary impact that must be assessed is the project's potential impact on traffic and air quality. Page 6-21 of the DEIS concludes that no cumulative air quality impacts are attributable to this project. The New York metropolitan area is currently a non-attainment area for air quality. The HNS reports that 70 percent of all containerized traffic entering the Port is destined for, or originates in, the 31 county metropolitan area (page 34). Given that short haul (less than 100 miles) transportation by rail is not economically justified, the assumption is that 70 percent of the total containers will enter or leave the port by truck (further supported by Table 12 in the TA, page D27). Assuming one container (lift) per truck, the increase in traffic in 2015 will be 988,000 additional trucks per year (1.4 million lifts x .70 / 365 days), or 2,706 additional trucks per day concentrated in the Port area. Based on the assumptions in the HNS of no terminal expansion, and productivity increases of 3,500 lifts per acre, the number of additional trucks per day is 8,763 ([1677 acres x 3,500 lifts per acre per year] –1.3 million existing x .7 by truck / 365 days per year). Taking the 2060 projection of 11.2 million containers would yield an additional 18,986 trucks per day ([(11.2m-1.3m) x .7] / 365). It does not appear that this additional volume of truck traffic could be accommodated on the regional road network, and would result in the deterioration of air quality in the region. These potential impacts have not been evaluated in the HNS nor the DEIS.

"Cumulative impact" is defined in 40 CFR §1508.7 as

> *the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.*

In several places both the HNS and the DEIS recognize the need for future port terminal expansion (HNS pages 37, 38, 41, 99, 105; DEIS pages ES1-1, ES1-3, 4-2, 6-9, 6-21), and even quantify the acreage needed (HNS Table 6). By its own admission, future terminal expansion is reasonably foreseeable by the Corps and the impacts associated with that expansion must be addressed in the DEIS. In addition, increased truck traffic from terminal areas is foreseeable and should be addressed in the context of this DEIS. This is not to say that the Corps is responsible to mitigate those actions, but that it must assess this project's role in shaping when and where future terminal expansion occurs and the associated impacts.

Economic Analysis

The economic analysis provided in the HNS and Appendix-D Economics (TA) is confusing and does not provide sufficient information to verify the conclusions in the HNS. The premise of the economic analysis is that the proposed 50-foot channels will generate no additional container traffic. The basis for all benefits derived from the project is the per container shipping cost reduction attributable to carrier efficiency. These efficiencies are further broken down, on page 73 of the HNS, into "Vessel Efficiencies" (benefits from shifting to larger vessels and efficient loads) and "Operational Efficiencies" (benefits of reduced tide and queuing delays). As presented, it seems that there may be some overlap between these efficiencies. There is a presumption that trends in the world fleet will continue to move toward larger ships, with or without this project (TA pages D49 through D54), and that those ships will be deployed along major and hybrid routes. Consequently, benefits derived from the shift to larger vessels (Vessel Efficiencies) do not appear to be attributable to this project.

The real benefit to the 50 foot deepening is that these vessels will be able to call on the Port fully loaded, eliminating light-loading or off-loading containers at other ports prior to calling on the Port of New York and New Jersey. But Tables 25, 26, 27 and 28 (TA pages D54 through D57) indicate that at 45-foot channel depths (the Without Project Condition) no cargo will enter the Port on ships with sailing drafts in excess of 43 feet. The Department questions the accuracy of this information in light of the fact that the *Regina Maersk*, with a sailing draft of 48 feet, has already entered the Port in a light-loaded condition. If the projections in these tables are accurate, then no operational benefits are attributable to this project. We do not believe this table to be accurate.

In numerous places throughout the HNS and DEIS, it has been stated that fills (Port terminal expansion) have not been included in either the Without Project or With Project Conditions (HNS pages 37, 38, 99; DEIS page ES1-1). While the Department agrees with this approach, the data provided is insufficient to verify this conclusion. For example, data in the TA is only provided for the Northern Europe Route. In Table 32 (page D66), the total weighted cost per TEU at 45 feet is $68.33 and the total weighted cost per TEU at 50 feet is $54.48. The cost savings per TEU in the With Project Condition is calculated by subtracting the With Project figure from the Without Project figure ($68.33 - 54.48 = $13.85 in savings per TEU). No information is provided for any of the other routes, so an exact computation of total project benefits cannot be accomplished. Therefore, rightly or wrongly, we are left to assume that this represents an "average" savings per TEU. Based on this assumption, the total project benefit would be calculated as the savings per TEU multiplied by the total number of TEU that can be accommodated by the Port without fills. The total number of TEU that can be accommodated annually without fills is 9,562,000 (TA, Table 30, page D64). This yields a total benefit of $129,851,960 per year. It should be noted that this figure is for the out years of the study and relies on a dockside efficiency of 3,500 lifts (or 5,950 TEU) per acre per year (which as of now is projected to be unattainable until years approaching 2040). Yet, Table 28 (page 115) in the HNS reports an annual transportation cost savings of $238,500,000. To arrive at this figure either the average cost savings per TEU would have to be $23.85 ($238,500,000/10,000,000 TEU), or the terminal acreage would have to be expanded to 2, 894 acres([$238,500,000/$13.85per TEU]/5950 TEU per acre). The Corps needs to provide a full explanation of how this figure was derived (TEU cost savings for all routes, total TEUs for those routes, and total terminal capacity assumed). Based on the figures provided, this would appear to be unattainable without the Port expansion that the Corps has claimed to be unnecessary to justify this project.

S3-6

Irrespective of the details of the economic analysis, the Department is unconvinced that terminal capacity is the sole limiting factor. No analysis has been performed to demonstrate that the regional road network can accommodate another 2,700 trucks per day concentrated in the port district, as projected for the 2015 condition, and an additional 8,763 additional trucks per day in the no fill scenario. It may well be that landside transportation capacity, not terminal capacity, is the limiting factor.

On the cost side of the equation, it is unclear whether the Corps has included all non-Federal costs associated with the deepened channels. For example, Table 26 of the HNS (page 112) includes costs associated with replacing bulkheads at Atlantic Salt and Richmond Terrace, and a wave screen at Elizabeth Marina. No investigation of the stability of other waterfront structures is indicated in the HNS. However, the General Design Memorandum for the Port Jersey Channel (U.S. Army Corps of Engineers, January 1992) concluded that the wharf occupied by Global Marine Terminals was only stable with an adjacent depth not to exceed –42 feet MLW, and that the MOTBY wharf was only stable with an adjacent depth of 45 feet MLW. Yet neither of these wharf repairs or reconstruction, necessitated by a 50-foot channel, seem to be included in the cost analysis. We further question whether the stability of waterfront structures at Port Elizabeth, and other terminals, have been studied, and if so whether appropriate costs have been included in this analysis.

Channel Depth

Both the HNS and the DEIS lack clarity on the issue of channel depth. In order to understand the recommended channel depth, it is first important to understand the design draft required. Page 58 of the HNS refers to Maersk "K Class" or equivalent as the design vessel. This page cites a sailing draft of 48 feet for this class of vessel, and a requirement for 2 feet of underkeel clearance in soft bottom channels and a 4-foot underkeel clearance in hard bottom channels. However, in a letter to Thomas Shea (U.S. Army Corps of Engineers), Maersk reports a requirement for 48 feet plus 4 feet while underway, and a berth depth of 48 feet plus 3 feet. If the vessel operator states this class of vessel requires 48 feet plus 3 feet of water while berthed, will it not also require additional depth for squat and trim plus additional underkeel safety while underway?

The answer to the foregoing notwithstanding, for the purpose of this discussion we assume the Corps figures to be correct (46 feet stationary and 48 feet underway). Page 59 of the HNS states that a 4-foot underkeel safety factor is required in most New Jersey channels, resulting in an unstated 52 foot channel. This 52 foot depth is stated or alluded to several times throughout the report (HNS pages 65, 85, 89, 131). However, these sections fail to address overdredge in the context of the actual depth excavated. Page 6-8 of the DEIS states that most channels would be overdredged by 2 to 3 feet, while page 65 of the HNS states that overdredge has historically averaged two feet. Neither report clarifies whether the "overdredge" is included in the 52 foot excavated depth. Is the actual construction depth likely to be –54 feet MLW? Therefore, we are left to infer that the project is really 50 feet + 2 feet hard bottom clearance + 2 feet of overdredge, resulting in a construction depth of –54 feet. S3-7

This distinction is particularly important in both planning for dredged material management and in assessing the project's potential impacts. The HNS does not account for overdredge in its quantification of dredged material, yet these volumes can be significant. Based on Table 9 of the HNS, an additional 2.2 million cubic yards of rock and an additional 11 million cubic yards of non-rock material may have to be managed due to overdredge. The Department questions whether this additional material has been included in the Dredged Material Management Plan for the Port of New York and New Jersey (DMMP, USACE, September 1999).

Also, regarding dredged material management, the HNS recommended plan includes deepening the Ambrose Channel to -53 feet MLW (page 89) and plans to manage 13 million cubic yards of sandy material from this deepening. The Department believes that this channel (or at least a portion of it), has already been deepened to –67 feet MLW by various ongoing sand mining activities. This may reduce the amount of dredging and dredged material that needs to be managed from this channel. This may also affect water quality modeling efforts already undertaken as part of the HNS. The Department recommends that the Corps verify existing depths in the Ambrose Channel. S3-8

The HNS states in several locations that the construction depth of the channels will be –52 feet MLW, but that the bottom 2 feet will be allowed to silt in over time, and that the maintained depth will be –50 feet MLW (pages 59, 85, 89). This is inconsistent with the DMMP (page 13), which recognizes overdredging as an intentional effort to reduce the frequency of future dredging operations, thereby saving mobilization costs for the dredge equipment over the long term. This inconsistency needs to be addressed by the Corps. S3-9

The confusion over channel depths may have also led to inaccuracies in assessing the project's potential environmental impact. An extremely complicated and comprehensive modeling effort was undertaken to estimate sedimentation rate changes and water quality impacts associated with the project (HNS page101). However, the channel depths used to run the model in the With Project Condition may not be appropriate. As the earlier discussion points out, the actual construction depth of several channels may be as deep as –54 MLW. However, model inputs for these same channels assumed a 50 foot channel depth (DEIS page B-1a-5). We do not know whether conclusions drawn from the model regarding water quality and hydrodynamics in the DEIS are flawed by this input (page 6-2). However, the DEIS does recognize that changing the channel depths will alter sedimentation patterns in the channels and in adjacent areas (page 6-20). Given that the impacts were calculated on a 50 foot channel and not a 54 foot channel, how reliable are the results of these models? S3-10

Direct habitat impacts have also been calculated incorrectly if an additional 2 feet of overdredge is anticipated. Preliminary plans used to calculate littoral and sublittoral habitat impacts were based on a 52 foot construction depth (October 1999). If the actual permitted construction depth is 54 feet, then the footprint at the top of the channel may increase by 6 or more feet on each side, depending on the substrate. S3-11

Lastly, impacts to submerged infrastructure and relocation costs cannot be accurately assessed unless the actual dredging depth is clearly stipulated.

Sub-channel Placement Cells

The HNS makes reference to the use of Sub-channel Placement Cells (SPCs) in Newark Bay as the NED option for managing dredged material that cannot be used to remediate the Historic Area Remediation Site (pages 93, 127). The HNS also states that the non-Federal partners agreed with this approach in a letter dated March 17, 1999. These statements are inconsistent with the DMMP, which advocates disposal of dredged material only when that material cannot be beneficially used. The DMMP and the State of New Jersey have identified significant capacity at upland beneficial use sites for the material generated by this and ongoing maintenance dredging projects in the Harbor. SPCs may be considered as a contingency, to be used only in the event that all beneficial use options are exhausted. The HNS needs to be rewritten to be consistent with the DMMP. S3-12

Port Terminal Expansion

In several locations the HNS and DEIS conclude that the future terminal expansion needed to meet projected Port growth must be accommodated by filling water areas (HNS pages 37, 38, 41; DEIS pages 4-1, 4-2, 6-21). The Department is unconvinced that the only opportunities for future Port terminal expansion involve filling hundreds of acres of water area. Filling water areas for terminal expansion would only be considered if there were no available alternatives with less environmental impact, and provided that the fill would not result in significant adverse impacts on the estuarine ecosystem. Numerous alternatives to filling water areas presumably exist, including, but not limited to: reconfiguring the Port, reclaiming and utilizing existing brownfields, and short haul rail to central distribution points located west of the Port. The Department has not begun to evaluate the alternatives to in water fills, let alone the potential associated impacts. Consequently, the suggestion that Port terminal expansion can only be accommodated through S3-13

fills is premature. These regulatory hurdles are acknowledged on page 42 of the HNS, but need to be stressed everywhere fills are mentioned. Further, expectations of regulatory approvals for fills here, based on regulatory history in California, are not appropriate and should be removed from the document (DEIS page 4-1 and 4-2). The regulatory analysis for decisions in California would have no application in New Jersey.

Technical Comments

HNS, page 37 – Paragraph 127 states that the non-Federal partners developed a Comprehensive Port Improvement Plan (CPIP). This statement is inaccurate, and conflicts with other sections of the HNS that correctly indicate that a Memorandum of Understanding (MOU) is yet to be signed to initiate the CPIP process (page 99). Also, see HNS page 41 (Paragraph 141), which actually states conclusions from a CPIP that has not yet been developed. **S3-14**

HNS, page 40 – The section on MOTBY indicates that a 130-acre container terminal will be developed on the MOTBY peninsula. The Department understands that the amended redevelopment plan being advanced by the Local Redevelopment Authority now includes 200 or more acres to be dedicated to container terminal development. The current acreage to be dedicated to maritime commerce should be verified. **S3-15**

HNS, page 65 – For planning purposes, overdredge should be included in the computation of dredged material volumes that must be managed for this project. **S3-16**

HNS, page 65 Table 9 and HNS, page 93 – The estimated quantities of dredged material for the construction of this project do not coincide. Also, why does Table 9 refer to maintained channel depths when the material quantities are based on constructed channel depths? **S3-17**

HNS, page 66 , Table 10 - the phrase "tipping fee" carries with it a strong solid waste connotation. Dredged material is not solid waste. An alternate wording for this cost such as "processing" or "placement cost" is preferred. **S3-18**

HNS, page 85 – Both paragraphs 232 and 233 describe impacts to the Jersey Flats. Please clarify whether these impact areas are distinct or one-and-the-same. **S3-19**

HNS, page 93 - Table 23 should be clarified with regard to maintenance dredging volumes. What does these volumes represent and how were they calculated? Based on the estimates provided on page B-1.5-3, the total annual increase of maintenance material unsuitable for HARS is 2,900 cubic yards, giving a 50-year total increase of only 145,000 cubic yards. Table 23 suggests 3,220,000 cubic yards of maintenance material over the 50-year life of the project. Likewise the HARS suitable numbers are not consistent. These tables need to be reconciled. **S3-20**

HNS, page 100 – Paragraph 274 states that sedimentation rates in the deeper channels will initially be greater than in other areas of the Harbor. Why only initially? Does this apply to all channels, or will some of the deepened channels actually scour? This needs to be explained. **S3-21**

HNS, page 102 – Paragraph 280 states that a portion of the disturbed littoral zone habitat may become permanently deeper than 6 feet. Why only a portion? Is it because part of the channel side slope will remain above the 6-foot depth? If so, has disturbance of the existing channel side slope above –6 feet been included in the calculation of littoral zone impacts? **S3-22**

HNS, page 102 – Paragraph 282 states that bottom habitats will quickly return to a similar substrate as exists currently. Given the large areal and temporal extent of the construction and maintenance dredging activities associated with the proposed channel deepening project, it would seem innappropriate to state that habitat losses in channel bottoms "would only be temporary". In addition, are there areas which are currently depositional, which under the with project condition will no longer be depositional (based on sedimentation models), resulting in a change from soft bottom to hard bottom or vice versa? If so, these areas should be identified and quantified. Also, see HNS, page 108, Paragraph 314. **S3-23**

HNS, page 121 – Paragraph 346 states that the maximum Federal share of the project costs below –45 feet is 50 per cent of the total project cost. Paragraph 347 states that the non-Federal share must be a minimum of 25 per cent. Who picks up the other 25 per cent? Is the distinction to be made that both of these figures are relative to the total dredging cost, as opposed to the total project cost, and that the other 25 per cent is credited for associated non-deepening costs such as utility movements? This section could be reworked to make the funding responsibilities clearer. **S3-24**

HNS, page 127 – This page states as many as six clamshell dredges could be working at any given time. Has any assessment of the cumulative impacts of that many dredges working in close proximity been completed? For example the cumulative total suspended solids, dissolved oxygen impacts, and other water quality impacts should be assessed and compared to the New Jersey Water Quality Standards. In addition, given the long timeframe for construction of this project (and the currently authorized -45 foot projects), it appears that high levels of dredging activity will be under way for 10+ years. This could result in continual, permanent impacts to water quality. **S3-25**

HNS, page 127 – This page assumes "No regulatory compliance testing will be required during construction for material which is unsuitable for placement at the HARS." Material unsuitable for placement at the HARS will presumably be used beneficially at an upland site. This material must be tested to assess its suitability for use at any given upland site. Does this statement intend to say that unsuitable material will not be tested? Please clarify. **S3-26**

HNS, page 127 - identifies only one environmental dredging window in the harbor. Additional restrictions are currently in place, and the construction schedule should be developed in consideration of them. **S3-27**

DEIS, pages ES-1 through ES-3 – Paragraph ES4 States that no Port facility expansions are attributable to channel modifications. Paragraph ES15 states that the non-Federal sponsors have advanced the concept of capturing additional commerce, which will require expansion of existing terminal areas. While it appears that some Port expansion would occur in the without project condition, it is abundantly clear that the deeper channels will allow more cargo to enter the Port and increase the competitive advantage of the Port. Consequently, it is probable that more commerce passes through the Port in the with project condition, thus requiring additional terminal acreage. Port expansion is undeniably a secondary impact of the deepening project. **S3-28**

DEIS, page 1-14 – The New Jersey State Regulations section titled "Tidal Wetlands" needs to be rewritten. This section has confused State jurisdiction over tidal wetlands and freshwater wetlands. For brevity, the Corps should eliminate the word "Tidal" from the section heading. Paragraph 1.52 recognizes the dual jurisdiction of the USACE and NJDEP over certain wetlands which could not be delegated. However, this paragraph concentrates on the USACE regulatory authority and not on the NJDEP authority. Please clarify this paragraph to make it clear that projects involving wetlands within 1,000 feet of tidal waters require both USACE and NJDEP permits. Also note NJDEP continues to use the 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands, as mandated by the New Jersey Freshwater Wetlands Protection Act. **S3-29**

DEIS, page 2-7 and 2-8 – These pages quantify project impacts on littoral and sublittoral shallow water habitats. It would be helpful in assessing cumulative and incremental impacts to know, in general terms, how much of each of these habitat types have already been lost to channel and port development relative to the remaining resource in each waterbody. This information could then be used to draw conclusions regarding the cumulative impact on the estuarine ecosystem. Such an analysis should be performed either here or on pages 6-3 or 6-18 as appropriate. S3-30

DEIS, page 4-1 through 4-4 – References to future Port expansion through fills should be balanced with other alternatives (eminent domain, brownfields, short haul rail etc.). References to Port expansion in California have no relevance here and should be eliminated. S3-31

DEIS, page 6-2 – the Hydrodynamics and Water Quality section should discuss the assumed channel depths used in the predictive model. The model used –50 feet in the proposed channels, but the Department believes that the actual construction depth will be –52 plus 2 feet of overdredge. What affect does this additional four feet have on the model? S3-32

DEIS, page 6-8 – Paragraph 6.36 states that the removal of hard-rock areas within the channels may have a permanent impact, being replaced with a soft sediment bottom. These areas should be identified and quantified, to further an analysis of impact on the estuarine ecosystem. S3-33

DEIS, page 6-9 – Paragraph 6.42 states that "Economic forecasts project that Port commerce will increase approximately 2 to 3 percent per year from its present 1500 lifts per acre to a maximum of 3500 lift per acre in the year 2040." This sentence has confused "Port commerce" with "Port efficiency." Total lifts is port commerce, lifts per acre is port efficiency. S3-34

DEIS, page 6-20 – As this section is intended to address cumulative impacts, paragraph 6.75 should address cumulative losses of shallow water habitat over time, and the effect on the estuarine community. S3-35

DEIS, page 6-20, Paragraph 6.77 - What channel depth was used to calculate sedimentation rates? S3-36

DEIS, page 6-21 – Paragraph 6.78 states that no cumulative impact to New York and New Jersey Harbor air quality is attributable to the proposed navigation project. If this project allows more containers to enter the Port, and 70 percent of those containers leave the Port by truck resulting in significant increased traffic local to the Port, how can we assume that no air quality impact is attributable to this project? The New York metropolitan area is a severe non-attainment area for air quality (NO_X, SO_X, O_3, CO). Secondary impacts from the deepening project must be addressed. S3-37

DEIS, page 6-22 – Paragraph 6.87 should identify and quantify changes in substrate based on sedimentation models. S3-38

DEIS, page 6-24 – Paragraph 6.93 identifies avoidance of winter flounder habitat during specified periods as a means to reduce potential impacts. However, I have found no commitment in the document to implement these timing restrictions. Please clarify whether critical winter / spring time periods will be avoided. S3-39

DEIS, page 7-5 – Paragraph 7.20 Please note that the State of New Jersey does not recognize filling dead end basins as a habitat enhancement. S3-40

DEIS, page 7-9 – Paragraph 7.41 Mitigation area ratios for habitat enhancement are generally 3:1 or greater, based on replacing equal ecological value. However, if equal value is demonstrated to be accomplished by a lesser ratio, then that lesser ratio will be accepted. However, mitigation must be of at least an equivalent acreage to the resource being lost. S3-41

DEIS, page 9-3 – Paragraph 9.9 states that because the channel improvements will require Federal approval, other state approvals will not be required per Section 307, so long as compliance with the state standards is demonstrated. This is not entirely accurate. Permits pursuant to State law are not required due to Sovereign Immunity afforded to the Federal Government. However, the project must comply with all Federal law including sections 307 of the federal Coastal Zone Management Act and Section 401 of the Federal Water Pollution Control Act (the Clean Water Act). S3-42

DEIS, page B-1.5-3 – The table representing estimated volumes of dredged material by category is said to include 2 feet of allowable overdredge, thereby representing the maximum volume of material to be dredged. Yet the volumes represented for rock and HARS suitable material are less than the volumes represented in Table 9 (HNS page 65), which states that it does not include overdredge. Also, the volume of HARS unsuitable material in the two tables is not equal. Because the overdredge material will be native, it is assumed that it will all be HARS suitable; therefore, the unsuitable totals should be the same. These two tables need to be reconciled. S3-43

DEIS, page B-1.5-3 – What channel depth was used in the sedimentation model to predict sedimentation rates, –50, -52 or –54 feet? Also, there is a typo in the calculated Base Year volume for Newark Bay: the volume should be 558,000 not 55,800. S3-44

DEIS, page B-1.6-2 – Item 'd' at the top of the page states that the project will remove approximately 250 million cubic yards of material including 26 million cubic yards of rock. This is nearly five times the volume reported elsewhere in the HNS and DEIS. S3-45

Coastal Zone Management Consistency

Beginning on page B-1.7b-1 of the DEIS, a coastal zone consistency determination has been presented. While the coastal zone consistency determination does address the applicable Rules on Coastal Zone Management, additional information is required to demonstrate consistency in the following areas.

7:7E-3.5 Finfish Migratory Pathways – The HNS reports that as many as six clamshell dredges could be working at any given time. Both the HNS and the DEIS fail to address the cumulative impacts of that many pieces of equipment working in close proximity. If an entire channel cross section could be impacted by total suspended solids or depressed dissolved oxygen levels, time restrictions may be required to allow anadromous finfish spawning runs through the project area. No such restrictions are indicated in the HNS or the DEIS. S3-46

7:7E-3.12 Submerged Infrastructure Routes – It is understood that the relocation of submerged infrastructure is not a Federal responsibility. However, it is unclear whether all submerged infrastructure in the project area has been identified, and whether the owners of that infrastructure have been notified of the project and the project depth. At a minimum compliance with regulation would require that the infrastructure be identified and that the owners be notified of the project. S3-47

7:7E-3.15 Intertidal and Subtidal Shallows – The discussion under this regulation indicates that impacts to this Special Area will be "incremental and temporary." If these impacts are indeed "temporary," additional explanation is needed concerning how disturbed areas will be restored. However, the DEIS seems to calculate all disturbance to the Special Area and plans to mitigate those impacts through habitat enhancement in other areas of the Harbor. If the areas cannot be avoided or restored, this would be consistent with the regulation. Consequently, removal of the characterization of the impacts as "temporary" may be all that is required. S3-48

7:7E-3.36 Historic and Archaeological Resources – This section should reference the Memorandum of Agreement between the Corps and the New Jersey State Historic Preservation Officer. S3-49

7:7E-3.39 Critical Wildlife Habitats – This regulation has been deleted from the current Rules on Coastal Zone Management. S3-50

7:7E-4.2(f) Maintenance Dredging – Dredged material management is only one of the considerations under the dredging rules. These rules also require mitigative measures to reduce a dredging project's impacts on fish and shellfish. Most often these measures include a restriction on the dredging activity in critical habitats during critical times of the year. The DEIS has identified seasonal restrictions as a method of reducing impacts from the project, but both the DEIS and the HNS lack a commitment to those restrictions. Consequently, consistency with the dredging rules has not been demonstrated. S3-51

7:7E-4.2(g) New Dredging – One of the standards for approval of new dredging projects is a demonstration of need. Given the premise that the Port will continue to grow with or without the project, the need for the project has not been clearly demonstrated. As presented in the HNS and DEIS, the project will not increase Port commerce, but will only make it cheaper to ship containers through the Port. This argument is purely economical and does not necessarily demonstrate a need for the project. As reflected earlier in these comments, the Department does not believe this to be the case. We believe that the project will allow additional commerce to move through the Port, which could demonstrate a need for the project. As currently presented, compliance with this rule has not been demonstrated. S3-52

7:7E-6.3 Secondary Impacts – "Secondary impacts are the effects of additional development likely to be constructed as a result of the approval of a particular proposal. Secondary impacts can also include traffic increases, increased recreational demand and any other offsite impacts generated by onsite activities which effect the site and surrounding region. Coastal development that induces further development shall demonstrate, to the maximum extent practicable, that the secondary impacts of the development will satisfy the Rules on Coastal Zone Management." For the reasons enumerated under the Secondary Impacts discussion above, the Department believes that this project will induce impacts including container terminal expansion and traffic in the region. Neither of these secondary impacts have been addressed in the HNS or the DEIS. Consequently, consistency with this Rule has not been demonstrated. S3-53

7:7E-8.2 Marine Fish and Fisheries – This regulation requires that coastal development cause the minimum feasible interference with the natural functioning of marine fish and fisheries. Where a dredging project could interfere with the life cycle or reproductive cycle of fish or shellfish, time restrictions on dredging operations would be required to demonstrate compliance with this rule. Both the HNS and the DEIS indicate that time restrictions would reduce the potential impact of this project on fish and shellfish yet neither indicates that those restrictions will be observed by this project. Therefore, compliance with this regulation has not been demonstrated. S3-54

RESPONSE TO COMMENTS

S3 State of New Jersey, Department of Environmental Protection

S3-1

In its first paragraph in this section of the comments from NJDEP, the commenters state, "Benefits of the project have been assessed by multiplying the per container cost savings by the maximum number of containers that can be accommodated at existing terminal areas, with projected improved container handling efficiencies in the future." The commenters continue, "This projected scenario raises a number of questions and concerns relating to potential secondary impacts resulting from the proposed project, and the economic justification for the proposed project." The remainder of the comments in the sections headed, "Without Project Condition" and "Secondary Impacts" are premised on the first sentence quoted. That statement, though, is inaccurate in three important ways.

First, the benefit calculations are done on a per TEU basis, not a per container basis. The commerce forecast is in terms of TEUs. The marine shipping services involved are priced in terms of TEUs. The vessel carrying capacities are stated in terms of TEUs. In short, the basic unit of measure in the marine container shipping industry is the TEU. The terminal operators, in contrast, care about the number of containers they have to handle and measure their theoretical capacity in terms of container movements, or "lifts." The fact that the commenters conflate these two concepts leads to a number of invalid conclusions that, in turn, form the basis for additional comments.

Second, the benefits were not calculated by multiplying the per container cost savings by the maximum number of containers that can be accommodated at existing terminal areas. The benefits are calculated by multiplying the transportation cost savings per TEU by the number of TEUs that, according to the commerce forecast and the fleet forecast and the statistically derived loading pattern, would be carried into or out of this port aboard vessels that would benefit from the proposed deepening. If the benefits had been calculated in the manner claimed by the commenters, the total would be much larger than the total reported.

Nevertheless, the commenters, in the section headed "Secondary Impacts" state,

> The HNS also incorrectly relies on the projected increase in Port commerce in the Without Project Condition, and its conclusion that Port Terminal expansion is unnecessary for economic justification, to avoid analysis of potential secondary impacts which could result from the proposed project.

This comment is evidently based on the apparent misconception as to the method employed in the economic analysis that is described in the paragraph above.

Third, the suggestion that the objective on the part of the terminal operators is to handle, "the maximum number of containers that can be accommodated at existing terminal areas, with projected improved container handling efficiencies in the future," is one that is frequently made by these and other commenters, and consistently rejected by the District's economic analysis. The policy implicit in this suggestion is one of maximizing market share. Taken literally, no rational business would ever adopt this policy, for it is always possible to increase market share by cutting price[1]. In contrast, the District assumes that all economic actors have profit maximization as their objective. The distinction is an important one. The assumption of market share maximization leads the various commenters to infer that terminal operators must increase their container handling capacity sufficiently to capture all of the 19.1 million TEUs of volume that the commerce forecast predicts would be available in 2060 at the current price of container handling services. This is an overly broad conclusion. Several commenters, including the present ones, build on this overly broad conclusion to reach further overly broad conclusions. The District's analysis indicates that, the only increases in container handling capacity that may justifiably be assumed to occur are those that had already been announced or were in the process of negotiation as the report was written.

The main problem with the assumption of market share maximization is that it requires the terminal operators to make investments in container handling capacity even if the additional revenue derived from handling the additional containers would be less than the additional cost of obtaining and maintaining the additional capacity. In contrast, the District assumes that:

1. The terminal operators face some demand function for their services[2].

2. Terminal operators will seek to produce and sell the profit maximizing level of output, which is that level of output at which the marginal revenue derived from selling another unit of container handling services is equal to its marginal cost of production.

3. Terminal operators will make the best investments first, the second best investments second, and the third best investments third. In more technical language, this amounts to saying that the marginal cost of container handling

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[1] It only makes sense to have increasing market share as a business goal if it is believed that after a certain market share has been achieved, it can be defended by the erection of one or more artificial barriers to entry. In light of the recent SeaLand / Maersk lease experience, it appears that there are no artificial barriers to entry by other ports.

[2] Given that in the container handling services business, proximity to product markets is an important element of the service, container handling services at the Port of New York & New Jersey would not be a perfect substitute for container handling services in some alternative port with a smaller local market. The implication of that would be that the demand function faced by terminal operators in the Port of New York & New Jersey is downward sloping to the right. In more technical language, this amounts to saying that the marginal revenue derived from selling container handling services falls as the quantity sold rises. While very realistic in this case, this assumption is not a necessary one. Adopting it would make the arguments that follow even more forceful.

capacity is positive and rising.

4. Terminal operators will create and maintain container handling capacity sufficient to produce the profit maximizing level of output, and they will do so by choosing the least expensive combination of land, labor, and machinery available to them at the time that container handling capacity increasing investments are made.

The commenters evidently believe that the commerce forecast is a demand function. It is not a demand function. The commerce forecast predicts the quantity of container handling services demanded for each of the years through 2060. To do so, it relates the quantity of container handling services demanded to a variety of variables, most of which deal with income and none of which deal with the price charged for container handling services. Thus, the price of container handling services is implicitly held constant.

This approach is entirely fitting and proper for the purpose of performing cost - benefit analysis, but it does not result in an equation of the demand function for container handling services. A demand function relates the quantity demanded of some good to its price, holding constant other explanatory variables, notably income. To predict the profit maximizing level of output for any good, including container handling services, knowledge of the demand function is indispensable. Without knowledge of the demand function, therefore, it is not possible to know what amount of container handling capacity the terminal operators would desire to have. The Study does not include a demand function for container handling services. Apparently believing that the commerce forecast is the analytical equivalent of a demand function, the commenters claim that it indicates that the terminal operators will increase container handling capacity sufficiently to be able to handle 19.1 million TEUs (11.2 million lifts) by 2060. Because the commerce forecast is not the analytical equivalent of a demand function, no such conclusion can be validly drawn on the basis of the Study.

Even if the demand function were known with precision and certainty, though, it would only give the utility side of the capacity investment decision. The opportunity cost side of the decision is also indispensable to predicting the profit maximizing level of output. This information would be included in a supply function. A supply function relates the quantity of a good willingly produced to its cost of production, holding constant the level of technology and the prices of factors of production. To put it another way, the cost of producing various quantities of output would have to known in order to predict the profit maximizing level of output for any good, including container handling services. Without knowledge of the supply function, therefore, it is not possible to know what amount of container handling capacity the terminal operators would desire to have. The Study does not include a supply function for container handling services. Apparently believing that the Study does include a supply function for container handling services, the commenters claim that it indicates that the terminal operators will increase container handling capacity sufficiently to be able to handle 19.1 million TEUs (11.2 million lifts)

by 2060[3]. Because no supply function is included in the study, no such conclusion can be validly drawn on the basis of the Study.

It should be stressed that neither the demand function nor the supply function are needed in order to perform the cost-benefit analysis required in the Study.

Nevertheless, the commenters go on to conclude not only that the terminal operators will increase container handling capacity sufficiently to be able to handle 19.1 million TEUs (11.2 million lifts) by 2060, but that the investments they make to do so will simply replicate the proportions of land, labor, and machinery of the investments made heretofore. Only by implicitly grafting this invalid conclusion onto the description of the without-project condition can the commenters claim, as they do, that the Study indicates that it is inevitable that more land will be devoted to the production of container handling services.

Even if it is assumed that the terminal operators will find it in their economic interest to increase container handling capacity sufficiently to be able to handle 19.1 million TEUs (11.2 million lifts) by 2060, to conclude that the necessary investments will simply replicate the proportions of land, labor, and machinery of the investments made heretofore presumes that the relative prices of land, labor, and machinery are constant and that there are no changes in technology. There is no basis for these assumptions. Indeed, the history of the U.S. economy in this century (and the 19th century, for that matter) strongly contradicts these assumptions and indicates that by far the most likely event is for land and labor to rise in price relative to machinery. This would lead profit maximizing businesses to choose combinations of land, labor, and machinery that include relatively more machinery and relatively less land and labor. This general business pattern of substituting machinery for land and labor, which is made possible by technological change and economies of scale in the manufacture of machinery, has also characterized the business of marine terminals specifically. Contrary to this historical pattern, the commenters implicitly assume fixed factor proportions and that there will be no further technological change.

Even if all the economic assumptions of the commenters were granted, their conclusion that it is inevitable that more land will be devoted to the production of container handling services does not follow. The Port Authority of New York and New Jersey (PANYNJ) is engaged in a number of revenue producing activities that are not related to marine terminals. Its ability to finance real investment is not unlimited, so financing one project means that there is less financing available for other projects. A finding by PANYNJ that investing in increased container handling capacity would have positive net present value does not imply that it is better than investment opportunities available in its other revenue producing activities[4]. It does not even imply that the

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[3] Moreover, whatever the profit maximizing level of output turns out to be with our assumption of a constant marginal revenue demand function, it would be smaller if we made the more realistic assumption of a diminishing marginal revenue demand function as described in the previous note.

[4] The same is true of the private terminal operators. There is no reason to assume that they are not confronted with investment opportunities outside the container handling services business, that they must

execution of superior investment projects would not exhaust PANYNJ's financial capacity before it got around to investing in increased container handling capacity.

In light of the foregoing, it is clear that the description of the without-project condition in the study is supported by facts and economic reasoning. It is also clear that the claim by the commenters that it is reasonably foreseeable that increases in container handling capacity beyond that described in the without-project condition, accomplished by expanding the land area of the terminals or otherwise, is not supported by economic reasoning. This is not to say that that event cannot occur. It is to say that there is no fact or economic reasoning suggesting that it must occur or that it is likely to occur and that historical fact and economic reasoning suggest that it is less likely to occur than the without-project condition described in the Study.

In their last paragraph in the section headed "Without Project Condition," the commenters wrote:

> Therefore, the basic premise presented in the HNS Without Project Condition is incorrect: if navigation channel improvements are not made, growth in Port commerce will be constrained. Thus, there are potential secondary impacts resulting from landside development induced by the proposed channel deepening which must be evaluated.

It is not clear from the first quoted sentence whether the material following the colon is meant to describe "the HNS Without Project Condition" as written or the commenters' view of what the implications of the "true" without-project condition would be. It is assumed in what follows that the latter meaning was intended. That amounts to saying that channel depth is what attracts movements of containerized cargo through a given port.

This is a common belief among commenters on the Study. Although the belief is common, it will not withstand analysis. If it is channel depth that attracts containerized cargo to a given port, some interesting facts must be explained:

1. Halifax has over 60 feet naturally, yet they did not get significant container business until they established a direct rail link with Chicago, effectively making Halifax the "Port of Chicago."

2. Two years ago, Dundalk Terminal in Baltimore was without tenants, which was attributed to lack of commerce volume, even though they already had 50 feet.

3. The major container ports of Northern Europe are situated on the naturally shallow and treacherous North Sea, and not on the naturally deep fjords of

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invest further in the container handling services business, or even that they must maintain their present level of investment or remain in the container handling services business at all.

Norway.

4. Veldez, AK, a well known U.S. port with a channel capable of accommodating Suezmax tankers at full load (controlling channel depth is 231 feet), is not a major container port. Mr. Michael Bodine, the Port Director, reports that they have never had a call by a containership, only Ro-Ros.

The inescapable conclusion is that there is something other than channel depth that attracts containerized cargo. Experience and economic theory both suggest that cargo goes to markets, not to deep channels. The commenters are arguing, essentially, "if you build it, they will come." To test this proposition, imagine that a 50 ft. channel and a container terminal equipped with 22 box outreach cranes has been built at, say, Point Barrow, and ask how much container traffic can plausibly be hypothecated to that port.

What of the argument that channel depth must have some commerce inducing effect, even if it is not the most important consideration? Even this narrower assertion is not supported by facts. In this Port, the pathway to Red Hook Terminal has had a 40 foot channel since at least 1930, yet it has lost business to other terminals at Port Newark, Port Elizabeth, Global Terminal, and Howland Hook, all of which had less depth than Red Hook until 1995 and two of which still have less depth than Red Hook. Indeed, the operators of Red Hook Terminal have announced that they will phase out container handling services completely when South Brooklyn Terminal resumes handling container cargo, their channel depth advantage having "induced" only 3.5%[5] of the flow of TEUs that were coming to this Port anyway to their facility.

Nor did the Study conclude that it would not be possible for the channels in their without-project condition to handle the number of vessel passages implied by the commerce forecast, whether petroleum and dry bulk (and auto carrier, break bulk, and non-petroleum liquid bulk, for that matter) traffic is considered or not. It did estimate the frequency and duration of delays caused by the volume of traffic in the channels in their without-project condition.

S3-2

The first paragraph of this section suggests that if neither terminal area nor channel capacity constrain the amount of commerce handled by the Port, limitations on the inland transportation network will. It goes on to suggest that the Study ignores this possibility in order to safeguard its illegitimate without-project condition by, "simply assum(ing) that the 'inland transportation network is expected to grow independent of Harbor deepening, therefore, no additional analysis of inland infrastructure capacity was warranted."

In fact, the Study was required to so assume. Please refer to ER 1105-2-100, para. 6-77(a)(4), which reads:

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[5] This was calculated on the basis on 1996 statistics.

> In projecting commodity movements involving intermodal movements, sufficient capacity of the hinterland transportation and related facilities, including port facilities, is assumed *unless there are substantive data to the contrary*. (emphasis added)

The only material offered by the commenters on these topics is contained in the second paragraph of this section. It consists of calculations that do not specify what level of traffic delay must be experienced to establish that the network cannot handle the load. No material indicating that the network cannot be or will not be improved is offered.

The air quality impacts of deepening the channels in the Port, if there are any at all, can only be understood in the context of some specified airshed. If the airshed is taken to be the area between the Port and any alternative (*i.e.*, 50 foot channel depth) port to which cargo that would have passed through New York and New Jersey is diverted because of some capacity constraint, then the air quality effect can only be neutral or an improvement. The reason for this is that the sum of the net distances traveled on land (and consequent discharge of combustion products) rises with diversion of any percentage of cargo that originates at or is destined for any point within the vicinity of the Port to any alternative port. This conclusion is supported by data and calculations that have been included in the final draft of the Environmental Impact Statement.

In the third paragraph of this section, the commenters say that information they have gleaned from various meetings involving unspecified participants contradicts the description of the effects of 50 foot channels in the Study. Whether that is so or not, it is irrelevant. The Study is the report of the District. While the District has relied on those and other parties to supply necessary information, the analysis of that information is that of only the District.

The premise of the fourth paragraph of this section is that the Study and the DEIS project that terminal expansions will be necessary at several locations. If the expansions referred to are increases in land area in the with-project condition, this premise is faulty. In the without-project condition, there are some renovations of terminal areas and some changes in the specific activities conducted on land that is currently in use for marine terminal operations or has been so used in the past, but there are no increases in the amount of land devoted to marine terminal operations as a consequence of channel deepening. Therefore, in its work concerning 40 C.F.R. §1508.7 and N.J.A.C. 7:7E-6.3, NJDEP should not assume that terminal expansions will be necessary at any locations, much less several locations.

In the fifth paragraph, the commenters remark that they are not convinced that the only opportunities for future Port terminal expansions involve filling hundreds of acres of water area. The District would go further and say that it is not convinced that there will be any desire on the part of the terminal operators to expand the land area of the terminals at all.

The District agrees with all of the sixth paragraph except the last sentence. An inland port is nothing more than a terminal at which containers can be transferred from trucks to trains and *vice versa*. There are already several terminals of that type in the vicinity of the Port. Their activities are already an everyday part of the process of moving containers to and from the various marine terminals, and therefore they are implicitly accounted for in the analysis of the operations of the marine terminals.

S3-3

The procedure used to estimate the extent of project induced disturbances to littoral (MLW to –6 ft. MLW) and sublittoral (-6 ft. MLW to -15 ft. MLW) zones involved the review of proposed channel alignments and cross-sections applied to the existing channel topography for each project reach. The study area covers the entire New York/New Jersey Harbor region, therefore a variety of channel cross-sections were used to allow for the differing channel geometry, differing geologic conditions and differences in exposure to wave action. In addition to the physical variables that effect the channel design depth, the habitat impact assessment also included allowance for the standard 2-ft of overdredge. The following table summarizes the channel depths utilized in the assessment of impacts:

Recommended Channel Depths			
Channel Name	**Maintained Depth**	**Excavated Depth**	**Habitat Assessment Depth**
Ambrose	53 ft	53 ft	55 ft
Anchorage	50 ft	50 ft	52 ft
Bay Ridge	50 ft	50 ft	52 ft
Port Jersey	50 ft	52 ft	54 ft
Kill Van Kull	50 ft	52 ft	54 ft
Newark Bay	50 ft	52 ft	54 ft
Elizabeth	50 ft	52 ft	54 ft
South Elizabeth	50 ft	52 ft	54 ft
Arthur Kill (to HH)	50 ft	52 ft	54 ft
HH – Howland Hook Marine Terminal			

In the above table, the column entitled *"Maintained Depth"* refers to the Recommended Plan depths that the USACE is seeking as the authorized depth for the improved channels. The column entitled *"Excavated Depth"* refers to the depth to which the channel must be constructed to satisfy safety criteria due to the presence of rock or hard sediments at the channel bottom. In addition to the extra depth required for under-keel safety, there is an additional allowance of 2-ft. This additional depth is commonly referred to as "overdredge". The overdredge depth was taken into consideration in estimating the disturbance areas in the littoral and sublittoral zones. The column entitled

"Assessment Depth" indicates the depths used for estimating areas of potential project disturbances in each of the project reaches. The channel side slope areas of disturbance, fully account for the potential 2-ft of overdredge, and the project habitat mitigation plan uses these conservative area estimates as part of the basis for overall habitat impact assessment.

As stated in the report, an "overdredge" amount of 2 feet has been considered in the engineering/cost analysis of the project. With regard to habitat impact, most of the impacted areas are located in hard and/or rocky areas where we do not expect significant "overdredging" because it will not be in the interest of the contractor to excavate any more hard material than is absolutely necessary to complete the job. Nonetheless, overdredge was included in the habitat impact assessment. The use of "overdredge" here was to establish a likely unit cost for dredging.
This amount of overdredge was not included in hydrodynamic/water quality modeling.
The maintained channel depths (i.e., 53 feet MLW for Ambrose Channel and 50 feet MLW for the remaining channels) were simulated using hydrodynamic/water quality model. The rationale for assessing these depths was that these depths constituted the long-term condition for the harbor. The long-term condition is that which would occur after sedimentation has filled the channels to their respective maintained depths. The freshwater flow, temperature and wind conditions used to model the potential impacts of harbor deepening were deliberately conservative so as to produce relatively low dissolved oxygen conditions as described in the DEIS. Accordingly, it was judged to be appropriate to model a long-term bathymetric condition. As demonstrated in the DEIS, the impacts to the harbor are relatively small in terms of changes in hydrodynamics and/or water quality. It should be noted that although the impacts predicted by the model are relatively small, the areas of largest relative impact are in the Arthur Kill and Newark Bay. This finding is consistent with the overall geometry of New York Harbor. Specifically, the Kills and Newark Bay are comprised of relatively shallow/narrow channels that form connections between the Passaic, Hackensack and Hudson Rivers and Lower New York Bay. In contrast, the channels leading to Brooklyn and Port Jersey do not convey flows to/from rivers or larger bodies of water. Consequently, changes in channel depths and/or widths in Brooklyn and Port Jersey produce relatively small changes in overall harbor hydrodynamics and water quality. In this connection, the following discussion of sedimentation rates focus on the Kills and Newark Bay.

A sedimentation model of the harbor was prepared for the HNS in order to estimate long-term maintenance dredging quantities throughout the harbor. Sedimentation rates are provided in the DEIS. Overall, the results show that increases in sedimentation rates can be expected for the Kills and Newark Bay. It will take some time to fill the channels to maintained depth and this time will vary according to location. There are uncertainties as to the time required to fill the Kill Van Kull because it has a relatively low sedimentation rate. This argues against the notion of modeling the KVK at 50 feet MLW. Nonetheless, experience with the model suggests that changes in the depth of the KVK itself do not impact the overall model results. The reason for this is that the depths of the Arthur Kill and Newark Bay tend to control the areas of impact predicted by the model which are in the middle portions of the Arthur Kill (non-deepened areas) and the lower segments of

the Passaic and Hackensack Rivers. As a result, the approach used to model the harbor is considered an appropriate approach to evaluate the long-term impacts of harbor deepening.

S3-4

The HNS/DEIS relies upon the DMMP analysis of management options. So long as the options used for the HNS/DEIS comply with those evaluated within the DMMP, the sequencing of finalization of the two documents is not required. However, as described within the DMMP, each specific option that is used for federal material, would have to be fully NEPA evaluated and permitted prior to its final selection and use for the federal material.

S3-5

The preferred options for HNS material are the same as those recommended in the DMMP. However, for benefit/cost evaluation purposes, the sub-channel cell options were used since sufficient backup design was available and since the sponsor recommended the option by letter in March 1999. At the time of construction for each of the features resulting from the HNS, an evaluation of currently available management options will be performed in coordination with the project sponsors to determine which option will ultimately be used. As long as the desired beneficial use options are available for use and do not substantially change the project justification, they will be used. If however, these options cannot meet the management needs of the project, then the contingency options described in the DMMP (*e.g.*, sub-channel placement cells) can be brought "online" and utilized.

S3-6 (Economic Analysis)

In the second paragraph of this section, the commenters say that they do not believe that a particular series of tables can be accurate because they indicate that at 45-foot channel depths, no cargo will enter the Port aboard ships with sailing drafts in excess of 43 feet, yet, "*Regina Maersk*, with a sailing draft of 48 feet, has already entered the Port in a light-loaded condition." The commenters have failed to distinguish between design draft and sailing draft. The design draft is an inherent characteristic of the vessel that is planned in advance by naval architects, hence the term, *design* draft. The sailing draft is a result of the manner in which the vessel is loaded for a given particular voyage and local water conditions. The sailing draft of a vessel would only be equal to its design draft at full load. In the case of a containership, this statement assumes that the ship weights out before it cubes out. A vessel with a sailing draft of 45 feet that entered a 45 foot mean low water channel at mean low water would run aground even in a dead calm. Because dead calm is rare and because it is possible that there are places in a 45 foot mean low water channel that, in fact, are less than 45 feet deep, ship pilots rarely attempt passage of such a channel with a sailing draft of more than 43 feet. Many carriers will not allow their captains to operate with less than a three foot difference between channel depth and sailing draft. So yes, it is true that *Regina Maersk* is on a regular rotation to

New York, but not at a sailing draft of 48 feet, but rather 36 feet, more or less (but not much more!), depending on the particular call being considered. To get that sailing draft, the ship can have only 30-40% of its slots filled. Moreover, the sailing draft of *Regina Maersk* in particular cannot be much less than 36 feet because, if it were, it would have problems clearing the Bayonne Bridge, where the maximum air draft is 151 feet.

The fact is that because of business as well as maritime considerations, there is no reason to believe that the same vessel will be operated in the same manner on each call it makes at a given port. That is why the Study uses the records of actual vessel entrances and clearances in the Port to develop a statistical profile of the loading patterns that can be expected on vessels of each relevant design draft. Tables generating and reporting these calculations and those associated with other necessary aspects of this analysis would run to more than 2,000 pages[6]. In the third paragraph, though, the commenters express dissatisfaction with the fact that the data provided is insufficient to verify the conclusions of the Study. For the Study to include all of this material for publication so that the results can be reproduced by readers is not practical. To show the method of the analysis, as distinct from providing the means to reproduce it, an example was published.

The fourth paragraph again suggests that the quantity of cargo on which benefits can be realized may be constrained by the inland transportation network to a level below that which is necessary to justify the project. This suggestion has already been dealt with in some detail in the response to comment S3-2.

The fifth paragraph suggests that the cost estimate is defective because it fails to include non-Federal costs that are listed in the LRR on the Port Jersey Channel 41 foot project. As the Study states repeatedly, the without-project condition assumes that the currently pending deepening projects have been completed. Because the work described will have already been done in connection with the 41 foot project, it would be double counting to attribute the cost of doing that work to the 50 foot project too. A thorough investigation of all necessary bulkhead and other non-Federal work has been conducted by the District's Engineering Division and the non-Federal partners, with additional input from representatives of the various terminals involved. It was determined that several berths (*e.g.*, Port Elizabeth and Global Terminal) will require reinforcement, and the cost of this work is included in the cost appendix. All of the associated costs revealed by that investigation have been included in the cost estimate.

There are two substantive matters in the first paragraph that have not yet been addressed. One of them is the suggestion by the commenters that there is "overlap" as between the benefits of more efficient ship loading and the benefits of reduced tide delay, leading to double counting of benefits. There is no such overlap. The length, in terms of time, of the ocean part of each voyage is assumed to be a function of vessel service speed and the distance between port of origin and port of destination. Tide delay adds nothing to voyage time in this analysis. Therefore, there is no "overlap" and no double counting.

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[6] A full set of the calculations for the economic analysis of the Kill Van Kull LRR ran to just over 1,900 pages.

The other substantive matter is the suggestion that it is error to presume, "that trends in the world fleet will continue to move toward larger ships, with or without this project, and that those ships will be deployed along major and hybrid routes." Until the limits of structural technology are reached, the size of the ships is determined by economic considerations. The pattern is clear. Because a cargo vessel only generates revenue while it is moving and its costs of operation are more of less the same wherever it goes, the owners will seek to deploy the largest vessels on the routes for which the product of the rate per unit carried and the number of units to be carried is the greatest. Because of the intensely competitive nature of containership operations, the realized (as distinct from the published) rate equals opportunity cost. This, combined with the amount of economic growth in recent decades in Eastern Asia, has meant that the newest and largest vessels are generally introduced on the longest routes, *i.e.*, Far East to Northern Europe. This has the effect of bumping the net largest class of vessels to the next longest routes, and so on. So long as the volume of world trade keeps growing, the carriers will be able to gather sufficient cargo to support scheduled service aboard progressively larger vessels. This means that there will be deployments of successively larger classes of container vessels on routes to and from the Port of New York and New Jersey, provided the Port's market area can generate sufficient demand for those services. To the extent that the center of economic growth in Asia continues to shift to the south and west, the very long Asia to U.S East Coast route will grow in popularity and attract the largest container vessels. The effect of this will be to accelerate the deployment of larger vessels on routes to and from the Port of New York and New Jersey.

The example of *Regina Maersk* is instructive. When the ship was new and the largest containership in operation, it was deployed on the Far East to Northern Europe route. *Regina Maersk*, though, has been surpassed in size by vessels of other carriers and by Maersk's own S-Class vessels. Consequently, its deployment has been changed, even though it has to call on New York in the inefficiently loaded manner described above. It is true that the redeployment of *Regina Maersk* despite the lack of channel depth in the Port of New York and New Jersey took many people by surprise, but what caused them to be surprised was the rapid rate of growth of world containerized commerce and the speed of the response to that growth by the carriers with more appropriately sized ships.

Moreover, even though the market area of the Port of New York and New Jersey is large, by U.S. standards, in terms of its ability to generate demand for the services of the containership operators, it is not large enough by world standards to have more than a minimal effect on the ship building decisions of any but the most specialized carriers. The container volume of the Port of New York and New Jersey is only about a third of that of the adjacent Ports of Los Angeles and Long Beach combined, or Rotterdam, or Kaohsiung and only about a quarter of that of Hong Kong or Singapore.

S3-7

The design depths required for the Maersk "K Class" vessel were determined using standard USACE design methods that are common to navigation studies throughout the country. The requests for water depth advanced by Maersk were reviewed, but were not borne out by the USACE design procedures.

The FEIS will indicate an overdredge value of 2 feet rather than 3 feet. The overdredge value is not included in the 52 foot depth. Therefore there is a possibility that the contractor will overdredge as much 2 additional feet which would result in areas as depth as 54 feet. It should be noted, however, the that contractor would not be paid for the overdredge and there is a built incentive for the contractor to avoid overdredging.

The dredged material management plan for this project (and DMMP) accounts for the possibility of the full 2 feet of overdredge (see DEIS appendix B-1.5) and this work has been coordinated with the DMMP. It should be noted that any material that does fill-in the channel below the maintained depth of 50 feet will not have to be handled by the DMMP.

S3-8

The most recently available bathymetric surveys of Ambrose Channel were used for this study in order to make an accurate assessment of dredging quantities and assessments of environmental impacts.

S3-9

The allowable overdredge described the HNS (pages 59, 85, and 89) and that described on in the DMMP (page 13) the same and is an allowable margin of error for dredging contractors during construction. There is a difference between a two foot allowance for safety in hard material or rock (called overdredge in the DEIS) and overdredge as defined above. This difference will be clarified in the FEIS.

S3-10

See response to Comment S3-3.

S3-11

See response to Comment S3-3.

S3-12

Concur as noted in Comment S3-8. The text has been revised..

S3-13

The HNS only reports that the local partners have chosen to present fills as a means of further expanding capacity and acknowledges it is one of many ways. As indicated on page 38, paragraph 128 in discussing further increasing capacity:

> "This might be accomplished in any of several ways or a combination of them: productivity can be further increased, non-water dependent facilities can be relocated upland to provide additional container yard space, the terminals can be expanded or new facilities developed.... It is important to note that none of this contemplated increase in capacity, however it is to be accomplished, is necessary to justify improving any of the Port's channels and were not deemed to be part of the Without-Project Condition."

The reference to Long Beach is used simply to show that such fills are not impossible and have met the regulatory hurdles in other parts of the country.

S3-14

There is no conflict. The MOU is to develop an EIS to address the initial plans developed to date by the local partners as part of their Comprehensive Port Improvement Plan (CPIP). These plans include the Port Authority's Port Development and Investment Plan and the NYCEDC's plan for the development of South Brooklyn and expansion of Howland Hook Marine terminal. It is due to the fact that these plans are still in a developmental stage and the lack of an EIS and concerns over the proposed fills that the District has taken a more conservative position with regard to the Without-Project Condition, which represents the most probable future condition. As indicated in Table 7 on page 42 of the HNS, the Without-Project Condition used for formulation has no open water fills included.

S3-15

The MOTBY development formally provided by the local partners at the time of project formulation was 130 acres. This is a moving target until finally approved and permitted. In order to complete the formulation process, the 130 acres has been used for now. If at some future time it is expanded to 200 acres, additional benefits may be accrued.

S3-16

Non-pay overdredging volumes were used in the HNS (and DMMP) volume projections.

S3-17

Table 9 as so titled reflects "Estimated Geologic Dredged Material Quantities". These quantities are the volume of rock, non-rock, and HARS-unsuitable material as calculated from in-situ volumes and do not include an estimate of the equipment inefficiencies in

separating the rock from the non-rock material nor the added non-pay volume the contractor will remove due to equipment inaccuracies. Page 93 as so titled reflects "Dredged Material Pay Quantities". This is the estimated quantity of material the contractor will receive payment for and includes an estimate for contractor equipment inaccuracies in separating rock and non-rock material. Therefore the mix between rock and HARS suitable material will vary between the two tables. However, in addition to this variation the comment identifies an error in that the total volume of dredged material varies between the two tables. It would appear the variation in total volume is due to continuous refinements in the estimate right up the printing of the draft report. In addition further quantity refinements had been made that were not reflected in the Main Report but were reflected in the Cost Appendix and the project formulation process. Upon further review of Table 23 which is contained in a discussion of Dredged Material Placement, we have concluded the table would be more pertinent if it reflected the Gross quantities of dredged material rather than pay quantities. The Gross quantities reflect a non-pay overdredge of as much as 2 ft and represents the upper limit of dredge material placement. The corrections/revisions to Table 9 page 65 and Table 23 page 93 and their supporting text is as follows:

TABLE 9
Estimated Geologic Dredged Material Quantities – NY&NJ Harbor

Maintained Channel Depth	Dredged Material Category (MCY)			Total
	Rock	Non-Rock	Unsuitable for HARS	
48 ft	2.52	16.66	8.17	27.35
50 ft	4.21	25.92	8.17	38.30
52 ft	5.81	36.51	8.17	50.49

Top of page 93 will be revised to include possible non-paid over draft as follows:

"...rock will be less than the geologic quantity of non-rock while the pay quantity of rock will accordingly be greater than the geologic quantity of rock. In addition when considering dredged material placement, the permitted non-paid over dredge quantity must be included in the volume. This includes the potential of as much as an additional two feet of over dredging and is referred to as the Gross quantities. ..."

TABLE 23 Dredged Material Gross Quantities			
	Non-HARS Material (CY)	HARS Material (CY)	Rock Material (CY)
Initial Construction	7,662,000	35,507,000	8,168,000
50 Years Maintenance*	145,000	1,600,000	0
Total	7,807,000	37,107,000	8,168,000
*Certain channels, due to changes in the hydraulic regime, will actually require less maintenance dredging than prior to project implementation. They have been assumed not to contribute to the maintenance volumes.			

Maintained depth has been used as this is the nominal depth referenced throughout most of the report unless specifically discussing a final excavation depth.

S3-18

The term "tipping fee" is in keeping with terminology used in other USACE reports.

S3-19

They are one-and-the-same.

S3-20

The 50-year maintenance volumes in Table 23 have been revised in order to be consistent with Appendix B-1.5.

S3-21

The word "initially" will be removed from the second sentence in Paragraph 274. It should be noted from the Table on B-1.5-3 that some of the channels are expected to have reduced rates of sedimentation relative to without project conditions.

S3-22

The estimated littoral zone area disturbed as a result of navigation channel improvements is based on projecting the side slope profiles of the deepened channels. Because the littoral zone is defined as the area between mean low water (MLW) and 6 ft below MLW, not all of this area will be lost (or changed to deeper habitat) as a result of navigation channel improvements. For the purpose of estimating project impacts (and preparation of the project mitigation plan) the entire littoral zone area has been included.

S3-23

When taken as a whole, the proposed project is quite large and dredging activities will impact a considerable amount of bottom habitat. However, the project will be

implemented incrementally and will disturb only a fraction of the total project area at any one time. For this reason it is expected that the impact to bottom habitats and benthic communities will be temporary. This will be clarified in the text.

With regard to changes in sedimentation rates, no significant changes are expected. Based on modeling results, there navigation channels may experience an increase or decrease in sedimentation but these changes are not expected to result in the transformation of a hard bottom habitat to soft bottom, or vice versa. Please refer to Appendix page B-1.5-3 of the EIS for a table illustrating expected changes in Maintenance Dredging, a reflection of changes in sedimentation rates.

S3-24

The 50 percent is the maximum Federal share for channel depths in excess of 45 ft MLW. For depths less than 45 ft MLW, the Federal share can be greater. Paragraph 347 provides the minimum non-Federal share, but does not specify any maximum non-Federal share, which could be up to 100 percent, thus there is no 25 percent to be "picked up".

S3-25

It is expected that six dredges working in the Harbor would be a worst-case scenario. Due to limitations on the availability of dredges and barges to remove dredged materials, it is likely that fewer than six dredges would be working in the Harbor at one time. Furthermore, as stated in this bullet, a maximum of three dredges will be working per contract reach at one time. Therefore, a maximum of only three dredges could potentially be working in close proximity to each other at the same time. Impacts to water quality related to multiple dredges working at the same time are not expected because Best Management Practices and water quality monitoring will be employed during dredging. If multiple dredges are working in close proximity to each other at one time, and the water quality monitoring data indicates that water quality standards are being exceeded, the number of dredges would be decreased so that the water quality standards could be met. Therefore, an evaluation of the cumulative impacts to water quality of multiple dredges working in close proximity to each other is not necessary.

S3-26

The statement was worded incorrectly. Text edited for clarification.

S3-27

Seasonal restriction (i.e., dredging window) requirements (specified in dredge permit Special Conditions issued under the NYSDEC's Protection of Water Permit/401 Water Quality Certificate Program and NJDEP state water quality certification) for currently authorized in-water work within New York Harbor were evaluated along with available biological data to determine their applicability to the proposed project. See Chapter 9,

State Permits and Approvals for reference to this evaluation. Only one seasonal restriction was determined applicable (dredging prohibited within 1,000 ft of Shooters Island from 1 March to 1 September) for inclusion in the preliminary construction schedule described in the HNS (page 125-127). Final seasonal restrictions will be prescribed under Special Conditions by NYSDEC in Protection of Water Permits and NJDEP State Water Quality Certifications/ CZM concurrence prior to project implementation.

S3-28

Secondary Impacts are discussed under Item S3-2 above.

The non-Federal partners have indicated that they expect to increase productivity and expand terminal yard area with or without deeper channels. As indicated in Table 7 on page 42 of the Report the proposed Without-Project terminal reconfigurations do not involve waterfront fill. This proposed reconfiguration of terminals is presented as the Without-Project Future Condition. The Recommended Plan was formulated upon the same productivity increases and area expansions as described in the Without-Project Future Condition. Thus, the productivity, terminal area, and throughput are the same in both the With- and the Without-Project Condition and neither requires fill in open waters. Any further expansion of the Port is not needed to justify this project. The terminal expansions are not an indirect effect nor a "cumulative" effect of this project, but rather an independent action that may or may not take place and certainly will not take place in the near future.

While the EPA letter dated 7 April 99 states that the local partners have indicated that investment in port development is likely to change depending on the existence and/or timing of the proposed project, it is a basic premise of this feasibility report, as stated in paragraph 128, that "none of this contemplated increase in capacity, however it is to be accomplished, is necessary to justify improving any of the Port's channels," and the decision to go forward with such further expansions will be driven by increased quantity of container handling services demanded, as predicted by macroeconomic analysis. Therefore, future terminal expansions, as envisioned by the local partners in the CPIP, are not driven by channel deepening and are not connected actions.

S3-29

Text in paragraph 1.52 edited as suggested.

S3-30

The text has been rewritten to explain in a more comprehensive manner the impact on fish and invertebrate species brought about by a shift in habitat from littoral/sublittoral zone to sublittoral/deepwater zone.

The littoral zone (0 to 6 ft below MLW) and the sublittoral zone (6 ft to 15 ft below MLW) area disturbed due to navigation channel improvements was determined by projecting side slopes from the deepened channels. The method of calculation is presented in FEIS Section 6. New York and New Jersey Harbor bottom contour information from the hydrodynamic model was used to estimate the total littoral and sublittoral zone bottom area in two study areas: a smaller area defined by the channels where disturbance will occur; and the New York and New Jersey Harbor project area, which includes the areas associated with all Federal channels proposed for improvement (i.e., Lower New York Bay-Ambrose Channel). The table below presents the estimates of areas disturbed by the proposed channel improvements and the estimates of total bottom areas with the same depth.

HABITAT DEPTH CATEGORY	ESTIMATED AREA DISTURBED (ACRES)	ESTIMATED AREA (ACRES)	PERCENT AREA DISTURBED (%)
STUDY AREA: Upper New York Bay, Kill Van Kull, Arthur Kill and Newark Bay			
Littoral Zone	6.3	1,196	0.05
Sublittoral Zone	42.0	3,320	1.27
Total Area	48.3	4,516	1.07
STUDY AREA: Lower New York Bay, Jamaica Bay, Upper New York Bay, Kill Van Kull, Arthur Kill, and Newark Bay			
Littoral Zone	6.3	5,579	0.11
Sublittoral Zone	42.0	37,787	0.11
Total Area	48.3	43,366	0.11

When considering the smaller study area (channels with projected habitat disturbance) approximately 0.05% of the littoral zone and 1.27% of the sublittoral zone in that study area would be disturbed. In the larger study area 0.11% of the littoral and sublittoral zone areas, respectively, would be disturbed. As indicated in the DEIS and reaffirmed in the FEIS, proposed navigation channel improvements will impact a minimal amount of the littoral zone area, and this coupled with the proposed mitigation options will result in a net benefit to the Harbor's aquatic populations and populations dependent on the Harbor's shore zone.

S3-31

References to Port expansion in California were deleted as suggested. With regard to reference to future port expansion through fills, the Comprehensive Port Improvement

Plan (CPIP) and its related EIS are separate from the New York and New Jersey Harbor Navigation Study (HNS). The CPIP was summarized in the HNS document to explain its exclusion from the Without-Project Conditions. Alternatives to Port expansion through fills will most likely be addressed in the CPIP EIS.

S3-32

This issue was addressed under S3-3 above.

S3-33

This statement referred to rock outcroppings that may occur along the bottom of the Kill Van Kull, Arthur Kill, and portions of Newark Bay. It is not likely that these outcroppings amount to an appreciable area, however, to omit the loss would have understated the impact on species requiring hard substrate. This will be clarified in the text.

S3-34

The text of paragraph 6.42 has been edited as suggested.

S3-35

Section 6.3 of the FEIS has been expanded to discuss the cumulative effects of the losses of shallow water habitat over time and the effect on the estuarine community.

S3-36

The sedimentation modeling was performed using the maintained depths (i.e., 50 feet and 53 feet).

S3-37

Cumulative impacts to air quality arising from future port expansion and transportation improvements will be addressed in the FEIS.

S3-38

The sedimentation model results indicate that the changes to the substrate would be very small and it was judged that additional efforts to further quantify the changes were not justifiable.

S3-39

Examples of seasonal restrictions for in-water work (i.e., dredging or environmental windows) are provided as means of mitigating potential impacts to aquatic species and

habitats, including winter flounder spawning or nursery areas. Final restrictions to ensure impact avoidance and/or minimization during critical periods will be prescribed by NJDEP under Special Conditions of a state water quality certificate prior to project implementation. See Chapter 1 and Chapter 8 for discussions concerning environmental statutes and requirements for project implementation. Chapter 9 provides a description of state permit and approval requirements.

S3-40

Comment noted. The use of dredged materials to fill dead-end basins is included in the DMMP as a beneficial use of dredged materials and is recognized by some as a habitat restoration technique. Therefore, this bullet will be retained in the FEIS.

S3-41

One of the criteria for selection of the recommended mitigation plan was that mitigation must be at least acre for acre. The recommended plan, as described in the Mitigation Alternatives Report and the revised Section 7 of the FEIS, comprises mitigation of a much larger acreage than the 6.26 acres of littoral habitat that will be disturbed as a result of the project.

S3-42

Text in paragraph 9.9 edited as suggested.

S3-43

Tables in the Feasibility Report and Appendix B-1.5 have been updated to indicate the latest estimated volumes of dredged material related to proposed navigation channel improvements. Note that the table presented on page B-1.5-3 does include the allowable 2-ft overdredge volume, which represents the worst case scenario, while Main Text tables present the authorized channel depth volumes since the allowable overdredge volume is not included in project budget estimates.

S3-44

The typo has been corrected. The sedimentation model was run for the maintained channel depths.

S3-45

Item 'd' at the top of page B-1.6-2 has been changed to indicate that approximately 51 MCY of dredged material would be removed by the proposed action. The overall estimate includes about 7.7 MCY of rock.

S3-46

Potential impacts to anadromous finfish spawning runs through the project area due to increases in suspended solids or depressed dissolved oxygen levels were identified in the DEIS under Chapter 6. These potential impacts were considered short-term, not cumulative, and unlikely to occur through the use of BMPS, such as sealed-bucket dredges and designated hoist speeds.

Examples of seasonal restrictions for in-water work (i.e., dredging or environmental windows) are provided as additional means of mitigating potential impacts to aquatic species. Seasonal restrictions for in-water work (i.e., dredging or environmental windows), if considered necessary by resource agencies, will be prescribed under Special Conditions by NYSDEC in Protection of Water Permits and NJDEP State Water Quality Certifications/ CZM concurrence.

S3-47

Construction of the proposed project would meet all applicable Federal and state guidelines regarding the relocation of submerged infrastructure, including owner identification and notification.

S3-48

The policy consistency evaluation has been updated and edited as recommended. Characterization of the impacts as temporary has been edited.

S3-49

As recommended, a reference to the Memorandum of Agreement between the USACE-NYD and the New Jersey State Historic Preservation Officer (NJSHPO) has been added to the policy consistency statement.

S3-50

As provided, because this regulation has been deleted from the current Rules on Coastal Zone Management Evaluation, this policy evaluation has been removed.

S3-51

Examples of seasonal restrictions for in-water work (i.e., dredging or environmental windows) are provided as means of mitigating potential impacts to aquatic species. Seasonal restrictions for in-water work (i.e., dredging or environmental windows), if considered necessary by resource agencies, will be prescribed under Special Conditions by NYSDEC in Protection of Water Permits and NJDEP State Water Quality Certifications/ CZM concurrence. The policy evaluation has been updated to reflect this.

S3-52

The deeper channels will allow cargo to arrive more efficiently. This would be more economical but would also improve navigation safety and relieve congestion associated with many smaller vessels as compared to fewer large vessels. Additional commerce cannot move through the Port without expanding the capacity of the terminals. The impacts associated with expansions to port facilities will be addressed in the CPIP as described in the MOU.

S3-53

The secondary impacts associated with traffic are addressed in the FEIS and detailed in Appendix B-1.9. The project is located in areas that have been allocated to Port activities historically. The project is not expected to affect the demand for recreational facilities.

S3-54

Examples of seasonal restrictions for in-water work (i.e., dredging or environmental windows) are provided as means of mitigating potential impacts to aquatic species. Seasonal restrictions for in-water work (i.e., dredging or environmental windows), if considered necessary by resource agencies, will be prescribed under Special Conditions by NYSDEC in Protection of Water Permits and NJDEP State Water Quality Certifications/ CZM concurrence.

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E1

November 22, 1999

Mr. Thomas Shea, III
Project Planner, Flood Control & Navigation Section
U.S. Army Corps of Engineers, New York District
26 Federal Plaza, Room 2145
New York, N.Y. 10278-0090

BY FACSIMILE: (212)264-6040

Re: Harbor Navigation Study, Draft Main Report

Dear Mr. Shea:

The following comments are submitted on behalf of the NY/NJ Baykeeper of the American Littoral Society and the Tri-State Transportation Campaign. The intent of these organizations in commenting on the Harbor Navigation Study is to help ensure that, in the process of expanding the Port of New York and New Jersey, the region takes steps sufficient to preserve and improve the aquatic habitat in the Harbor and to create and maintain a viable transportation network. We are concerned that the extensive channel deepening program recommended in the Harbor Navigation Study ("Study") is moving forward out of its proper context and fails to anticipate or address the consequences of that program for the natural resources of the Harbor and for the region's land side transportation network. This concern has been raised in comments submitted by the Environmental Defense Fund and the Baykeeper. As pointed out by these organizations and others since the formulation of the "Without Project Condition" this summer, the Corps' justification for the separation of the channel deepening analysis from other Port-related studies, namely that the deepening project will have no effect on the land side transportation network or on projects requiring fills in the Harbor, is simply not credible. The following comments provide specific examples from the Study documents of the problems inherent in the approach to Port infrastructure expansion being taken by the Corps and cooperating agencies.

I. The Study does not justify the implausible notion that demand for Port facilities is independent of channel depths.

The EIS contains no analysis of the Recommended Plans' impacts on the region's transportation system, because it claims to have no such impacts. This idea is based in turn on the notion that the container traffic projected for the Port is independent of channel depths, and that channel deepening therefore cannot generate or call for land side investments beyond what would occur without them. Indeed, the sole mention of channel depth in the "Future Commodity Movement" chapter of the Study (D31) is a passing reference to the fact that such factors may help determine the distribution of cargo within a "port-range." (D39) The possibility that channel depth may

E1-1

Edward Lloyd, Esq. Director
Ann Alexander, Esq. Staff Attorney
Susan Kraham, Esq. Staff Attorney
Therese Langer, PhD. Staff Scientist

play a role in the Port of New York and New Jersey's share among North Atlantic ports is nowhere reflected in the remainder of the discussion. Moreover, the Port Authority's analysis of the potential for the Port of New York and New Jersey to attract millions of TEUs of Asian trade away from West Coast ports annually solely on account of the economies gained for the all-water route to the East Coast using deep-draft ships is nowhere reflected (or refuted) in the Study.

The Study also cannot ignore the fills that will be prompted by channel deepening. Neither the indirect impact nor the cumulative effect sections of the EIS acknowledge this phenomenon, beyond references to the environmental analysis that will conducted in conjunction with the proposed Comprehensive Port Improvement Program. The fact that these inevitable consequences of channel deepening are not analyzed in the EIS for the Study, however, is further evidence that the Study has removed channel deepening from its proper context and should be instead folded into Comprehensive Port Improvement Program.

II. The Study fails to consider certain important alternatives.

The precise assumptions in the Study regarding allocation of berths to deep-draft ships in the economic analysis of channel deepening alternatives are unclear. These assumption come into play in the determination of incremental benefits of increasing channel depth leading to a terminal after 50-foot channels to another terminal already exist. Given that at no time over the study period does the shallow draft component of the goods entering the Harbor become negligible, it is reasonable to ask whether the projected cargo could be accommodated, at lower economic and environmental cost, through the designation of certain Port sites as deep-water sites and the maintenance of other sites to serve ships drawing 45 feet or less. E1-2

The discussion in Appendix C (C80-81) indicates that i) dedication of berths to carrier alliances and large independents correlates to usage of those berths by deep-draft ships and ii) 3 of 6 berths at Port Jersey/Global would be allocated to such users and that South Brooklyn and Howland Hook "are assumed to be available for dedicated use by smaller alliances or independents." Thus, there is no analysis of a scenario in which Port Jersey/MOTBY and South Brooklyn were developed as exclusively deep-water facilities, with maximum flexibility with respect to carrier usage. Yet carrier alliances are fluid and responsive to changes in conditions, and, given the tremendous costs of deepening all four pathways as the Study recommends, it is clearly worth analyzing such a scenario, especially given that terminals in South Brooklyn and much of Port Jersey/Global do not yet exist and therefore have no established allegiances. E1-3

III. The benefit/cost analysis shows marginal justification for two of the four pathways in the Recommended Plan.

The conclusions drawn about the Port Newark/Elizabeth and Howland Hook Channels in the benefit/cost analysis are problematic. The channel-by-channel analysis reveals that, while deepenings of the Port Jersey/MOTBY and South Brooklyn pathways have benefit-cost ratios of over three, the costs for Port Newark/Elizabeth and Howland Hook channels exceed the benefits. By sequencing the projects to allow these less profitable projects to piggyback on the more E1-4

profitable ones, the analysis concludes that deepening Port Newark/Elizabeth channels after deepening Port Jersey/MOTBY would have a favorable benefit-cost ratio. This ratio, however, is 1.05, resulting from a net annual benefit of $5 million from a $1.2 billion project. Surely this benefit is well below the margin of error of the entire analysis, which is based on projections out to the year 2060. A project of this magnitude with a marginal benefit-cost ratio and significant direct environmental impacts, which have been excluded from the benefit-cost analysis, is probably not a promising candidate for investment at this time.

IV. The sensitivity analysis suggests that even a small reduction in projected commodity traffic growth rates would dictate a greatly curtailed plan.

The sensitivity analysis described in the Study gives further reason for skepticism regarding the robustness of the benefit-cost conclusions about the Recommended Plan. Table 29 (C104) shows that, had the annual growth rate for commodity traffic been projected at 3%, rather than 3.3%, annual net excess benefits for the Recommended Plan would have declined by nearly half, from $72.6 million to $37.7 million, bringing the benefit-cost ratio from 1.44 to 1.23. While this may still be regarded as a reasonable benefit-cost ratio, it does not demonstrate that, at this growth rate, the Recommended Plan still maximizes net excess benefits, as the recommended plan is required to do. In fact, it seems highly unlikely that the "third added pathway" and "fourth added pathway," respectively the Port Newark/Port Elizabeth and Howland Hook pathways, would add net benefit to a plan that includes only the two most profitable pathways, namely the Port Jersey/MOTBY and South Brooklyn pathways. E1-5

According to Table 19 (C83), for example, the Port Newark/Port Elizabeth deepening from 45' to 50' as a last-added element to the Port Jersey/MOTBY deepening provides annual benefits of $94.6 million at a cost of $89.9 million. If a growth rate of 3%, rather than 3.3%, means a 15% reduction in benefits (Table 38, D74) for the Recommended Plan, then it must also lead to a reduction in benefits for the Port Newark/Port Elizabeth deepening at least sufficient to eliminate this $4.7 million in net benefits (only 5% of the total benefits for the pathway). Thus, although the information provided in the Study is not sufficient to reproduce the benefit-cost analysis, we would expect that under a 3% growth scenario, only the Port Jersey/MOTBY and South Brooklyn channels would prove justified according to this analysis.

V. If the NED plan is determined by national benefits, then the alternatives analyzed should include channel deepenings elsewhere in the nation as well.

The benefits of the Recommended Plan analyzed in the Study are "national" benefits, rather than benefits to New York/New Jersey region. That is, the benefits allegedly accrue to U.S. consumers through lowered costs of transporting goods, not to region residents through increased Port commodity traffic. It seems clear that a study focusing exclusively on national benefits should include a national alternatives analysis, which the Harbor Navigation Study EIS does not do. That is, the alternatives analysis should compare the impacts of deepening channels in the NY/NJ Harbor with those of deepening channels elsewhere. E1-6

VI. The most beneficial deepenings should be carried out first.

Should the region choose to proceed with a wholesale deepening of channels, projects should at least be sequenced consistent with their performances in the benefit-cost analysis. Thus deepening of channels to Port Newark/Elizabeth and Howland Hook should begin after the completion of the Port Jersey/MOTBY and South Brooklyn pathways. This is particularly important in view of the uncertainty regarding funding for the entire $1.7 billion proposal and the distinct possibility that thinking on the region's Port strategy could change over the course of the ten-year program of deepenings. E1-7

In closing, we note that the time allowed for review of the Study documents was inadequate, and that the Study documents were not available at the Newark Public Library, listed in the Corps' publication *Navigation News* as a "Main Library for Harbor Navigation Study Documents."

Yours truly,

Therese Langer

RESPONSE TO COMMENTS

E1 Rutgers Environmental Law Clinic

E1-1

The commenter characterizes the proposition that, "demand for Port facilities is independent of channel depths" as implausible. If the demand for Port facilities is dependent on channel depths, then a number of anomalous facts must be explained, among which are the following:

1. Halifax has over 60 feet naturally, yet they did not get significant container business until they established a direct rail link with Chicago, effectively making Halifax the "Port of Chicago."

2. Two years ago, Dundalk Terminal in Baltimore was without tenants, which was attributed to lack of commerce volume, even though they already had 50 feet.

3. The major container ports of Northern Europe are situated on the naturally shallow and treacherous North Sea, and not on the naturally deep fjords of Norway.

4. Veldez, AK, a well known U.S. port with a channel capable of accommodating Suezmax tankers at full load (controlling channel depth is 231 feet), is not a major container port. Mr. Michael Bodine, the Port Director, reports that they have never had a call by a containership, only Ro-Ros.

The inescapable conclusion is that there is something other than channel depth that attracts containerized cargo. Experience and economic theory both suggest that cargo goes to markets, not to deep channels. The commenter is arguing, essentially, "if you build it, they will come." To test this proposition, imagine that a 50 ft. channel and a container terminal equipped with 22 box outreach cranes has been built at, say, Point Barrow, and ask how much container traffic can plausibly be hypothecated to that port.

What of the argument that "channel depth must have some commerce inducing effect, even if it is not the most important consideration"? Even this narrower assertion is not supported by facts. In this Port, the pathway to Red Hook Terminal has had a 40 foot channel since at least1930, yet it has lost business to other terminals at Port Newark, Port Elizabeth, Global Terminal, and Howland Hook, all of which had less depth than Red Hook until 1995 and two of which still have less depth than Red Hook. Indeed, the operators of Red Hook Terminal have announced that they will phase out container handling services completely when the South Brooklyn facility resumes handling

container cargo, their channel depth advantage having "induced" only 3.5%[1] of the flow of TEUs that were coming to this Port anyway to their facility.

The commenter's conclusion or assumption that fills will be one of the "inevitable consequences of channel deepening" is unfounded. Validly reaching such a conclusion would require a showing that (1) the profit maximizing level of output of container handling services is greater than the level of output that can be had with the present factors of production (in this case, land, labor, and machinery) plus the changes in the labor and machinery elements of the factors of production that have already been announced or are in the process of negotiation, (2) that the various terminal operators will invest in the increase in cargo handling capacity required to produce the profit maximizing level of output, and (3) that those investments will either replicate the factor proportions of the prior investments or have a higher proportion of land than the prior investments did.

To determine the profit maximizing level of output, it is necessary to know the marginal revenue function and the marginal cost function of the firm producing the output. The marginal revenue function would come from the demand function the firm faces, which in this case would be the demand for container handling services. The function describing the demand for container handling services is not provided by the commerce forecast of the Study, nor is it derivable from the commerce forecast. No other study of which the District is aware has estimated the demand for container handling services in the Port.

The marginal cost function would come from the supply function of the firm, which in this case would be the supply of container handling services. The supply function of the various terminal operators depends on the relative prices of the various factors of production (in this case, essentially, land, labor, and cargo handling machinery) and the state of technology. Obviously, the relevant supply function would be the one based on the relative prices of the factors of production and the state of technology that prevail at the time for which the profit maximizing level of output is to be determined. The supply function of the various terminal operators is not provided by the Study. No other study of which the District is aware has estimated the supply function of container handling services in the Port.

It should be stressed that neither the demand function nor the supply function are needed in order to perform the cost-benefit analysis required in the Study.

Without knowing the demand function or the supply function that will prevail at the time that the volume of commerce would (at the current price charged for container handling services) first exceed the capacity of the various terminal operators (sometime after 2020), the commenter cannot have validly concluded that there will ever be a desire on the part of profit maximizing entrepreneurs to increase the capacity of the terminals at all, much less that the form that the capacity increase will take will involve fills.

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[1] This was calculated on the basis on 1996 statistics.

For the sake of argument, though, let us assume that the profit maximizing level of output has been determined and that to produce that level of output would require that the various terminal operators increase their cargo handling capacity. Such an investment would be profitable. That alone, though, does not mean that the investment will be made. The Port Authority of New York and New Jersey (PANYNJ), for instance, is engaged in many revenue producing activities other than its maritime activities. Even though an investment in cargo handling capacity would be profitable, there may well be even more profitable investments in the other activities that would exhaust their then-current financing capacity.

Again, for the sake of argument, let us assume that the profit maximizing level of output has been determined, that an increase in cargo handling capacity would be profitable, and that the required investment would be within the financing capacity of the various terminal operators. Even this does not imply that the capacity increasing investment would involve fills. The commenter implicitly assumes that future investments will simply replicate the factor proportions of past investments or that land will be a higher proportion of future investments than it was in past investments. While this might be an arguable assumption to make in an analysis that covers only a period of time so short as to not permit technological change or change in the relative prices of land, labor, and machinery, it is not appropriate to make this assumption with respect to an investment that is not expected to take place for more than twenty years. Making that assumption implies a belief that the relative prices of land, labor, and machinery will be the same at that time as they are now (or that land will fall in relative price) and that there will be no significant technological change.

There is no basis for these beliefs. Indeed, the history of the U.S. economy in this century (and the 19th century, for that matter) strongly contradicts these beliefs and indicates that by far the most likely event is for land and labor to rise in price relative to machinery. This would lead profit maximizing businesses to choose combinations of land, labor, and machinery that include relatively more machinery and relatively less land and labor. This general business pattern of substituting machinery for land and labor, which is made possible by technological change and economies of scale in the manufacture of machinery, has also characterized the business of marine terminals specifically. Contrary to this historical pattern, the commenter implicitly assumes (at best) fixed factor proportions and that there will be no further technological change.

E1-2

Below is the berth distribution used in the analysis. It is based on existing operational practices such as alliance sharing of facilities and it has approximately 35% of the berths available to non-alliance carriers. The berth distribution was arrived at after discussions with consultants and personnel of the various terminal operators.

Terminal Location	Berth Distribution
Port Elizabeth and Port Newark	11 (out of 18 berths) at 50 ft

Port Jersey	3 (out of 6 berths) at 50 ft
Howland Hook	2 (out of 2 berths) at 50 ft
South Brooklyn	2 (out of 2 berths) at 50 ft

The commenter's question as to whether the projected cargo volume could be accommodated at a lower total cost through the designation of particular terminals as deep water terminals is taken up in the next response.

E1-3

The response is developed in three parts:

1. The plan formulation process requires the identification of the plan that maximizes discounted net benefits (the NED plan) based on an incremental analysis which includes all possible pathway-channel depth combinations. Deepening only the channels to Port Jersey/MOTBY and South Brooklyn does not maximize the net benefits of the project.

2. One of the reasons that the Port Jersey/MOTBY and South Brooklyn only plan does not maximize discounted net benefits is that exclusive use of these terminals by only the largest vessels is not operationally feasible. The incremental analysis used to identify the NED plan was constrained by the existing and reasonably foreseen operational practices in the Port. The analysis could not be based reasonably on the expectation that terminal operators, carriers, and the Port Authority would change their operating practices to a less efficient more costly way of doing business, which is implied by the Port Jersey/MOTBY and South Brooklyn only plan.

3. It is unreasonable to assume that carriers would use only the largest vessels. If Port Jersey/MOTBY and South Brooklyn were to only service the largest vessels, carriers would therefore have to split their operation among multiple terminals (largest vessels at Port Jersey/MOTBY and South Brooklyn, smaller vessels elsewhere). The inefficiency (from the carrier's perspective) of the Port Jersey/MOTBY and South Brooklyn only plan would stem from carriers splitting their Port operations between two or more terminals.

The inefficiency of this operational practice is discussed in the lead article of the Journal of Commerce, 22 Nov 99 (www.joc.com/issues/19991122/p1age1/web_main.htm). In this article, industry experts discuss plans by the Grand Alliance which would split their Port operation between Howland Hook and Maher Terminals. Some of the industry expert comments cited in the article are:

> It's the least desirable situation. You lose the economies you should get from sharing equipment with your partners...

> Alliances with three or four different carriers should be operating out of the same terminal to make sure they get the most productivity out of their terminal operations.
>
> It's a lot easier to coordinate equipment and documentation and the chance of something going wrong increases exponentially with multiple terminals...

The only positive comment in the article was that the carriers "might feel that they can get more leverage on the terminals by splitting their services...."

Given the likelihood that carriers will not split their operations among multiple terminals, it is unreasonable to put forward a channel deepening plan that will require them to do so.

E1-4

The commenter's reliance on the benefit to cost ratio (BCR) as a complete measure of the economic performance of a given alternative is misplaced. Comparison of BCRs is only a valid analysis when the scale of all the alternatives being compared is the same. In this instance, the various pathways (as well as the segments thereof) form a set of alternatives of differing scales.

All the BCR calculation does is divide total discounted benefits by total discounted costs. No attempt is made to account for the scale of the project, so it is not useful in comparing projects of different scales. To see why this is a significant omission, imagine that there are two projects, one large and one small. The small project has benefits of $10 and costs of $5, for a BCR of 2.0 and net benefits (total benefits less total costs) of $5. The large project has benefits of $1,000 and costs of $512, for a BCR of 1.95 and net benefits of $488. If the decision rule was to choose the project with the highest BCR, we would choose the small project, and leave $483 worth of benefits (99% of the total available benefits) unrealized.

The objective of the economic analysis is not just to find a project with total benefits greater than total costs. The objective is to find the optimal project, which is that project for which total benefits exceed total costs by the greatest possible amount. In more technical language, that means maximizing discounted net National Economic Development (NED) benefits (net NED benefits are total NED benefits less total NED costs). That optimal project becomes the NED plan.

The commenter next suggests that the BCR of the recommended plan is not high enough at 1.05 to remain in the range greater than one if there happens to be less commerce than the forecast indicates. Putting aside the limitations of the BCR as a measure of economic performance already discussed, this comment fails to appreciate the stochastic nature of model-generated commerce forecasts. That there is some level of commerce growth below the one predicted in the study that would result in a realized BCR of 1.0 (and, equivalently, discounted net NED benefits of zero) cannot be denied.

By implicitly holding constant all of the other factors that affect the calculation of NED benefits, it would be possible to find such a level of commerce growth no matter what level of commerce growth was predicted in the study.

The level of commerce growth predicted in the study is the central tendency of a symmetrical distribution of outcomes from the model. That means that there is a 50% probability that the actual level of commerce growth in the event will be above the level predicted and a 50% probability that the actual level of commerce growth in the event will be below the level predicted. Because the level of commerce growth that would result in a realized BCR of 1.0 is less than the level of commerce growth predicted in the study, there is a less than 50% probability that the actual level of commerce growth in the event will be that level that would result in a realized BCR of 1.0 or less. Another way of saying the same thing is that it is more likely than not that the realized BCR will be greater than 1.0.

It should also be pointed out that the discounting procedure used to convert NED benefits implied by the model into discounted net NED benefits implicitly includes at least some and perhaps all of the opportunity cost of risk. To perform sensitivity analysis after the discounting analysis and after recognizing the stochastic nature of the commerce forecast supplies a very comprehensive accounting for risk. The commenter would add yet another layer of accounting for risk.

E1-5

The same observations regarding the limitations of BCR analysis and the implicit and explicit treatment of risk discussed in the response to comment E1-4 are applicable in response to this comment. Of course, it is possible to imagine a rate of commerce growth so low that no alternative to the without-project future condition is economically justified. Plan formulation, though, must be based on the most likely without-project future condition, and that is the basis for the plan formulation in this case.

Again, it is almost always possible to find a set of conditions in which the outcome of the analysis would have been different. The analysis presented is based on the set of circumstances most likely to prevail during the period of analysis. Moreover, the probability that the level of commerce growth will in fact be higher than the level posited in the comment is greater than 50%. Furthermore, the size of the reduction in the level of commerce growth posited in the comment is large by the standards of the history of world trade since 1950.

E1-6

The term, "National Economic Development" refers, in effect, to economic effects that would appear in the National Income Accounts. It does not mean, as the commenter has evidently inferred, that a given effect must be felt in a noticeable or measurable way in all parts of the nation to be a National Economic Development (NED) benefit or cost. The purpose of the requirement that these studies consider only NED benefits is to avoid

counting as a benefit of the project an effect that merely moves an economic activity from one part of the country to another. Multiport analysis, which is included in the study, is meant to answer the question of whether the extra costs of accomplishing the same results in terms of goods movement by way of another port or combination of ports would be less than the cost of the recommended plan. The analysis indicates that there is no opportunity to accomplish the same results in terms of goods movement by way of another port or combination of ports would cost less than the recommended plan.

E1-7

Assuming that construction of separate pathways cannot proceed simultaneously; putting aside the practical considerations of engineering, construction, and funding; and considering the matter only on the basis of its pure economics; the commenter is correct. In fact, though, it is possible for construction of certain pathways to proceed simultaneously, and the practical considerations of engineering, construction, and funding are real and frequently lead to adoption of policies that might not maximize economic efficiency.

Natural Resources Protective Association

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E2

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Jim Scarcella
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Secretary:
Mr.Kerry Sullivan:
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October 29, 1999

ACOE
26 Federal Plaza
New York, NY 10278

Att: Mr. Frank Santomauro

Dear Mr. Santomauro: Re: Navigation Study

Thank you for sending us the draft E.I.S. for the navigation study. The document is comprehensive and well written, but it is lacking numerous comments the project planner has received about acquisition of habitat for losses of tidal wetlands and shorelines.

We are restating our opposition to mitagation. Mitagation is doomed to fail because of methodology, procedure, etc. We need acquisition of habitat for permanent protection. Areas such as Arlington Marsh, Neck Creek, Graniteville Tree Swamp, Bridge Creek, Old Place Creek, Lower Graveyard of ships and other tidal wetlands must be given permanent parkland status.

E2-1

We cannot and will not support the navigation study without your inclusion of acquisition of habitat as a priority for relief from erosion and habitat damage from proposed channel deepening.

Thank you.

Sincerely,

James Scarcella,
President

cc: Col. Pearce
cc: Paul Westphal
cc: L. Caldera
Hon. C. Schumer
Hon. N. Fossella

Clean Air Campaign, S.I. Federation of Sportsmens Clubs, Midland Beach Civic Association, Midland Beach Sportsmans Club, Crescent Beach Civic Assoc., Citizens of Ocean Breeze, Richmondtown Clarke Ave. Civic Assoc., Protectors of Pine Oak Woods, Baykeeper of New York New Jersey, Conference House Park Raritan Bay Conservancy, Mariners Marsh Conservancy, New Dorp Beach Civic Assoc., Princes Bay Boatmens Assoc., Lemon Creek Boatmens Assoc., Staten Island Baymens Assoc., S.I. Citizens for Clean Air, F.A.T.E., Global Action/Tottenville High School, Friends of Blue Heron Pond, Friends of North Shore Greenbelt, Friends of Gateway/N.O.S.C., Mariners Harbor Civic Assoc., Arlington Civic Assoc., Clean Ocean Action, Friends of Spanish Camp, N.Y. Harbor Lights, Lighthouse Research for Preservation, Great Kills Harbor Preservation Committee, Coalition for Safe Boating Marine Environment, S.I. Friends of Clearwater, S.I. Environmental Coalition, S.I.Taxpayers Assoc., Save The Bay, Beachcomber Surf Club, S.I.Explorers Club, S.I. Sport Divers, American Littoral Society, S.I. Tuna Club, Richmond County Yacht Club, Great Kills Yacht Club, S.I. Yacht Club, Staten Island Reporter, The Waterfront Watch, International Order of the Blue Gavel

E2 Natural Resources Protective Association

E2-1

The final mitigation plan was developed in full compliance with current laws, regulations, and policies concerning the Corps of Engineers participation in water resources projects. At the present time, the Corps does not feel that pure acquisition of habitat is a beneficial way of mitigating for project related direct impacts. This type of activity is best left to those agencies such as the Fish and Wildlife Service and the National Marine Fisheries Service, that have the capability to do so.

The final mitigation plan for the New York and New Jersey Harbor Navigation Study presents several mitigation options including restoration of littoral zone wetlands, shoreline stabilization and the acquisition and restoration of marine (intertidal) wetlands. It should be noted that acquisition of wetlands, in and of itself, does not satisfy the Federal goal of no net loss of wetlands. Therefore, any acquisition sites considered in the mitigation plan also include a wetlands restoration and/or creation component. USACE guidelines found in ER 1105-2-100 (Guidance for Conducting Civil Works Planning Studies) was followed in selecting the final mitigation plan from combinations of mitigation options that included some wetlands acquisition/restoration sites. The mitigation sites included in the recommended mitigation plan were selected because together they represent the best combination of mitigation options that satisfy the criteria established by the USACE. Details regarding the selection of the recommended mitigation plan are contained in Section 7 of the FEIS and in the Mitigation Alternatives Report, to be published concurrently with the Main Report and the FEIS.

ENVIRONMENTAL
DEFENSE FUND

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November 11, 1999

Mr. Thomas Shea, project Planner
U.S. Army Corps of Engineers, New York District
Room 2145
26 Federal Plaza
New York, N.Y. 10278-0090

E3

Re: Harbor Navigation Study

Dear Mr. Shea:

Via a separate letter, we have requested an extension of the comment period. As some have suggested, at a minimum this should be to December 3, the deadline for comments on the DMMP. It would make much more sense to extent the comment period until the preparation of the Comprehensive Port Improvement Plan (CPIP)/EIS. We have proposed that the preparation of the CPIP be greatly accelerated so that a complete draft would be available by next summer and a final CPIP within a year so that we could review and go forward with a joint HNS and CPIP within that concentrated time period. In the event that these requests are not granted, we provide some preliminary comments.

E3-1

Hydrodynamic and water quality impacts of HNS recommendation plan. In general we are supportive of a range of efforts to strengthen and revitalize the Port of New York and New Jersey. This would include, in some cases, expansion of navigation channels, such as deepening of the Kill Van Kull to 45 feet, a project now underway. As channels are deepened further, certainly below 45 feet, the likelihood of broader hydrodynamic and water quality impacts increases. The draft HNS and EIS seems to minimize these impacts. We would like to be confident that this is the case. We would like to know what kind of scientific peer review process has been used for the hydrodynamic and water quality models. We would be interested in an opportunity through a workshop to sit down with the modelers to look at these models and how they are applied to the Lower Hudson and Raritan Estuary. In general, while the HNS indicates the littoral-zone and sub-littoral zone habitats that 50 foot channel expansion will affect, intuitively it would seem that the impacts in terms of changes in water and sediment flows and fishery habitats will be greater than indicasted in the draft HNS.

E3-2

Navigation channel expansion subset alternatives. The HNS recommends expansion of all of the major federal navigation channels to 50 feet. We can envision reasonable alternatives that would provide for expansion of some subset of these channels. Such alternatives should be explored. For example, it is clear that the amount and cost of dredging the Kill Van Kull below 45 feet and the Arthur Kill beyond present depths will be significantly greater than deepening the channels in the Upper Harbor to Bayonne and Brooklyn. The length of channels that need to be deepened to the latter destinations is less than the former, and the

E3-3

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nature of the bottom sediments quite different. Further, these latter channels are located in more open parts of the Estuary, whereas the KVK and AK channels are more confined such that hydrodynamic and water quality impacts would be expected to be greater. It is also evident that expansion of the KVK and AK channels below 45 and 40 feet, respectively, will require more and more blasting through very hard rock.

One alternative vision for a growing Port would be to have 50 foot plus channels going to Bayonne and Brooklyn that the deepest draft, largest ships could use, with 45 foot channels to Newark/Elizabeth and Howland Hook, channels that could accommodate most, but not all, container ships. One could respond, of course, that the condition of transportation and other on-land infrastructure is not as robust at Bayonne and certainly Brooklyn as it is at Newark/Elizabeth. However, since the draft HNS does not deal with this on-land infrastructure at all, but, instead, merely assumes that it will be available to handle current traffic projections, these concerns are not relevant. From a navigation point of view and in terms of handling the number of ships that require 50 foot in contrast to 45 foot channels, why wouldn't this alternative be reasonable? Would some subset of the federal channels proposed for deepening in the draft HNS, along the lines proposed here, not have the capacity to accommodate all or most ships that would require these deep drafts in the future? E3-3

Another alternative would provide for selective expansion to 50 feet, with no deepening to the oil facilities west and south of Howland Hook. Yet another alternative would be extension of the 45 foot, but not necessarily 50 foot, channel beyond the current Howland Hook facilities so that any filling or disturbance of the Arlington Marsh could be avoided.

Uncertainty of on-land transportation and other infrastructure improvements to handle without project projected Port traffic. The draft HNS/EIS states that the transportation and other on-land facilities necessary to accommodate the level of traffic that the Corps assumes will be using Port of NY and NJ facilities without the 50 channel expansions, i.e., the amount of traffic used in the economic analysis, would have to be expanded in any case. Therefore, reasons the Corps, the impacts and costs of these on-land investments do not have to be addressed in these Corps documents. While the HNS may not be the appropriate place to look at the on-land facilities that will be necessary to handle the level of traffic that the Corps projects would happen in any case without the project, the statement in the HNS that these facilities will be built in any case has no foundation whatsoever. It may very well be the case that, for cost, environmental, political or other reasons, some or all of these on-land facilities will not be built. This in turn would impose a real constraint on the amount of cargo that the Port could handle and thus the amount of traffic use the federal channels would experience. If on-land facility capacity constrained traffic growth significantly below without project projections, the economics of the HNS could change materially, i.e., projected benefits would not occur, although costs would be the same. E3-4

Furthermore, the kinds of on-land investments, particularly transportation investments, that projected, without-project traffic growth would demand are not small or modest. They raise very complex and difficult questions for the Port and the region. Indeed, their very complexity and physical, cost and political challenge provide the rationale for the CPIP. A basic issue is

how much of the projected traffic, particularly containers, will be moved from and to the Port by truck, rail or water. The region is surfeited by trucks. In response to truck congestion and safety impacts, NY DOT is looking at expanding the Staten Island Expressway, the Bronx Expressway and the Deegan Expressway. The Port Authority continues to talk about twinning the Goethals Bridge. New Jersey is considering a number of highway investments as well, in part to accommodate Port-related truck traffic, but also to handle additional regional truck traffic. There is increasing environmental and community opposition to these proposals, not to mention cost constraints.

In terms of freight rail investments, EDC is conducting a major cross-Harbor freight movement study at the present time. It may propose some major investment in freight rail capacity, including an inner-regional shuttle freight rail system that could service port facilities on both sides of the River, but whether the City and NY State or the private sector will support these important investments is an open question. There is somewhat greater certainty about some significant rail investments on the part of the State of NJ and the private sector carriers CSX and Northfork Southern, but more will be needed if freight rail is to carry a major part of the projected increase in Port goods, let alone other goods not related to the Port.

The nature of the transportation investments in turn will affect Port productivity growth rates and thus the likelihood of Port fill proposals. It appears to be the case that on-dock rail access may increase productivity, thus reducing the need for additional acreage, including fill in waters of the U.S. The HNS assumes significant increases in productivity such that no fill would be required to handle the levels of future Port traffic that the Corps uses in its economic analysis. However, pending at the very least the completion of the Port Authority's port investment study that should spell out in detail what specific investments in transportation and other types of facilities would have to be made to achieve this level productivity, this assumption is questionable as well. Further, right now, the status of the Staten Island Railroad is still up in the air. In addition, we understand that consideration is being given to removing some rail connections at MOTBY.

E3-4

On the other hand, within the next six to 12 months, we could know considerably more about potential transportation investments to serve Port traffic growth, as well as more general regional growth in goods movements. EDC is scheduled to complete its cross-Harbor freight study in the spring. Congressman Jerry Nadler has established a task force chaired by Connie Eristoff with participation by representatives of the railroads active in the trans-Hudson area and other transportation specialists. Eristoff with some of the private carrier representatives made a presentation at the most recent DMMIWG meeting on November 10. That task force may have a series of recommendations for improved freight rail and water operations, particularly east of the Hudson, with a view to reincorporating the rail system east of the Hudson into the larger regional and national rail network within six months. Further, the Port Authority's investment program should be much further advanced by mid-2000 than it is now so that we would all be in a position to evaluate specific productivity plans and alternatives. Thus, within the next year, we may be in a far better position to evaluate alternative freight transportation investments on both sides of the river than we are today. It is progress on this front that forms the basis of our

suggestion that EPA and the other SERG members accelerate the CPIP so that we have a good draft before the end of the summer of 2000.

Environmental restoration program. On the environmental restoration front, we have other concerns in addition to the on-land transportation and related air quality, congestion and community impact issues described that justify some accommodation in the HNS congressional authorization schedule. These relate to habitat protection and acquisition, sediment contaminant reduction and waterfront access. It is, of course, our hope that the CPIP that should be better renamed the Comprehensive Port and Estuary Improvement Program (CPEIP) should address these issues as well. Some progress has been made, particularly on the contaminant side with CARP. However, assessment of sediment and source identification data that are now being collected may allow us in the next 6 to 12 months to assess what kinds of specific public and private investments would be necessary to achieve significant reductions of inputs of contaminants of concern, at least at levels that the DMMP forecasts to reduce dredging costs. We still have no state or federal program for treating contaminant hotspots in the Lower Passaic River and Hudson River Superfund sites. Further, HARS remediation criteria are still unresolved, although EPA is making significant progress. This leaves key questions of what the HARS restoration program should be and what portion of the HARS-compatible dredged materials designated in the DMMP are appropriate candidates for this important ocean sediment restoration initiative.

While we have put forward a very modest, three-year, $60 million habitat protection and restoration initiative, state and federal funding remains uncertain. As such, this key component of the Estuary's environmental restoration program that could help engender some degree of concurrency, as well as equivalency, between the Port economic development and the environmental restoration program is up in the air. Since the Corps' WRDA 1999 environmental restoration reconnaissance study has now been funded, furthermore, by mid-2000 we should have a good sense of the magnitude and cost of a longer-term habitat protection and restoration effort. At the same time, the strength of state and federal support for a program designed to assure protection of all of the remaining wetlands in the Hackensack Meadowlands with sediment quality as well as habitat benefits, may be evident. Similarly, the planning and brownfield remediation status of EDC's Sunset Park proposal is currently uncertain. Finally, the DMMP leaves big gaps in terms of what New York's dredged disposal program will be for both the short-term and long-term. All this could change within six to eight months.

E3-5

If the HNS were to proceed to construction authorization now, the basic principles of port economic development and environmental restoration concurrency and equivalency would be violated. Without some comparability, enthusiastic endorsement of the HNS is extremely problematic. Certain actions could be taken now that would promote concurrency and equivalency, such as:

- Full and effective agreement between New York and New Jersey, affected local governments and railroads on completion and funding of the Staten Island Railroad with its connection to the Chemical Coast Line or larger rail network;

- Committed retention of on-dock rail access at MOTBY
- Effective commitment by NYS and NYC to freight rail yard capacity in Queens with access to the Montauk Line and Long Island at the Pilgrim State Hospital site;
- Committed federal and state funding for the three-year, $60 million habitat restoration and protection program;
- Committed support for Hackensack Meadowlands protection;
- NYS funding for the Sunset Park planning study;
- Initiation of Superfund site decontamination technology demonstration projects.

E3-5

These are all specific environmental improvement and restoration actions that support and are related to Port revitalization that the two States, NYC, NJ municipalities, the federal government and the Port Authority can take now. Within the next six to eight months, significant progress on the assessments, investigations and investments described above is altogether feasible. These are the basic elements of the CPIP or CPEIP. They point to the feasibility of rapid acceleration of the CPIP, the practicality of achieving port development and environmental restoration concurrency and equivalency and the desirability of folding the HNS into this larger context so that all parties will be able to consider and discuss the comprehensive program and its constituent pieces with evidence of successful commitment of near-term environmental restoration measures of the sort bulleted above.

Yours very truly,

James T. B. Tripp, General Counsel

cc.
HEP Policy Committee members
DMMIWG members

RESPONSE TO COMMENTS

E3 Environmental Defense Fund

E3-1

The District is not in receipt of any request from the Environmental Defense Fund for an extension. The public review period was extended for one week to permit resolution of a specific question.

E3-2 Hydrodynamic and Water Quality Impacts of HNS Recommendation Plan

As explained in the DEIS, the hydrodynamic and water quality modeling was performed with an internationally known modeling system that has been the subject of numerous peer-reviewed technical publications. The specific hydrodynamic/water quality modeling efforts conducted for this study were reviewed by a panel of nationally recognized experts. These experts included members of various academic institutions, private industry, and a non-profit organization. The Waterways Experiment Station was also involved in model selection, development and review. The results of the modeling were displayed and discussed at the public sessions for the EIS. The project team is available to discuss these models further if desired.

E3-3 Navigation Channel Expansion Subset Alternatives

The alternatives mentioned have all been considered in the study. Because of the need to consider a comprehensive set of alternatives for the study (based on the study authority) an incremental analysis was used in accordance with Engineering Regulation (ER) 1105-2-100 (*Guidance for the Conduct of Civil Works Planning Studies).* This incremental analysis was performed on an equi-marginal basis, in which all possible combinations of alternatives (various pathways and depths) were considered. There are, in fact, over 4,000 possible combinations of pathways, at various alternative depths, from which to choose. The formulation process presented in the study shows the logical analysis used to eliminate unjustified alternatives and progress to the plan with the greatest net excess benefits. ER 1105-2-100 requires the District Engineer to recommend the alternative that has the greatest net excess benefits (this plan is called the National Economic Development (NED) Plan) unless the non-Federal partner has indicated that they would be satisfied with a plan that is less than the NED Plan. The plans proposed by the commenter were not accepted by the non-Federal partners. That being the case, the District will not recommend them for authorization. See also Response to E1-4.

E3-4 Uncertainty of On-land Transportation and Other Infrastructure Improvements to Handle Without Project Projected Port Traffic

The growth of the inland infrastructure has historically kept pace with Port growth. While we concur with the comment that there is some uncertainty related to inland infrastructure growth, which is dependent on costs, environmental concerns, political issues, and other factors, it is a requirement of the planning process to identify the most probable Without-Project Condition, taking into account all plans and uncertainties. The comment identifies many potential studies and projects that may relieve some of the congestion and provide access for expansion. The fact that there is some opposition to these plans in today's environment should not be considered as grounds to think some plans in some form will not go forward.

The EDF questions the assumption that transportation and other infrastructure improvements needed to support the "without project" cargo movements. It should be pointed out that for feasibility study purposes, assuming that recognized and accepted growth projections will be realized is a reasonable approach. With this assumption, the following can be projected: quantity of cargo handling services demanded, traffic, and infrastructure needs. These factors are interrelated, meaning one is not realized without the others. Therefore, and in keeping with ER 1105-2-100, para., 6-77(a)(4), it is assumed that no significant limitations in infrastructure will occur on a regional basis over the very long planning period, which is being considered here.

Certainly, sub-regional capacity deficits may occur and require resolution. Specific projects may be needed which may have significant costs and environmental impacts. As EDF points out, the HNS may not be the appropriate place to evaluate the specific issues. Such regional issues will be considered in the CPIP, and specific project-level issues will be analyzed in individual Environmental Impact Statement's (EIS) and permitting actions, which are projected to occur on a site-specific basis.

E3-5 Environmental Restoration Program

Comments noted. The District supports environmental restoration of the NY-NJ Harbor Region and has initiated a separate study (The Hudson-Raritan Estuary Environmental Restoration Study) in Fiscal Year 2000. The goals of this initial study will be to identify a federal interest in further studies, identify a cost-sharing partner(s) to cost-share those additional studies, identify the required additional studies along with their costs and duration and finally, enter into the cost-sharing agreement and proceed into the feasibility phase. The purpose of the feasibility phase will be to fully identify, screen, evaluate and select restoration plans and recommend those plans to Congress for project authorization.

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November 22, 1999

E4

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Jenine Gallo
Project Biologist, Environmental Analysis Section
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RE: Draft Feasibility Report and Draft Environmental Impact Statement for the New York and New Jersey Harbor Navigation Study

To Mr. Shea and Ms. Gallo,

Thank you for extending the public comment to November 22, 1999 for the Draft Feasibility Report and Draft Environmental Impact Statement for the New York and New Jersey Harbor Navigation Study.

In sum, Clean Ocean Action finds that the Environmental Impact Statement is incomplete, the financial assessments are in need of verification, and the lack of coordination with other key port activities unacceptable. Therefore, COA urges that the document not be finalized until these issues are addressed and the opportunity for additional public comment provided.

The primary concerns are: lack of thorough environmental studies, inadequate methods by which contaminant loadings in sediments are determined, no implementation of best dredging technologies, the need for independent review, and lack of coordination with other Port development documents and studies.

Environmental Studies

Essential Fish Habitat environmental assessments are important tools for evaluating potential impacts to fish populations since they require that all aspects of fish habitat, life cycles, and food sources must be analyzed in terms of the proposed projects. These assessments could also be used to

E4-1

evaluate and choose the least environmentally destructive options. We have seen no use of these types of assessments in the Draft Environmental Impact Statement. While it is clear that the US Army Corps plans to consider EFH, it is neither clear how and when EFH assessments will be completed nor the resulting effects to the deepening proposals from such assessments.

Inadequate methods by which contaminant loadings in sediments are determined—

Potential environmental impacts due to disruption and misidentification of contaminated sediments have not been adequately addressed in the scope of the environmental impact statement. Of primary concern are the methods by which contaminant loadings in sediments are determined. As a practice, the US Army Corps analyzes sediment contamination by complete composition. Vertical cores are taken to the project depth and then fully mixed. This mixes the contaminated top layers with the cleaner deep layers and severely under-represents the levels of contamination in sediments. In contrast, regional guidance for dredged material characterization allows vertical cores to be stratified and tested for vertical stratification of contamination. Knowing the vertical stratification of contamination has many benefits and we strongly request that the US Army Corps adopts the principles of (1) not compositing vertical cores when characterizing dredged material and (2) targeting the separation of contaminated and uncontaminated layers. These principles must be adopted when assessing environmental impacts during the deepening project.

From an environmental impact assessment perspective, the implementation of these principles would accomplish the following: E4-2

1. By using environmental dredging techniques to isolate the top-most layers of contaminated sediments; impacts to biota by exposure to contaminants would be reduced and thus be an environmental benefit.
2. By using less expensive dredging techniques to dredge the deep, uncontaminated sediments, dredging could happen with minimal environmental risk at low cost.
3. By targeting the isolation of contaminated layers, the contaminated material can be treated and beneficially re-used (e.g. as primary cap on leaching landfills). This brings dual benefits of environmental remediation and economic prosperity to the region.
4. By targeting the isolation of uncontaminated layers, the uncontaminated material can be used for beneficial re-use (e.g. as remediation material at the Historic Area Remediation Site, HARS). This brings the benefits of having material available with little or no contaminants of concern (in contrast to the composited mixtures with contaminants of concern) for environmental remediation.

In addition, COA does not find a comprehensive assessment of sediment sources to the navigation channels and how these sources would impact the maintenance of these channels in the future. For example, some private terminals are constructing pneumatic devices in their berths to prevent sediment settlement. The sediment then settles elsewhere, perhaps in navigational channels, thus creating additional sediment loading that must be managed. E4-3

No implementation of best dredging technologies

While the DEIS outlines the various dredging technologies that exist in the Region, it does not assess the relative costs and benefits to implementing other technologies (e.g. silt screens, Cable Arm clamshell buckets) that would have less environmental cost and more environmental benefit. NY/NJ Harbor is one of the most polluted harbors in the United States if not in the world—resuspension of E4-4

chemical mixtures during dredging activities, especially in areas of high silt and contaminants of bioaccumulative concern (such as dioxins, pesticides, mercury, PCBs) is a serious and true risk that must be assessed in more detail in conjunction with other agencies such as National Marine Fisheries Service.

E4-4

Investment in technologies to minimize resuspension while dredging contaminated mud would have multiple pay-off benefits in the future especially when the Port is committing to create and maintain deep-water facilities in naturally shallow-water systems. Why has the US Army Corps not evaluated the need and benefits for improving dredging technologies that would reduce environmental risks?

Lack of coordination with other Port development documents and studies

The New York and New Jersey Harbor Navigation Study and its Draft Environmental Impact Statement have not been coordinated with other Port development documents and studies, such as the Dredged Materials and Management Plan (DMMP) and the Comprehensive Port Improvement Plan (CPIP). It is practically impossible to fully evaluate these documents without clear coordination. For example, this study fails to review, assess, or discuss the secondary impacts associated with the proposed navigation study (e.g. increased land-based transportation). Presumably, this concern would be addressed in the CPIP. Because of the lack of coordination between the Port documents, the public comment period for the Harbor Navigation Study must remain open beyond the comment periods for the DMMP and CPIP.

E4-5

Independent Peer Review

Since the US Corps of Engineers conducted the Navigation Study, will apply for the permits to deepen areas (once authorized) and will conduct the deepening project, it is important to ensure independent verification of the study. COA urges an independent peer review of the economic evaluations, justifications, and bases for the Navigation Study's recommendations. The extraordinary financial public costs, the profound harbor-wide impacts, as well as environmental costs warrant such a review. This review would allow several of the other major port initiatives to be considered within the context of the Navigation Study.

E4-6

Conclusion

In summary, we have numerous concerns, some of which have been outlined above. In addition, COA requests that the US Army Corps comply with all recommendations submitted by natural resource agencies, including Essential Fish Habitat requirements, habitat conservation and preservation, and minimal exposure to contaminants during dredging and disposal before issuing the final Environmental Impact Statement for the NY/NJ Harbor Navigation Study.

Sincerely,

Cindy Zipf,
Executive Director

Kristen L.D. Milligan, Ph.D.
Staff Scientist

E4 Clean Ocean Action

E4-1

The essential fish habitat (EFH) assessment provided in FEIS Section 6 has been updated to include information from the baseline Biological Monitoring program, which was completed in September 1999 and not available for the DEIS. The EFH assessment provides temporal and spatial distribution information on EFH species within the project area. The temporal and spatial distribution information is evaluated relative to minimizing or avoiding impacts to EFH species through mitigation techniques such as avoidance techniques (i.e., dredging windows) (see Section 7 and Section 8). Avoidance techniques are stipulated in dredging and water quality permits. No unavoidable impacts to EFH were identified.

EFH designations emphasize the importance of habitat protection to maintain healthy fisheries and serve to protect and conserve the habitat of marine, estuarine and anadromous finfish, mollusks and crustaceans. With the overall EFH objective as a basis for the analysis, it was determined that the proposed channel improvements are not considered destructive to EFH.

E4-2

The USACE-NYD only uses completely composited vertical cores (cores composited from surface down to project depth) for the analysis of contaminant concentrations when the sediment is found to be homogeneous over the entire length of the core. The USACE-NYD adheres to instructions and follows the guidelines established by the USEPA Region 2 detailed in their regional guidance manual, which specifies that:

- "Sampling must adequately characterize the heterogeneity and spatial extent of the project. Core sampling to 2 ft below project depth is required for all proposed dredging projects."

- "All individual core samples of the dredged material must be visually inspected, and any sediment strata present within the core must be recorded. If the sediment appears uniform within a single core sample, the entire core should be homogenized and analyzed. When other information indicates that there might be significant physical or chemical differences within a core sample (e.g., there was a historical discharge or spill in the area or the sample includes maintenance material and new work or there are discernible strata within the core), physical analyses will be done on each stratum of every stratified core. The core sample must be analyzed in sections (homogenization within each stratum but no homogenization between strata). The applicant and/or the contract laboratory

must contact the New York District immediately if there is a question regarding the need to test strata separately."

- "Bulk sediment chemical analyses must be conducted on the same sediment samples that were used for the physical analyses (i.e., all samples, subsamples, and reference and control samples)."

Any strata found are analyzed separately as stated above. This has particularly been the case for sampling and testing for the recent Kill Van Kull deepening project.

E4-3

The sedimentation model did not model the potential for sediment resuspension associated with pneumatic devices. Examination of this parameter would be difficult with any available sedimentation models. The daily sediment input associated with pneumatic devices is known to be small and this in conjunction with the relatively high channel flows suggests that it is unlikely that pneumatic devices would induce significant or measurable sedimentation in the system. Experience with pneumatic devices at Mare Island, California and Grays Harbor, Washington indicates that these devices do not induce sedimentation in adjacent areas.

E4-4

The USACE-NYD will follow State guidelines and permit conditions in its selection of dredging technologies for this project. This is stated in Paragraph 8.5.

E4-5

The cumulative assessment provided in the FEIS addresses Port-related land-based transportation impacts associated with the projected growth under the Without-Project Condition. The full identification and evaluation of these impacts is the purpose the Comprehensive Port Improvement Plan (CPIP). The Harbor Navigation Study fully relies on the Dredged Material Management Plan for the identification and evaluation of dredged material placement options. As such, the studies EIS extensively references the DMMP.

E4-6

This study has been conducted in full compliance with all applicable laws, regulations and policies concerning the Corps of Engineers participation in water resource projects, all of which call for the public input and review of the project's recommendations and environmental impact statement. In addition, the District formed an advisory group composed of the region's port and transportation industry leaders, academic institutions interested in the project, the region's environmental interest groups, (to include the commenter) and other interested parties. The persons who participated in this advisory group were nominated at the recommendation of the non-Federal partners. This group

met several times during the course of the study to review its purpose, methods of analysis, and findings. Input received from the group was used as appropriate. In addition, specific technical groups (environmental, economics, and engineering) were formed with representatives from the non-federal partners. These groups had a similar purpose to that of the advisory group and met routinely during the course of the study. Also, in addition to its normal internal quality control process and its Washington Level Policy Review, the feasibility study was reviewed by another Corps of Engineers District and the Institute for Water Resources. Comments received from these two organizations were fully integrated into the final products. In light of this, this study has undergone an intensive and critical review which constitutes an independent peer review.

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

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C1

November 15, 1999

Thomas J. Shea III
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Re: Comments on the USACE Feasibility Report for New York and New Jersey Harbor Navigation Study (Draft) and Draft Environmental Impact Statement
BBL Project #: 09994.033

Dear Mr. Shea:

On behalf of Chemical Land Holdings, Inc. (CLH), Blasland, Bouck & Lee, Inc. (BBL) has completed its review of the United States Army Corps of Engineers' (USACE) Feasibility Report (Report) for New York and New Jersey Harbor Navigation Study (Draft), including the associated Draft Environmental Impact Statement (DEIS) (September 1999). In general, the Report identifies the need for deeper channels within the New York and New Jersey Harbor (Harbor) so as to accommodate larger commercial marine vessels. Using a Benefit-Cost analysis (based strictly upon transportation costs), along with other technical information (i.e., geotechnical investigations, structural studies, shipping simulations and dredged material placement requirements), the Report puts forth a Recommended Plan to address this navigational need.

While the Report is well-written, it appears that issues regarding dredging volumes, dredging operations and the resulting impacts to water quality/biota have not been sufficiently addressed. The Report also lacks an appropriate evaluation of dredged material management, although some of these issues are covered under the Dredged Material Management Plan (DMMP). Comments related to the Report and DEIS are provided below in Sections I and II, respectively.

I. Feasibility Report for New York and New Jersey Harbor Navigation Study (Draft) (September 1999)

1. Page 64, Paragraph 194 and Page 65, Paragraph 196

Dredged material quantities (Table 9) are likely underestimated. Material quantities assume that, prior to undertaking the proposed deepening operations, the pertinent channels will have been maintained to their currently authorized depths. However, as acknowledged in the Report (Table 1), this may not be the case. In fact, as projected, several of the existing channels could be up to 10 feet above the authorized depths. The Report should provide more realistic volume estimates that take into consideration those channel depths that are likely to be encountered at the time of project implementation.

C1-1

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2. **Page 92-93, Paragraph 253**

Differentiation of dredged materials (i.e., HARS-suitable versus non-HARS suitable) was determined based upon previous testing for hydrocarbons, moisture content and color. The Recommended Plan does not explicitly state that any additional testing will be required for the material that actually is dredged. However, based upon discussions with USACE personal at the Staten Island Public Meeting (November 4, 1999), material testing is to be performed to more definitively identify material management and associated volumes. Such testing protocols should be described in the Report. C1-2

3. **Page 100, Paragraph 270**

A hydrodynamic model was used to evaluate the impacts of the Recommended Plan on the surrounding environment. This model evaluated changes to various parameters including water surface elevation, salinity, water temperature, and dissolved oxygen. While these are important, other water quality parameters (i.e., TSS and turbidity) need to be considered to better understand the potential effects of dredging on the surrounding biological community. C1-3

4. **Page 103, Paragraph 283**

The Report states that the loss of littoral habitat is temporary. However, it is very possible that littoral habitats may not return to preexisting conditions once the channels are deepened. In fact, they may be permanently lost. Therefore, the potential loss of littoral and sub-littoral habitats should be acknowledged and properly evaluated in the Report. C1-4

5. **Page 103, Paragraph 284**

Organisms that feed in littoral and sub-littoral areas will experience a permanent decrease in forage habitat, which is already limited within the study area. Several other bird species, including threatened or endangered species (TES), utilize this habitat in addition to wintering waterfowl. C1-5

6. **Page 104, Paragraph 291**

The loss of littoral habitats is permanent, resulting in the loss of foraging habitat for marine turtles. This loss of foraging habitat for a TES should be acknowledged and evaluated in the Report. C1-6

7. **Page 104, Paragraph 292**

Although shortnose sturgeon were not observed by the USACE during biological characterization efforts, the United States Fish and Wildlife Service (USFWS) reported that juvenile shortnose sturgeon may be found in the estuarine environment of the harbor area. Therefore, juvenile shortnose sturgeon could be present in the littoral and sub- C1-7

littoral habitats of the study area. Their potential presence in the study area requires further evaluation in the Report.

8. **Page 104, Paragraph 293**

Modeling of the water quality impacts associated with dredging did not include dissolution of organic contaminants from dredged materials. Water quality could be impacted and contaminants released to adjacent habitats during dredging. This potential water quality and aquatic organism impact should be further evaluated in the DEIS. **C1-8**

9. **Page 105, Paragraph 295**

The Report discusses the "vast majority" of the project area available for foraging, breeding, and growth. Quantification of the different habitat types (wetland, littoral, sub-littoral) in the project area should be performed such that each habitat impact can be put into the proper perspective. **C1-9**

The displacement of larval and egg stage aquatic organisms from construction areas may make them susceptible to increased predation and potentially affect population structure. This potential impact should be acknowledged and evaluated in the Report. **C1-10**

10. **Page 105, Paragraph 296**

This section identifies temporary and seasonal impacts to fish species during habitat disruptions. Littoral and sub-littoral habitat disruptions during specific periods of the year could result in population impacts to Essential Fish Habitat (EFH) species. The timing of disturbances to these habitats should be identified in the Report, and the potential impact to fish species sensitive to the selected season should be evaluated. **C1-11**

11. **Page 107, Paragraph 308**

Biological Exposure Potential is inadequately addressed as a "secondary impact". Although the Report does acknowledge that "dredging activities may re-suspend contaminated sediments, thereby potentially increasing the exposure of biological receptors", it concludes that sediment resuspension is expected to be short-lived due to rapid resettling of suspended sediments. This assumption ignores any dissolution of contaminants into the water column. It also fails to recognize the silts/fines that tend to remain in suspension for longer periods of time. It is well documented that such particles are preferred sorption sites for contaminants. **C1-12**

In addition, this argument is based upon a single dredging event that was previously conducted at the Howland Hook Marine Terminal (LMS, 1997). This project showed no significant TSS increases 500 feet from dredging operations. While this event provides some basis from which to draw upon, site-specific factors may not preclude suspended materials from migrating a distance of 500 feet and beyond during the deepening project.

12. **Page 109, Paragraph 317**

The Report references a functional analysis of habitat that has been completed for the mitigation evaluation. Without such information, it is difficult to evaluate the sensitivity and value of the habitats that will be impacted, and whether proposed mitigation is appropriate for the impacts. This information should be provided in the DEIS. C1-13

13. **Page 110, Paragraph 318**

In the Report, selection of the mitigation areas was based on "reasonable equivalent economic value" and "proximity to impacted areas". These criteria are not sufficient to justify selection of mitigation areas. Mitigation should be selected based on the values of the impacted habitats and preference should be given to in-kind mitigation, especially since the littoral habitats are reportedly rare in the project area. Insufficient information is provided in the Report to evaluate the value of impacted habitats and the appropriateness of the mitigation areas. C1-14

14. **Page 110, Paragraph 319**

Mitigation sites were identified as Goethals Pond and the Woodbridge (South) Mitigation Site. The precise locations of these areas were not presented in the Report. Based on Report figures and descriptors in the text, these sites may be inland freshwater wetlands and would not effectively mitigate the functions of littoral habitats. C1-15

II. Comments on the Draft Environmental Impact Statement (DEIS) for the Feasibility Study for New York and New Jersey Harbor Navigation Study (September 1999)

General Comments:

In general, the DEIS is well-written and contains a substantial amount of information regarding the environmental impacts associated with planned dredging operations for the Harbor. However, the DEIS does not contain discussions or evaluations of several potentially important issues associated with the project. These general issues are presented below:

1. The Report does not discuss the loss of fish rearing, bird foraging, and turtle feeding habitat associated with lost littoral and sub-littoral habitats as discussed by the USFWS (P25 of USFWS Section 2(b) Report). C1-16

2. The Report does not discuss indirect impacts to several TES or EFH associated with lost littoral and sub-littoral habitats. C1-17

3. The Report does not provide sufficient information regarding the value of lost littoral and sub-littoral habitats to wildlife, or the justification for the selected mitigation area. Insufficient information is presented for the proposed mitigation areas. C1-18

4. The Report discusses use of "dredging windows" that are protective of sensitive seasons for aquatic fish and invertebrate species; however, based upon information presented in the Report, there are potential impacts to some species associated with dredging at any time of the year. This impact was not acknowledged or evaluated in the Report. C1-19

5. The Report identifies the scarcity of littoral habitats in the project area and regulations requiring their protection; however, mitigation does not appear to compensate in-kind for the impacts to these scarce resources. C1-20

Specific comments:

6. **Pages 5-95 to 5-102**

Several threatened or endangered bird species are identified as being potentially present in the study area and forage in littoral and sub-littoral habitats. However, the DEIS only discusses potential impacts to the peregrine falcon. An evaluation of project-related impacts to habitats of the other TES (e.g., pied-billed grebe, least tern, roseate tern) should be included in the DEIS. C1-21

7. **Page 5-102, Paragraph 5.489**

See comment I.7. C1-22

8. **Page 5-112, Paragraph 5.548**

See comment II.6. C1-23

9. **Page 6-2, Paragraph 6.5**

See comment I.8. C1-24

10. **Page 6-4, Paragraph 6.17**

The impact of the loss of littoral habitat is considered minimal when compared to the overall habitat availability in the study area. Quantification of available shallow habitat is not presented in the DEIS so the appropriateness of this conclusion cannot be evaluated. The Report also states that many species use both shoal and deep habitats, so changing shoals to channels will have little impact. Although many species utilize both habitats, species that only utilize shallow habitats will be affected. Species that require shoal and littoral habitats should be better defined and evaluated in the Report. C1-25

11. **Page 6-5, Paragraph 6.20**

There is no basis for the conclusion that deepening of the habitat may not reduce the value of the area to the benthic community.

C1-26

12. **Page 6-5, Paragraph 6.22**

See comment II.10.

C1-27

13. **Page 6-7, Paragraph 6.34**

The Report states that conversion of shallow habitats to channels would change the distribution of individuals but would have little effect on the ability of the altered areas to support aquatic life. A shift in the distribution of organisms is an environmental impact that warrants further evaluation in the DEIS. These areas are included in the EFH designation and juveniles of several fish species require shallow shoals; therefore, the loss of the shoal would be an impact to EFH and could impact fish species.

No discussion is presented in the Report of the impacts of lost shallow habitats on bird species, including TES, which utilize these areas for foraging.

C1-28

14. **Page 6-12, Paragraph 6.50-6.54**

The DEIS indicates that a large portion of the sediments in the Harbor are characterized as silts and fines. The DEIS further acknowledges that most contaminants in the Harbor have been shown to readily adsorb to silt and clay particles, and that some adsorbed contaminants will disassociate from sediments and dissolve into the water column. However, the DEIS does not evaluate the effects of this contaminant dissolution. The DEIS should more fully evaluate contaminant dispersion and dissolution into the water column as a result of dredging.

C1-29

15. **Page 6-13, Paragraph 6.55**

See comment I.8.

C1-30

16. **Page 6-15, Paragraph 6.58**

See comment II.6.

C1-31

17. **Page 6-15, Paragraph 6.59**

The USFWS indicated several species, including bird and turtle TES, may utilize littoral habitats of the harbor. The impacts of habitat loss to these species are not acknowledged or evaluated in the Report. C1-32

18. **Page 6-20, Paragraph 6.75**

Disturbance to EFH and TES habitats are not acknowledged or evaluated in the DEIS. Juvenile fish displaced from littoral habitats will be susceptible to predation, which could affect fish populations. The potential impacts of lost forage habitat on bird TES should be evaluated in the Report. C1-33

19. **Page 6-22, Paragraph 6.87**

See comment I.8. C1-34

20. **Page 6-23, Paragraph 6.88**

This paragraph acknowledges the impact on EFH in the active project area. However, it does not acknowledge the permanent loss of littoral and sub-littoral EFH. In addition, the displacement of larval and egg stages of aquatic organisms from construction areas would make them susceptible to increased predation and potentially affect fish populations. This potential impact should be acknowledged and evaluated in the Report. C1-35

21. **Page 6-29, Paragraph 6.121**

See comment I.6. C1-36

22. **Page 6-30, Paragraph 6.124**

The Report states that no direct or indirect impacts would occur to bird TES as a result of the project. Impacts to bird TES could result from the loss of littoral habitats in which they forage. C1-37

23. **Page 7-2, Paragraph 7.10**

Based on information regarding sensitive seasons in the EFH areas, the DEIS does not identify a time of the year when impact will not occur. C1-38

24. **Page 7-8, Paragraph 7.39**

The habitat evaluation is not presented in the DEIS; therefore, the appropriateness of the mitigation plan cannot be evaluated. C1-39

25. **Pages 8-1 to 8-3, Paragraphs 8.5-8.6**

The DEIS provides a summary of the best management practice (BMPs) to be used during dredging and placement operations. The following issues have been identified:

Silt Curtains

The DEIS states that the State of New York requires the use of silt curtains where feasible within Arthur Kill and Upper New York Bays. BMPs would call for the use of such protective equipment for all Harbor dredging as part of this project to reduce suspended sediment and contaminant dispersion. C1-40

Dredging Inspector

The use of dredging inspectors is anticipated for placement operations at the HARS. The DEIS does not provide for dredging inspectors during actual dredging activities. Such inspectors would be beneficial to ensure dredging BMPs are followed (i.e., bucket hoist speed, barge loading and environmental protection).

26. **Page 9-1, Paragraphs 9.3 and 9.5**

The DEIS indicates that a sediment sampling program is required for New York State permitting. Again, this sediment sampling program should be discussed adequately within the Report and DEIS. C1-41

DEIS Appendix B-1.6

27. **Page B-1.6-4, Paragraph c(2)**

See comment I.8. C1-42

DEIS Appendix B-1.7a

28. **B-1.7a-9, Paragraph 44**

The New York State Coastal Zone Management Policy states that mitigation should preserve the benefits derived from the impacted wetlands. The benefits of littoral habitats cannot be mitigated by enhancing inland freshwater wetlands. C1-43

DEIS Appendix B-1.7b

29. B-1.7b-3, Paragraph 7:7E-3.15

The New Jersey Coastal Zone Management Policy discourages impacts to shallow water areas. The Report states that impacts to these habitats will be temporary. Littoral habitats may be permanently lost following excavation. The statement should be revised to reflect this condition. **C1-44**

30. B-1.7b-8 Subchapter 3C

The Report identifies the peregrine falcon as the only TES that could be adversely impacted by the project. Other TES such as birds, shortnose sturgeon, and marine turtles could also be adversely impacted by loss of littoral habitats. Potential impacts to other TES should be acknowledged in the Report. **C1-45**

31. B-1.7b-11, Paragraph 7:7E-8.2

The Report states that the project will not interfere with reproductive patterns of fish. However, littoral areas are used by juvenile fish. Loss of these areas will reduce the amount of available habitat for juveniles, and displaced juveniles which may be subject to increased predation. **C1-46**

32. B-1.7b-11, Paragraph 7:7E-8.4

See comment I.8. **C1-47**

On behalf of CLH, BBL appreciates the opportunity to comment on the USACE Feasibility Report for New York and New Jersey Harbor Navigation Study (Draft) and Draft Environmental Impact Statement.

Sincerely,

Blasland, Bouck, & Lee, Inc.

Robert Romagnoli, P.E.
Associate

RR/amm

cc: Clifford Firstenberg, Chemical Land Holdings, Inc.

RESPONSE TO COMMENTS

C1 Blasland, Bouck & Lee, Inc. (Chemical Land Holdings, Inc.)

C1-1

The plan formulation was conducted on the basis of the most likely future without-project condition. This condition assumes that currently authorized projects will be constructed and maintained as currently planned. The volumes represented in the report are based on a recommended plan relative to the without-project conditions. Accordingly, the volumes presented in the report accurately reflect the recommended plan.

C1-2

Para. 253 of the Feasibility Report has been amended as follows: "Additional testing for contaminants will be conducted in accordance with established protocols, as described in the Project Management Plan.

C1-3

The three-dimensional (3D) water quality and sedimentation models were not used to assess the effects of dredging on the surrounding biological community. Dredged material placement modeling was conducted as part of the DMMP work for several placement alternatives that are incorporated into the HNS. Technical references for the DMMP provide details on the dredged material placement modeling. Results from a TSS and turbidity monitoring study conducted during the deepening of the Howland Hook Marine Terminal were referenced in addressing dredging influences on these parameters.

C1-4

The intent of paragraph 283 on page 103 was to indicate that the there would be only a temporary loss of benthic populations, since sediment composition would not be substantially altered and recolonization by benthic invertebrates is expected to occur relatively rapidly after dredging. This paragraph has been reworded to make this more clear.

C1-5

The disturbance of littoral zone habitat is estimated to be 6.26 acres. Some of this habitat will remain in the littoral zone, but would be part of the channel side slope. Some of the loss of littoral zone would be permanent, however, loss of benthic habitat would only be temporary because sedimentation will restore the habitat quickly to pre-dredging conditions.

C1-6

A discussion of the potential impact on marine turtles resulting from the temporary disturbance of the littoral zone area is included in the FEIS, Sections 5.4 and 6.5. See also Response to Comment C1-32.

C1-7

The NMFS has jurisdiction over the shortnose sturgeon. Following review of the proposed project, NMFS determined that potential impacts to this primarily riverine species would be temporary and localized, limited to potential difficulty in feeding because of suspended sediments in the immediate vicinity of dredging equipment (see comment F3-6). No further evaluation of potential impact to this species is warranted.

C1-8

Section 6 of the DEIS contains a qualitative evaluation of potential biological exposure due to dissolution of contaminants into the water column during dredging. A quantitative modeling effort to determine the extent to which sediment contaminants would be released into the water column during dredging requires current data on contaminant concentrations in the areas to be dredged. These data will not be collected until the Project Engineering and Design (PED) phase of the study. Best Management Practices (BMPs) will be used during dredging operations to minimize the suspension of sediments and thus contaminants into the water column, in turn minimizing the potential for exposure of biological receptors to contaminants during dredging. BMPs related to dredging operations will be specified as permit conditions in the respective State dredging permits. In addition, sediment contaminant analysis, where necessary, will be performed for the next phase of the project, and will be coordinated with the appropriate regulatory agencies.

C1-9

Acreage estimates for the littoral zone (0 to 6 ft MLW), sub-littoral zone (>6 to 15 ft MLW), and the pelagic zone (> 15 ft MLW) have been provided in the paragraph.

C1-10

Potential direct and indirect impacts to aquatic populations are addressed in Section 6. Although increased predation due to displacement of larval and egg-stage aquatic organisms is plausible, this type of impact would be extremely variable and most likely limited to the immediate vicinity of dredging activities. Avoidance and minimization techniques such as dredging windows and silt curtains (see Section 8) would reduce detrimental impacts to the early life stages of aquatic populations.

C1-11

An evaluation of potential impacts to EFH, including the seasonal distribution of EFH species in the project area, is provided in Section 6. Potential impacts to EFH were generally limited to the late winter/early spring and summer months.

Potential direct and indirect impacts to EFH or TES associated with the loss of littoral zone habitat will be mitigated as described in the Mitigation Alternatives Report, which is being published concurrently with the Main Report and FEIS, and which is summarized in Section 7. Beneficial use will be a priority for the management of dredged materials from this project. Given the projected volume of dredged material from the project (approximately 51 million cubic yards), the anticipated benefits from the beneficial use of such material are great. Furthermore, the acreage of wetland habitat that will be excavated or restored in the recommended mitigation plan exceeds the requirement to compensate for the littoral zone disturbances. While it is impossible to directly compare the impacts associated with the sublittoral disturbances with the benefits obtained from beneficial use of dredged material and the additional wetland compensation, it is believed that the net beneficial effects resulting from these factors outweigh the disturbances to 42.03 acres of sublittoral habitat.

C1-12

The fact that silts and clays are known to adsorb contaminants to a greater extent than sediments characterized by larger grain sizes is clearly stated in paragraph 6.49. It is also stated in paragraph 6.51 that most contaminants in the New York and New Jersey Harbor have been shown to adsorb readily to silt and clay particles. Paragraph 6.52 describes how contaminants are in a state of flux between adsorption and dissolution, and that when contaminated sediments are suspended into the water column they can dissociate from the sediment particles and become dissolved in the water column. This paragraph then goes on to state, "As described previously, materials characterized by relatively small particle size are generally correlated with a greater degree of contamination. The greater the degree of contamination, the greater the degree of contaminant dissolution. Furthermore, the smaller the sediment particle size, the longer it will remain suspended in the water column, and thus the more time its adsorbed contaminants will have to become dissolved in the water column." Therefore, the comment that these principles were ignored is unfounded.

The Howland Hook dredging study was used as an example of sediment suspension during dredging because it is a site-specific study in which very good data were obtained regarding sediment suspension and transport during an actual dredging activity. While sediment suspension during dredging has been evaluated in many studies, these studies were not conducted at locations where dredging is proposed for this study. Since the Howland Hook study took place at a location where dredging proposed for this study would actually take place, it was considered the most appropriate study upon which to

base qualitative predictions of the degree of sediment suspension during dredging. Furthermore, as indicated in the DEIS, the area of the Arthur Kill in which this study took place is characterized by high current velocities and small sediment particles (the sediments in this region consist primarily of fine particles). Therefore, it is expected that the degree of sediment suspension during dredging in this area would be high, which in fact was the reason why the Howland Hook study was conducted. Therefore, this is deemed an appropriate study upon which to base a qualitative assessment about sediment suspension during Harbor dredging. As indicated in paragraph 6.66, Best Management Practices and water quality monitoring will assist in further diminishing the possibility that dredging will release sediments into the water column that could migrate to adjacent areas.

C1-13

A description of the functional analysis to determine the value of the impacted habitat is provided in the Mitigation Alternatives Report, which has been integrated in the Final EIS as Section 7 and is available upon request.

C1-14

The mitigation plan discussed in the Draft Main Report was preliminary. A final Mitigation Alternatives Report, which includes appropriate habitat functional assessments and mitigation site selection criteria, is being published concurrently with the Final Report.

C1-15

The precise locations of the final mitigation sites are presented in the Mitigation Alternatives Report. Goethals Pond has, in fact, been identified as a freshwater wetland and has been removed from consideration for mitigation.

C1-16

FEIS text (Paragraph 6.111) has been edited to present a discussion of littoral zone habitats and use by aquatic populations. Section 7 of the FEIS presents a summary of the Mitigation Alternatives Report, in which a mitigation plan details compensation proposed for the unavoidable habitat disturbances as a result of the proposed navigation channel improvements.

C1-17

See the response to comment C1-11.

C1-18

An evaluation of lost littoral zone habitat is provided in the Mitigation Alternatives Report. FEIS Section 7 provides a summary of this report.

C1-19

Project-related impacts to several species of fish, particularly those included in EFH, were discussed in the Assessment of Effects section of the EIS. Therefore no discussion specific to dredging windows is considered necessary. The use of dredging windows is a widespread and well-documented practice. It is an unfortunate truth that not all species can be protected equally. For this reason, NMFS, NJDEP, and NYSDEC are the ultimate arbiters of dredging windows. While determining the dredging windows that will be enforced, these resource agencies work toward the goal of adequate resource protection in a framework of flexibility. The final dredging windows agreed upon by these resource agencies will be incorporated in the proposed project's dredging permits, and will be an intricate part of the Best Management Practices and Construction and Monitoring Plans.

C1-20

At least some of the impacted habitat value resulting from the disturbance of 6.26 acres of littoral habitat will be compensated for in-kind. The recommended mitigation plan also includes out-of-kind compensation. Together, the in-kind and out-of-kind mitigation will more than compensate for the habitat value that is projected to be lost as a result of the project. Again, details related to the recommended mitigation plan are available in the Mitigation Alternatives Report and in the revised Chapter 7 of the FEIS.

C1-21

Potential impacts to Federal and state listed threatened and endangered species (TES) and New York and New Jersey Harbor species with essential fish habitat (EFH) concerns determined to be in the project area are discussed thoroughly in Section 6 of the FEIS. The USACE-NYD participated in several consultation meetings and discussions with the USFWS and NMFS concerning the designation and potential impacts to TES and EFH species. Biological assessment reports were prepared by the USACE-NYD and submitted to the resource agencies for review and use in preparing the required Coordination Act Report.

The FEIS does not identify any indirect impacts to TES or EFH due to the loss of littoral or sublittoral zone habitat as overall there will be similar foraging area remaining following navigation channel improvements. In addition, the project mitigation plan identifies littoral zone areas to be used as mitigation sites that if accepted would result in littoral zone area with greater habitat value compared to the impacted area.

C1-22

See response to comment C1-7.

C1-23

See response to comment C1-21.

C1-24

See response to comment C1-8.

C1-25

The text has been rewritten to explain in a more comprehensive manner the impact on fish and invertebrate species brought about by a shift in habitat from littoral/sublittoral zone to sublittoral/deepwater zone.

The littoral zone (0 to 6 ft below MLW) and the sublittoral zone (6 ft to 15 ft below MLW) area disturbed due to navigation channel improvements was determined by projecting side slopes from the deepened channels. The method of calculation is presented in FEIS Section 6. New York and New Jersey Harbor bottom contour information from the hydrodynamic model was used to estimate the total littoral and sublittoral zone bottom area in two study areas: a smaller area defined by the channels where disturbance will occur; and the New York and New Jersey Harbor project area, which includes the areas associated with all Federal channels proposed for improvement (i.e., Lower New York Bay-Ambrose Channel). The table below presents the estimates of areas disturbed by the proposed channel improvements and the estimates of total bottom areas with the same depth.

HABITAT DEPTH CATEGORY	ESTIMATED AREA DISTURBED (ACRES)	ESTIMATED AREA (ACRES)	PERCENT AREA DISTURBED (%)
STUDY AREA: Upper New York Bay, Kill Van Kull, Arthur Kill and Newark Bay			
Littoral Zone	6.3	1,196	0.05
Sublittoral Zone	42.0	3,320	1.27
Total Area	48.3	4,516	1.07
STUDY AREA: Lower New York Bay, Jamaica Bay, Upper New York Bay, Kill Van Kull, Arthur Kill, and Newark Bay			
Littoral Zone	6.3	5,579	0.11
Sublittoral Zone	42.0	37,787	0.11
Total Area	48.3	43,366	0.11

When considering the smaller study area (channels with projected habitat disturbance) approximately 0.05% of the littoral zone and 1.27% of the sublittoral zone in that study area would be disturbed. In the larger study area 0.11% of the littoral and sublittoral zone areas, respectively, would be disturbed. As indicated in the DEIS and reaffirmed in the FEIS, proposed navigation channel improvements will impact a minimal amount of the littoral zone area, and this coupled with the proposed mitigation options will result in a net benefit to the Harbor's aquatic populations and populations dependent on the Harbor's shore zone.

C1-26

The paragraph provides a comparison of benthic species diversity among shallow and deep-water habitats. The comparison suggests that substrate type, regardless of depth, is the primary influence on benthic species diversity and value. Valuable habitat may therefore exist in shallow or deep-water areas (as shown in the discussion), suggesting that deepening would not necessarily lead to a loss of species diversity.

C1-27

See response to comment C1-25.

C1-28

First sub comment: Text edited as suggested. Para. 6.94.
Second sub-comment: Text edited as suggested. Para. 6.110, 6.226.

C1-29

See response to comment C1-8. An evaluation of biological exposure to contaminants potentially released into the water column is provided in the DEIS, paragraphs 6.56 through 6.60, for invertebrates, fish, birds, amphibians, reptiles, and mammals. Again, only a qualitative evaluation can be performed at this time, in the absence of site-specific data.

C1-30

See response to comment C1-8.

C1-31

Text in DEIS paragraph 6.58 edited as suggested.

C1-32

The topic of Federally listed Endangered and Threatened Species (TES) is covered in two Biological Assessment reports produced for USACE-NYD. One report covers marine turtles; the Point of Contact [POC] for this report is Mr. Howard Ruben (212) 264-0206. The second report covers the remainder of the TES species (USACE-NYD July 1999), and the POC for this assessment is Robert F. Kurtz, x- 2230. The species covered in the second document are; Peregrine falcon, piping plover, roseate tern, northeastern beach tiger beetle, and the seabeach amaranth.

The overall summary of the two reports is that "the majority of dredging activity to be conducted as part of the Harbor Deepening Project will be in areas far from the current or historic distribution of these species." The summary states further: "Dredging activity in the entrance channel, in particular, has the potential for the greatest potential to negatively impact the above listed species. The primary emphasis of this assessment is on the peregrine falcon, as this species is potentially impacted by all the proposed channel deepening activities via prey consumption and biological magnification of contaminants present in the dredged material.

Based upon the available information, contaminants expected, the likelihood of sediment resuspension, and potential for bioaccumulation and biomagnification, including information on prey species taken, it is unlikely that the proposed Harbor Deepening Project would significantly impact peregrine falcons or any other potential TES species present or likely to be introduced in the study area. However, information gaps, especially pertaining to available data on dredged sediment contaminants present in prey items in the vicinity of nearby peregrine falcon aeries, may result in understatement of potential negative impacts."

Current studies are underway to assess prey items of peregrines to determine if a potential contaminant pathway exists. If one is found, then additional studies may be warranted to determine body burden of prey species in relation to local contaminants in the sediments to be dredged to determine linkage. If local contaminants are involved and are present in the dredged material to be excavated during the proposed channel improvements, then several additional courses of action (e.g., seasonal dredging windows, area restrictions) may be required to reduce the chances of adversely affecting Federally listed species, especially the peregrine falcon, since it is the species most likely to be affected.

The National Marine Fisheries Service (NMFS) has jurisdiction over marine mammals and reptiles. Together with the District's informal Section 7 discussions with NMFS concerning marine turtles and the Harbor Navigation Project, consultations with the region's leading sea turtle expert produced a BA, which was submitted to NMFS (and copies were furnished to the AE). The results of the BA do not indicate that there will be a loss of any significant marine turtle habitat due to the proposed project. This is consistent with opinion of the USACE-NYD and this issue has never been raised by NMFS. However, potential impacts to turtles due directly to dredging activities are an issue and the main focus of the BA. The District is still awaiting NMFS response to the BA, which will dictate what future actions will be required of the District in relationship to the proposed project and marine turtles.

C1-33

Text in DEIS paragraph 6.75 edited as suggested.

C1-34

See response to comment C1-8.

C1-35

The loss of all littoral zone habitat is considered in Section 6. Mitigation for littoral zone habitat impacts is discussed in Section 8.

Potential impacts to EFH associated with the loss of littoral zone habitat will be mitigated as described in the Mitigation Alternatives Report summarized in Section 7. Beneficial use will be a priority for the management of dredged materials from this project. Given the volume of dredged material likely to be created from the project (approximately 51 million cubic yards from the initial construction alone), the anticipated benefits from the beneficial use of such material are great. Furthermore, the acreage of wetland habitat that will be created or restored in the recommended mitigation plan greatly exceeds the requirement to compensate for the littoral zone disturbances. While it is impossible to directly compare the impacts associated with the sublittoral disturbances with the benefits obtained from beneficial use of dredged material and the additional wetland compensation, it is believed that the net beneficial effects resulting from these factors outweigh the disturbances to 42.03 acres of sublittoral habitat.

C1-36

A discussion of the impact on marine turtles resulting from the loss of littoral zone has been added to the FEIS.

C1-37

DEIS Para. 6.125 has been edited as suggested..

C1-38

An evaluation of potential impacts to EFH, including the seasonal distribution of EFH species in the project area, is provided in FEIS Section 6. Potential impacts to EFH were generally limited to the late-winter/early spring and summer months.

C1-39

The habitat evaluation for the disturbed littoral zone is presented in the Mitigation Alternatives Report and is summarized in FEIS Section 7.

C1-40

With regard to the BMP issues identified:

Silt Curtains - The use of silt curtains throughout the Harbor would not be feasible. In tidal or river current environments, such as those of the Harbor, the force of the water pushing against the impermeable curtain can tear the vinyl, therefore defeating the purpose of the curtain. Silt curtains are most effective when used on a project where they are not opened and closed to allow equipment access. This would prove impractical for the proposed project, which will require periodic repositioning of the dredge, as well as regular movement of tugs and barges to and from the area. Finally, because dredging operations would occur within the navigation channels, an open area for ship passage must be maintained at all times. A silt curtain may be an obstruction under these conditions.

Dredging Inspector –The use of BMP's is ensured by enforcement of the contract, for which the Corps of Engineers has sole responsibility. To ensure that these requirements are in the contract, the plans and specifications must be reviewed by the Planning Division, who compares the document with all applicable permits and commitments made in the EIS.

C1-41

Sediment sampling will take place prior to the implementation of each "phase" of the project. This has been clarified in the text.

C1-42

See response to comment C1-8.

C1-43

The recommended mitigation plan does not include enhancement of freshwater wetlands. It includes a combination of creation/enhancement of littoral zone (in-kind) and intertidal wetlands (out-of-kind). This is described in detail in the Mitigation Alternatives Report and in Section 7 of the FEIS.

C1-44

Characterization of littoral zone impacts as temporary has been revised.

C1-45

Text edited as suggested, p. B-1.7b-8 Subchapter 3C of Appendix B.

C1-46

Potential impacts to reproductive patterns of estuarine and marine finfish associated with the loss of littoral zone habitat will be mitigated as described in the Mitigation Alternatives Report, summarized in Section 7. The policy consistency evaluation has been updated to reference this discussion.

C1-47

See response to comment C1-8.

GLOBAL
TERMINAL & CONTAINER SERVICES, INC.

November 15, 1999.

C2

Mr. Thomas J. Shea, III
Project Planner
Flood Control & Navigation Section
U.S. Army Corps of Engineers, New York District
26 Federal Plaza
New York, NY 10278

Dear Mr. Shea,

We are writing to respond to the New York and New Jersey Harbor Navigation Study that the Army Corps of Engineers recently completed.

First of all, on behalf of the hundreds of people working on this terminal, I want to congratulate your office on the fabulous efforts to complete this report. It encompasses most of the necessary information for decision making. To allow this Port to continue its growth, your continuous efforts are imperative to implement the recommendations in a timely fashion.

We do have the following comments for your consideration:

1. The Army Corps has established standards of disposing the dredged materials after lengthy negotiation with all concerned parties. All parties must adhere to these established standards to avoid cost over-run of the entire project due to higher costs of disposal as a result of newly proposed standards. When dredged materials meet the current standards for dumping at the Historic Area Remediation Site, they should be dumped there. C2-1

2. International trade has grown tremendously and will only grow faster because of free trade agreements signed among different countries and the removal of trade barriers. Use of ocean-going containerized vessels is the most economic way to transport these cargoes. It is one of the main reasons why shipping companies deploy bigger and bigger container vessels to gain economy of scale. These vessels require water depth of no less than 45 feet. Some even takes 50-foot deep water. New vessel orders for most containerized shipping companies are in the large-ship category - 5000+ TEUs – that requires at least 45 feet of water. All major ports in the world realize this fact and many of the biggest ports already make them at least 45-foot deep and have plans for 50-foot, if the water depth is not there yet. If any port is not ready, these vessels will go to a nearby port that has the capability to handle them and take jobs to that port. In this Port, vessels that require 50-foot depth of water are already calling. Unfortunately, the winding and rocky Kill van Kull has only 40 feet of water, while the Port Jersey Channel, a miserable 36 feet. Due to insufficient water, the vessels have to cut back their loading capacity. This situation cannot last long as shipping companies suffer when the vessels are not fully utilized. C2-2

302 PORT JERSEY BOULEVARD, P.O. BOX 273, JERSEY CITY, N.J. 07303
(201) 451-5200 • FAX: (201) 451-5088

3. At Global Terminal, the current water level for the channel is only 36 feet deep and only 200-foot wide. This is totally unacceptable from the federal standard. But Global Terminal, after suffering seven years and in collaborating with others, agreed that this would be the first phase of deepening. With the promise that 41-foot depth would be available by year 2000, we were able to keep some business in the terminal, although 35% of the original business left. Since customers had to reduce use of the vessel capacity to come to Global Terminal, we had to cut rates to keep business here and were able to obtain contracts to keep the business only through next year, the year that 41-foot deep water is supposed to be available. With the need for bigger cranes to handle these vessels and the promises from government officials for deeper water in, particularly the Port Jersey Area, Global Terminal purchased four of the world's biggest cranes. They arrived the terminal on schedule and within 15 months the order was placed! This is a proof of confidence in this Port. C2-3

4. Global Terminal plans to invest more in the terminal and convert it into a higher-capacity facility without increasing its acreage. We will
   - Further improve our computer systems – take care of more truckers efficiently as they use the gates
   - Re-do the layout of the terminal – provide better traffic flow inside the terminal for heavier volume C2-4
   - Change the yard operations to transtainers – handle more cargo within the same size of land
   - Construct a third berth along with the existing ones
   - Order more new cranes of the same size as those just arrived

5. Global Terminal, however, cannot survive or invest more if government officials do not act correspondingly. These government actions include to:
   - Deepen the Port Jersey Channel to 41 feet next year
   - Enhance the rail facility along side the terminal to handle containerized traffic C2-5
   - Make all major navigational channels, Port Jersey included, 50-foot deep in the very near future

6. The Harbor Feasibility Study does not advise a schedule to implement its recommendations. Neither does it indicate priority of deepening. It does, however, provide thorough and detailed cost-benefit analysis of deepening each channel. Global Terminal asks, for better return and spending tax money wisely, that the priority of deepening follows economic principles – the one that provides the best return receives the first priority. C2-6

7. Global Terminal has made major contribution to the Port. As a private terminal owning its land, we always improve our facility at our own costs. Such improvements include:

    - Expanding its facility by 15 acres in 1980
    - Deepening its berths to 40+2 feet in 1986 while the channel was only 35 feet
    - Introducing a paperless automated gate system to the entire Port in 1992 while others had theirs at least five years later
    - Collaborating with New Jersey State Government, having the Port Jersey Channel dredged in 1997 - the first time in 28 years
    - In 1999, bringing in state of the art cranes capable of handling the largest vessels in the foreseeable future

C2-7

In addition to the above, since the Terminal also owns its land, each year we pay handsome amounts of property taxes to both cities where we locate to facility their economic development. We also handle 10% of the Port's volume. In return to our contribution, infrastructure to this terminal has been secondary when it is compare to other facilities in the Port. We request our respectable decision-makers to be fair to private investors in future development of the Port.

C2-8

Global Terminal realizes that this Port is crucial to the economic development and quality of live in both New York and New Jersey States and believes that it is best achieved through public-private partnership. We sincerely hope that government officials demonstrate their care of the Port in improving the infrastructure, particularly the navigational channels to 50-foot deep, in a timely fashion, the way as private business invest to retain, and possibly expand, our business.

Sincerely,

Kathy Mak

Kathy Mak

C2 Global Terminal & Container Services, Inc.

C2-1

Acknowledged. Note though, that material can only be placed at the HARS when no other practicable alternative exists and that the HARS is not a "default" option for material that happens to pass the testing protocols established for the site.

C2-2

The information presented in this comment related to the requirement of newer larger container vessels for deeper navigation channels is the basis for the New York and New Jersey Harbor Navigation Study.

C2-3

As indicated in the comment, the current depth in the Port Jersey Channel is 35 ft MLW. The results of the New York and New Jersey Harbor Navigation Study indicate that the Port Jersey Channel in conjunction with deepening the Ambrose and Anchorage Channels should be deepened to a maintained depth of 50-ft MLW.

C2-4

The proposed improvements to the Global Marine Terminal, which will be undertaken with the existing Port Jersey Channel depth of 35 ft MLW and permit the facility to more efficiently handle the increasing marine commerce entering the Port are noted.

C2-5

As noted in response to comment C2-3, the results of the New York and New Jersey Harbor Navigation Study indicate that the Port Jersey Channel should be deepened to a maintained depth of 50-ft MLW.

C2-6

A schedule is provided in the Main Report.

C2-7

Global Marine Terminal facility improvements over the past few years are noted.

C2-8

Comments related to local economic issues and Port volume handled at the Global Marine Terminal are noted.

TOSCO

Tosco Refining Company
A Division of Tosco Corporation
1400 Park Avenue
Linden, New Jersey 07036
Telephone: (908) 523-5150
Facsimile: (908) 523-5183
Email: mgayda@tosco.com

Michael D. Gayda
Vice President and
Associate General Counsel

November 15, 1999

C3

VIA FEDERAL EXPRESS

Mr. Thomas Shea
Project Planner
Flood Control and Navigation Section
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, New York 10278

Dear Mr. Shea:

Tosco Refining L.P. ("Tosco") has reviewed the September 1999 Draft Environmental Impact Statement ("DEIS") for the New York and New Jersey Harbor Navigation Study. In general, Tosco continues to support the channel deepening and believes that deeper drafts in New York Harbor will result in both environmental and economic efficiencies that will benefit the New York - New Jersey region as a whole. We appreciate the opportunity to provide the following comments on the DEIS.

Tosco operates a petroleum refinery located along the Arthur Kill in Linden, New Jersey. Tosco operates a number of marine berths for vessels, primarily oil tankers and barges. In order for vessels to access Tosco's marine facilities, it is usually necessary for the vessels to transit the Kill Van Kull to the Arthur Kill. Because of the current shallow depth of the channels, Tosco is limited in its ability to bring in larger vessels that would offer economies of scale in its operation. Currently and under the proposed Project, Tosco is and would be required to have vessels lightered in New York Harbor before those vessels can proceed to Tosco's facility. Tosco believes that the ability of larger vessels to access its facility would result in economic efficiencies with benefits to Tosco and the region as a whole. Tosco continues to support the proposed Project, but believes that the deepening of the Arthur Kill channel to a depth of 55 feet has not been fully evaluated.

C3-1

The DEIS has concluded that the added costs of deepening the channels to tanker design vessel depth of 55 feet from sea to Tosco's facility outweigh the economic benefit. Therefore, the DEIS does not recommend dredging to Tosco's facility to a depth that would eliminate the added economic and environmental impacts associated with lightering. C3-1

Although the study mentions the economic cost benefit analysis, no environmental benefits associated with the reduction of offshore lightering operations have been considered. Tosco believes that this is an important issue for the region, and it should be evaluated in the DEIS.

In addition to operating several marine berths for vessels, Tosco owns a pipeline system that traverses the Newark Bay, the Kill Van Kull and the Arthur Kill channels and lies approximately 50 feet below mean low water. If the channel is deepened to 50 feet the pipelines that cross the Newark Bay and Kill Van Kull channel will need to be relocated. The DEIS does not evaluate the impact of the pipeline relocations.

In letters to the Army Corps dated April 28, 1997, January 9, 1998 and March 27, 1998, Tosco provided comments on the proposed Projects to deepen the channel to 45 feet and 50 feet. C3-2 In those letters Tosco raised its concerns about the impact to its pipelines and that the sponsors should be responsible for any necessary relocation. Tosco has also had discussions with the Army Corps on this matter on a number of occasions, including the "Cooperation Conference Between Kill Van Kull and Newark Bay and Arthur Kill Projects and Facility Removal Parties" held by the Army Corps on September 8, 1999. However, these issues have not been, but should be addressed in the DEIS. It is Tosco's position that any costs for relocation or removal must be borne by the sponsors.

Thank you again for the opportunity to provide these comments.

Sincerely,

Michael D. Gayda

MDG:prb
gayda/envir1199.doc

cc: Robin Callaghan

C3 Tosco Refining Company

C3-1

The Arthur Kill Channel through the Gulfport Reach was evaluated under the New York and New Jersey Harbor Navigation Study. There are several environmental benefits associated with deepening the Arthur Kill Channel including minimizing the potential for lightering spills and suspension of bottom sediments by passing ships; however, currently the economic benefits do not justify deepening of the channel beyond the authorized 40 ft below MLW. The environmental impacts related to lightering and ship passage in shallow channels was considered and evaluated in the EIS.

C3-2

The relocation of buried utilities (including pipelines) crossing the navigation channels proposed for deepening is addressed in Harbor Navigation Study Volume III, Appendix E: Channel Design. If a buried utility requires relocation, the cost of the relocation will be borne by the local project sponsors. Because the Kill Van Kull, Newark Bay and Arthur Kill-Howland Hook Marine Terminal Projects require that this pipeline system be relocated, this study assumed that the non-Federal partner and utility owner would take reasonable measures to consider the results of this study and relocate the pipeline only once. As such, this pipeline was not included in the study. However, the report was revised to mention this case.

FEIS APPENDIX A-1.2b

DEIS PUBLIC INFORMATION MEETINGS
COMMENTS AND RESPONSES

(1)

WRITTEN COMMENT FORM

PIM

Public Information Meeting for the
New York and New Jersey Harbor Navigation Draft Feasibility Report and Environmental Impact Statement

Please provide your written comments on the scope of work for the Draft Feasibility Report and Environmental Impact Statement below. Your comments will be used to finalize the topics and subjects included in the evaluation of potential impacts from the Recommended Plan under consideration. This form can be copied and used by multiple individuals, or a letter containing your comments can be substituted. **Comments will be accepted through November 15, 1999,** and should be addressed to:

Ms. Jenine P. Gallo / TOM SHEA
U.S. Army Corps of Engineers
Attn: CENAN-PL-EA
26 Federal Plaza
New York, NY 10278-0090
(212) 264-0912

NAME: JAMES SCARCELLA

ADDRESS: P.O. BOX 050328
SI NY 10305

PHONE: 718-987-6037

AFFILIATION: NATURAL RESOURCES PROTECTIVE ASSOCIATION NRPA
(if any)

COMMENTS

(continue on back of this form or append additional pages as needed)

DEAR MS. GALLO / MR. SHEA

THANK YOU FOR THE OPPURTUNITY TO COMMENT ON THE NAV. STUDY. AS WE HAVE DISSCUSSED WE ARE REQUESTING THE CORPS USE ACQUICTION OF HABITAT, NOT MITIGATION, TO COMPENSATE FOR LITTORAL ZONE LOSSES AND DAMAGES. IF THE CORPS CANNOT PROVIDE ACQUISTION, DIRECT THE LOCAL SPONSOR (THE PORT AUTHORITY) TO INVESTIGATE AND INVEST IN ACQUISTION OF HABITAT, THEN TRANSFER TO STEWARDSHIP AGENCIES (I.E. NJ/C PARKS DEPT.) FOR OWNERSHIP AND CARETAKING.

PIM-1

(CONT.)

REGARDING NON-FEDERAL PARTNERS CIP, WE ARE GRATEFUL HOWLAND HOOK EXPANSION WILL REQUIRE ZERO ACRES OF FILL, BUT CONCERNED ABOUT THE PROPOSED 387 ACRES AT PORT ELIZABETH AND 145 ACRES AT SOUTH BROOKLYN. WE DO NOT FEEL THAT 532 ACRES OF HABITAT SHOULD BE SACAFICED FOR PORT EXPANSION. PIM-2

ON AFFECTED ENVIRONMENT, WE ARE UPSET ABOUT ANY LITTERAL ZONE LOSSES, EST. THE 7 ACRES DESCRIBED IN YOUR D.E.I.S. WE INSIST YOU DIRECT THE PROJECT SPONSOR TO FACILITATE ACQUISTION OF HABITAT TO COMPENSATE FOR THESE LOSSES. THE HEP CONTACT IS MR. MARC MATZIL # 212-360-1417. PIM-3 ARTHUR KILL ISSUES

WE NOTE THAT N.Y. STATE HAS SERIOUS SHORT TERM DREDGE MATERIAL DISPOSAL SHORTFALLS (ACOE TDEIS DMMP 1999) WE RESPECTFULLY REQUEST THAT YOU REQUIRE NY TO PROVIDE ENVIRONMENTALLY SOUND NON-WATER DISPOSAL ALTERNATIVES FOR DISPOSING OF THE TYPE 'F' NON-HARS SEVERELY CONTAMINATED MATERIALS TO BE GENERATED BY THIS PROPOSED PROJECT. PIM-4

Additional Comments: WE NOTE YOU EXCLUDED THE MUSKRAT, AN IMPORTANT MAMMAL IN YOUR EVALUATION OF AFFECTED ENVIRONMENT. (ECOLOGICAL RESOURCES) THE MUSKRAT IS A PLAYFUL ENJOYABLE CREATURE THAT PLAYS A CRITICAL ROLE IN THE SALT MARSH ECO SYSTEM, TO DISMISS THE MUSKRAT, OR NORWAY RAT, IS A MISTAKE. PIM-5

WE HAVE SEEN AREAS OF DECIMATED SALT MARSH SPARTINA GRASSES AND THE PEAT WHICH ANCHORS IT. THE PEAT IS SEVERLY IMPACTED BY WAKES, SCOUR AND EROSION FROM DEEPENING OF CHANNELS, ALLOWING GREATER WAVE HEIGHT AND FORCE. IN LIEU OF MITAGATION, CANNOT THE CORPS FUND THE IMPORTANT RESTORATION WORK OF NYC PARKS SALT MARSH RESTORATION TEAM TO REEPLANT AND GROW SPARTINA, WHICH WILL HELP MARSHES STABILIZE? CONTACT THEM AT 212-360-1417. PIM-6

11/4, 11/8 ALSO AT THE PUBLIC HEARINGS FOR THIS D.E.I.S. NO COPIES OF THE DOCUMENT WERE AVAILABLE FOR THE CITIZENS TO TAKE HOME. THIS IS UNACCEPTABLE, WHAT WOULD IT HAVE TAKEN TO BRING 1 BOX (12) COPIES OF THE DOCUMENT FOR DIST. AT THE HEARINGS? WHILE WE OPPOSE ANY WATER BASED DISPOSAL OF (TOXIC) CONTAMINATED SEDIMENTS, WE NOTE YOU SPECIFY A CAP OF 3' → 6' OF CLEAN FILL, WHILE THE DMMP SPEAKS OF ONLY 2' → 3'. PIM-7

WE DO NOT FEEL THE TYPE 'F' MATERIAL CAN BE SAFELY DISPOSED IN WATER ENVIRONMENTS SUBJECT TO DISPERSAL THRU THE WATER COLUMN BY CURRENT, TIDES, WINDS, INTER-TIDAL CURRENTS AND OTHER FACTORS WE WOULD INSIST ON A THICKER CAP (6') IF THIS TYPE OF DISPOSAL FOOLISHLY CAME TO PASS. PIM-8

THANK YOU FOR YOUR CONSIDERATION OF OUR COMMENTS / QUESTIONS / REQUESTS.

A WRITTEN REPLY WOULD BE APPRECIATED.

SIGNATURE: [signature] JAMES SCARCELLA

CC: ~~PAUL~~ JOE WESTPHAL, COL. PEARCE, CHARLES SCHUMER, J. FOX, VITO FOSSELLA, BAY KEEPER

RESPONSE TO COMMENTS

PIM1 James Scarcella, Natural Resources Protective Association

PIM1-1

The mitigation plan for the New York and New Jersey Harbor Navigation Study presents several mitigation options including restoration of littoral zone wetlands, shoreline stabilization and the acquisition and restoration of marine (intertidal) wetlands. Every attempt has been made to direct the mitigation to the immediate area of projected construction impacts.

PIM1-2

The proposed deepening of the navigation channels based on the New York and New Jersey Harbor Navigation Study NED Plan does not depend upon nor recommend any fills at any Port facility.

PIM1-3

See response to comment 1. Mr. Marc Matsil and other members of the Harbor Estuary Program team were contacted during the development of the mitigation plan.

PIM1-4

The dredged material from channel deepening will be disposed of according to the Dredged Material Management Plan (DMMP) for the New York and New Jersey Harbor, which is currently undergoing public review.

As a non-federal sponsor for the HNS, the State of New York has been made aware of its responsibilities to provide disposal sites for material resulting from construction and maintenance of the project. The identification of which options may be used for the "type F" material resulting from the project will be made as the options and DMMP develop. Currently, the DMMP recommends the use of decontamination and mine reclamation options for the New York material resulting from this project. Both of these options are land-based. As for the near-term New York dredging shortfall and as noted in the DMMP report, options other than those evaluated in the DMMP may be used to meet this dredging shortfall (*e.g.*, transport to out of state permitted disposal facilities) or the dredging of the shortfall projects may be delayed until options are brought online.

PIM1-5

The muskrat is included in the discussion of mammals and wetlands habitat in the FEIS. The Norway rat was mentioned in the DEIS in the discussion of the Shooters Island rookery.

PIM1-6

One of the proposed uses of the rock from channel deepening is shoreline stabilization, especially along the Arthur Kill shoreline in the vicinity of Old Place Creek.

PIM1-7

Every effort was made to supply the interested public with copies of the New York and New Jersey Harbor Navigation Study DEIS. Copies are available for review in the District offices and area libraries and at the public information sessions.

PIM1-8

The New York and New Jersey Harbor Navigation Study EIS does not recommend cap thickness for any disposal option. This topic is addressed in the DMMP and EIS's for specific disposal sites.

In The Matter Of:

New York and New Jersey et al., v.
Public Meeting Briefing

Hearing
November 3, 1999

Doyle Reporting, Inc.
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New York, NY USA 10017
(212) 867-8220 FAX: (212) 286-1853

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1

Transcript of the minutes of:
NEW YORK and NEW JERSEY
HARBOR NAVIGATION STUDY
Public Meeting Briefing
November 3, 1999
5:10 p.m.
Held at: Holiday Inn/North
150 Frontage Road
Newark, New Jersey 07114
Taken by: STACY ANN MACE,
Certified Shorthand Reporter

Page 2

RAIMO LIIAS: Good afternoon. My name is Dr. Raimo Liias.

I'm with the U.S. Army Corps of Engineers, New York District. I work out of the Manhattan office, 26 Federal Plaza and I'd like to welcome you today to the first public session, public meeting that we're having on our recently-released Harbor Navigation Study.

We're going to have a series of three meetings, and the first one is today. And we'd like to welcome you and I'd like to introduce to you Mr. Tom Shea, who is our project planner, who has been with this project from its inception, and he's going to read over the groundrules by which we'll I guess conduct the recording of the information that we're allowing the public to offer us today.

And he'll read you those rules and when we're done. If you have more

Page 3

questions, we have quite a few of our staff here, the people who have worked on this project over the past couple of years, including some of our — some firms that supported the Corps of Engineers through contracts, as well as our sponsors, non-Federal sponsors.

This is a cost share project between the non-Federal sponsor Port Authority of New York and New Jersey, as well as the states of New York and New Jersey.

And without further ado, Tom Shea.

THOMAS J. SHEA, III: Good afternoon, I'm Tom Shea. I'm the project planner for the New York and New Jersey Harbor Navigation Study and I'd like to welcome you to the public information session and the public comment period.

Hopefully, you've had time to review the boards in the back and have spoken to the staff and have gotten any

Page 4

questions that you may have had answered adequately. If not, after this comment period we can go back and try to get them answered or you can always give us a call.

The purpose of this is to provide information and to get your comments.

If you'd like to speak, we ask that you be registered so we know who to call up and when to do so. And if you've not registered and you want to make a statement, please see Sue Metzger in the back she can do it.

At this time I'm going to give a very short overview of the study, nothing really that's not already mentioned in the boards, but it's just a formal-type thing.

This study was authorized by Section 435 of the Water Resource Development Act of 1996.

You don't need to read it, but it

Page 5

calls for a comprehensive examination of the port of New York and New Jersey with a view towards 50 feet or deeper.

During the reconnaissance phase, we met with potential local sponsors to scope out whether there was federal interest in pursuing further studies and also what those studies would be, how long they'd take, how much they would cost, who would help cost share them and help refine.

If you go back to this study authorization, it essentially authorizes a study in all the water in the port district. That's a huge task. And so we narrowed it down to the channels listed here.

And the depths are — we have the Ambrose and Anchorage Channels, the Ambrose is currently 45 feet, the Anchorage Channel is currently 40 feet. Then we go along Brooklyn waterfront with

Page 6

the Bay Ridge Channel which is currently authorized at 45 — 40 feet.

Going across the Bay to the Port Jersey and Claremont Channels, Port Jersey is currently 35 to 38 feet and the Claremont about 28 feet.

The — then the Kill Van Kull, which is authorized at 45 feet, it's currently 40 feet and the construction is underway to deepen it to 45 feet.

Going to the right up Newark Bay is the Newark Bay Channel into South Elizabeth and Elizabeth Channels and those are the same status as the Kill Van Kull. And then currently — it's authorized to 45 feet. There is a project being worked on to deepen that to 45 feet and with Port Jersey it's currently 35 to 38 feet, there's an authorized project to 41 feet, which we hope to start soon.

The authorized depths or the depths

Page 7

that are being constructed to now are important because that's where we used as a starting point for the analysis.

So for Arthur Kill, for instance, we started the analysis from 41 feet not at it's currently — current depth because we're assuming that that project gets constructed.

This is a brief overview of the planning process:

We identify the existing conditions in terms of the channels, I just mentioned those. But we also look at what the current fleet is, what's the current commerce, what's the natural resources in the area, and we do what we call an inventory of all those to identify the existing conditions.

Then we try to forecast what the future would look like without any Corps involvement. What will happen to the region if the study did not exist.

Page 8

From there we can also predict the future with the project, and that's where we — that's how we define what the environmental impacts would be and also our benefits.

Identify problems and opportunities. Problems in this case were the lack of sufficient water to allow the new and larger container ships to enter the port in an economically and environmentally safe manner. And the opportunity would be to deepen the channels to provide that.

Finally, we develop alternatives, which essentially came down to various alternative depths, leading to the terminals in the area. And then we select a plan which is most often the National Economic Development Plan, which is that plan which results in the greatest net excess benefits over the costs.

Page 9

For this study we came up with the recommended NED plan, which is to deepen the Ambrose Channel to 53 feet; the Anchorage Channel, Bay Ridge Channel, Port Jersey Channel, the Kill Van Kull, the Newark Bay and the Arthur Kill to Howland Hook to 50 feet.

The total cost would be $1.78 billion with an annualized cost of $165 million net excess benefits or for 238 million with a benefit cost ratio of 1.44 million — or 1.44.

There are some environmental effects, and, of course, you can see them in more detail in the back.

But they include the loss of some shallow water habitat, the loss of benthic fish and invertebrate species in the immediate construction area.

The channel construction will total of 6.3 acres of littoral zone habitat will be impacted. Littoral zone habitat

Page 10

is aquatic habitat from the mean low water mark to six feet below mean water.

Fish and invertebrate in the immediate construction area that are unable to move out of the area may be lost. However, repopulation of the area is expected to occur rapidly, so we feel that's a temporary situation.

Hydrodynamic and water quality modeling indicates that the water surface elevations will remain unchanged with the project and increases in salinity are minimal and would not impact aquatic species.

And again, the posters provide more detail.

This concludes my formal portion of the meeting. We'd like to go into the comment period.

And oh, I'm sorry, I'm not done. The next steps, the formal public review period for the draft report, draft

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Environmental Impact Statement finish — closes on November 15th. So if you wish to provide written comments, we encourage that you get them in there by then.

We're conducting public meetings now. Tomorrow night in Staten Island and Monday in Brooklyn.

Then based on all the review comments we receive from our headquarters and from the public and from the agencies, we try to tie all that together and complete the main report.

And finally, I ask by the end of December of this year we will then send it up through our Corps of Engineers chain first to the North Atlantic Division who will endorse the report, forward it to the chief's office, the headquarters in Washington then produces a Chiefs Report and will forward it to the administration.

The administration will decide

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whether it's within current policy and whether they want to recommend it to Congress for a construction authorization.

So hopefully, that will all happen and it will get to Congress and Congress will include it in the Water Resource Development Act of 2000.

Only after then would we be able to construct the project.

For the remainder of the period, again, we'll call you up in the order that you registered.

I don't know if there are any elected officials present. If there are, we would ask them to speak first.

We also ask that you limit your statements to three minutes. We'll signal you at two minutes and we have an egg timer to time you at three minutes. So when you hear that go off, we would ask that you complete your comments.

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We also have a court reporter present who will record your statements so that we make sure we have it right.

We are also filming this session. We're going to produce a video of the study, so we're just filming it. There's no sound recordings. This way we just have some video backdrop for that.

This is not a question-and-answer period. At this time we ask that you just make your statement. We're not going to provide an answer or a rebuttal or anything.

If you want to try to get answers to questions, that's what the poster board session is about. However, we'll try to evaluate and consider your comments in completing the draft report.

In addition to making a verbal statement, you're welcome to make written comments. I believe everyone was handed out a form which you could provide

Page 14

written comments on. You could provide those to us at any time during this session or you can mail it to us at the address provided. Comments will be accepted until November 15th for this public meeting.

And that's it.

Our first speaker is Reverend Joseph Parrish:

JP-1

THE REV. JOSEPH PARRISH: My name is Joe Parrish and I'm from St. John's Episcopal Church, which is located at 61 Broad Street in Elizabeth, New Jersey.

And I'm part of the Citizens' Advisory Team for the EPA Decontamination Project for the Newark Bay.

We currently have an ongoing pilot study here roughly in this area of Kearney. The company is called Biogenesis.

It's moving to the pilot stage, and the objective of this study is how to

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remove the dioxins and PCB's from the sediment, which is this area, this area and this area, the three — three of the areas that are gonna be deepened to 50 feet.

There are significant levels of — this is a Superfund site here. This is the Passaic River, this is the Hackensack River. There is a huge pockets of dioxin right in this area of the Passaic River.

And what is happening is that there is, slowly over time, dioxins migrating down into the Newark Bay.

We worked with the DEP and have posted signage all around this area of, the entire New Jersey area, which sometimes stay up — people will rip it down — not to fish, take crabs or anything in that area, yet we still find there's about 400 people that are still crabbing and fishing and feeding those fish to their families. So they're toxic

Page 16

fish that contain considerable Chlordane. The official DEP sign says it has Chlordane, PCB's and dioxins. So the fishing is prohibited.

To take a crab — to break the water with a crab from any — anywhere in this area, in the Newark Bay is a $50 fine. You don't have to put the crab in your boat, if it breaks water, $50. That shows you how contaminated the sediment is.

The crabs eat the marine life at the bottom, ingest it and they become highly toxic, as are all the fish in this area.

So we've produced video presentations to warn people about the dangers of using — eating the fish here.

So our concern is where will this contaminated sediment go?

There is no established proven decontamination technology known, and

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it's been worked on for about three years now, that will effectively decontaminate even a half a million cubic yards. That's our goal, to just decontaminate half a million yards.

This project produced 8 million, at least 8 million cubic yards of material that is not suitable for HARS and something has to be done with it.

So this is our major consideration that there is not adequate decontamination technology available. There's no good demonstration project that we can say for sure that there will be in the future. And therefore, the production of 8 million cubic yards is a hazard to human health and that has to be answered, we believe, before a consideration can be made to continue to dredge this part and even do maintenance dredging in this part of the project.

I've also, I don't know — I don't

know -- did I hear the bell?
Time's up, okay.
There's other issues, Bayonne has another issue, but that's the basic issue we have.
THOMAS J. SHEA, III: Thank you.
Is there anyone else that registered or wants to make a statement?
Okay, then we're done. And if you have any further questions or anything else, we'll join you in the back and you can get with staff or meet by the poster boards.
Thank you.
(Time noted 5:35 p.m.)

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Transcript of the minutes of:
NEW YORK and NEW JERSEY
HARBOR NAVIGATION STUDY
Public Meeting Briefing
November 3, 1999
8:00 p.m.
Held at: Holiday Inn/North
150 Frontage Road
Newark, New Jersey 07114
Taken by: STACY ANN MACE,
Certified Shorthand Reporter

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RAIMO LIIAS: Our first speaker is Mr. Jimmy Chen.

JIMMY CHEN: I was so pleased to finally see the — our Army Corps of Engineers' navigation plans for the region ports New York.

I think this is a very responsible study that will give this port benefits for the next century and will benefit to all our next generations. JC-1

And I hope this study will make it that more effectively and esspecially timewise hope that it can move quickly.

Whatever you can do, let's make the best use of this money, whatever available, and get the best benefit for the region.

And when you do these studies, I think you should also consider the energy we use today to transport New York or this northeast region's transportation cost, you know, by a lot cargo moving

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today over the road, including railroad to New York areas. If they change to a waterbound transportation from other world come to the New York areas, and I think the region, nation can save lots of energy.

The energy turns out to be a better environmental condition for our people, for our next generation. I think that issue be put into consideration.

The last one I want to say is I see a lot of good materials outside in here, particularly the quantity of the materials needed to be removed for the deepening. I think more interest too, we have to see how dollar effective it is, to remeve all of the different dredging materials in the different sections.

Thank you.

THOMAS J. SHEA, III: Next we have Daniel Maynard.

DANIEL MAYNARD: Good evening, my DM-1

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name is Dan Maynard. I'm the manager of Government and Community Relations at the Port Commerce Department.

Tonight's public meeting is an important milestone for the Port of New York and New Jersey. For years, those of us who know about the importance of the port to the regional economy and who follow the trends of the maritime industry have recognized that in order for our port to be more competitive, we must have adequate channel depths to meet the needs of modern ocean-going ships.

The Port Authority of New York and New Jersey congratulates the Army Corps of Engineers for the effort that has been put into the New York-New Jersey Harbor Navigation Study and wholeheartedly supports its conclusions and recommendations.

Specifically, we support the deepening of the Ambrose Channel to an

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operating depth of 53 feet and the deepening of the Anchorage, Port Jersey, Kill Van Kull/Newark Bay, Arthur Kill and Bay Ridge Channels to an operating depth of 50 feet.

Others will make this point throughout these meetings, but the port is an integral part of the region's economy. Not only is it responsible for the oft-quoted economic impact statistics — over 165,000 jobs generating $20 billion in economic activity — but it is also a cornerstone to the New York/New Jersey Metropolitan region being the world's commercial center.

Historically, the port has been the centerpiece to all of the other financial and industrial businesses in this region. Although less visible, the port continues to play this important role today.

And likewise, it will continue into

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the future. As the Army Corps of Engineers undertook the Harbor Navigation Study, the Port Authority was in the midst of a port strategic investment analysis. A key component of that analysis was an economic forecast of future trade activity. That forecast, which is similar to that used in the Harbor Navigation Study, projects a steady growth in international cargo flowing through the port of between 3.7 and 4.6 percent each year. At that rate the port will double its cargo volumes by 2010 and more than quadruple its volumes by 2040.

To meet this demand, the port must improve its basic infrastructure, including deepening its channels. It is worth considering what would happen if the port did not deepen its channels to accommodate these larger vessels. The impacts go beyond the loss in jobs and

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ecomonic activity — although those would be significant. It would also have tremendous impacts on our environment and overall quality of life.

The impression that many have is that the port generates the cargo. In fact, consumers generate the cargo. Ports facilitate the flow of goods from their point of manufacture to the consumer. Therefore, in the case of New York Metropolitan region, the 18 million consumers in our immediate 21 county market area, and over 80 million in the 10 state region, are the driving force for the trade activity. Given that reality, if the port of New York and New Jersey is unable to accommodate the ships carrying those goods, then those ships and the products they carry must go to another port. Once at that distant port, the goods must then be delivered to the consumers in our region either by rail

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or, more likely, by truck. For New York-New Jersey a likely alternative port is Baltimore. For every container diverted to Baltimore, means an additional two to three hours or 100 to 150 miles traveled per container to reach the consumers in the New York metropolitan area. When you multiply those factors on an entire ship's volume, or even more impressively, on an entire year's worth of containerized cargo in our port — 1.5 million containers annually — the impacts are enormous. Moving that volume of goods by a mode other than ship would affect roadway congestion and air quality, as well as raise the cost of the goods to consumers.

Deepening our harbor has tremendous benefits in terms of new jobs, additional cargo growth and improved productivity of the existing marine terminals, with little or no adverse impact. In fact,

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the Environmental Impact Statement in the study points out that since the recommended projects are simply deepening existing channels, there are no significant impacts.

Our private sector partners in the port, namely terminal operators and shipping lines, are already investing millions of dollars in marine terminal improvements to increase productivity and maximize terminal capacity within the existing facilities of our port in an effort to get the most economic benefit from the channel improvements.

In fact, through productivity improvements and new commercial maritime activities at existing industrial properties in areas such as South Brooklyn and Bayonne, the port will have sufficient capacity to meet a substantial portion of the increased cargo activity that will occur.

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But the region may want to consider expanding marine terminal properties even further by creating new land to maximize the full trade growth potential in the harbor. Such actions will require careful study. Therefore, the Port Authority is prepared to work with other state and federal agencies on a comprehensive port improvement program and an Environmental Impact Statement on possible future capacity enhancement concepts.

One area that will need further refinement in the final report and, undoubtedly, will continue through project implementation is the proposed construction schedule. The Port Authority recognizes that the Army Corps of Engineers is conservative in its initial assessment of construction timetables with projects.

Our experience in past federal

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deepening projects, including the current 45-foot deepening project for the Newark Bay and Kill Van Kull, is that the Army Corps has a tendency to be extremely conservative in their initial projections for both the cost and timetable of projects. For the Kill Van Kull-Newark Bay 45-foot project, the Port Authority successfully negotiated with the Corps to cut the original projected construction time frame by nearly half and reduced the overall cost of the project by $150 million.

As in the past, detailed discussions and deliberations will take place between the Corps, the Port Authority and the States, as a normal part of the process, before the report is put in final form. Our goal has been, and continues to be, that each of the projects included in the final recommendations of the Harbor Navigation

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Study be constructed in the shortest timeframe possible.

We fully expect that all of the deepening projects will remain on track, including our goal of deepening the Kill Van Kull-Newark Bay channels to 50 feet by 2009.

We are eager to see the Army Corps of Engineers complete the Harbor Navigation Study on schedule at the end of this year. Once the study's findings are passed on to the Congress, the Port Authority will work with the states of New York and New Jersey and the City of New York to ensure that the recommended projects are included in the Water Resource bill of 2000 and subsequent Army Corps appropriation bills.

Once again, we fully support the recommendations included in the draft feasibility report of the Harbor Navigation Study and congratulate the

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Army Corps of Engineers for maintaining the aggressive schedule set forth for the project. Nothing less than the future of the port of New Jersey and New Jersey rests on the completion of these critically important projects.

Thank you.

THOMAS J. SHEA, III: Thank you.

Is there anyone else who wished to make a statement?

Okay, then that concludes this portion, and if you have any further questions you can see us in the back of the room.

(Time noted 8:25 p.m.)

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In The Matter Of:

Public Meeting on the New York, New Jersey Harbor Navigation Study

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Hearing

November 4, 1999

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DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS

Public Meeting
on the
NEW YORK, NEW JERSEY
HABOR NAVIGATION STUDY

Thursday, November 4, 1999

4:15 p.m.
Held: Staten Island Hotel
Staten Island, NY

BEFORE:
THOMAS SHEA

PRESENT: RAIMO LIIAS, Project Manager

- *Proceeding* -

MR. SHEA: Our first speaker is Daniel Jacobs.

MR. JACOBS: I am Dan Jacobs, Director of Transportation for Borough President Molinari of Staten Island. I will be making an oral statement for the borough president and written comments will be made before the November 15th deadline. DJ-1

But, the borough president did want to make an oral statement of general support for the Harbor Navigation Study.

The borough president has reviewed the report and the borough president is very pleased that the Army Corps is giving the New York side of the harbor the general attention, the same attention as the New Jersey side.

The borough president is especially pleased that the Army Corps is looking at the Arthur Kill as a part of the port that can be economically leveraged off the Kill Van Kull instead of a stand alone project, recognize the

- *Proceeding* -

economic benefits that will accrue to Staten Island from that general deepening of the channel to 50 feet.

Finally, the borough president would like to commend the Army Corps on this open public process that will give Staten Islanders as well as everyone else a chance to make a statement and any interested comments.

Thank you.

MR. SHEA: Reverend John Johnson.

REVEREND JOHNSON: Good afternoon. JJ-1

I am a resident of Marinas Harbor; I am a fisherman; I am also a clergyman and a medical doctor.

I am in agreement with the navigational study. I am interested in anything that will bring commerce to Howland Hook.

And, I am also concerned with environmental issues. I think some of you may recognize me. I have been here

- *Proceeding* -

for the last year-and-a-half at these meetings. I am also filming for CTV. I had been showing what we have filmed for the last three or four meetings. It has played in Brooklyn about ten times and here on Staten Island it's played about ten times.

I am very concerned about the even distribution of all phases of the project. We have homeless people who need jobs, we have unemployed people who need jobs, we also have engineers. I myself just returned from Africa, the Caribbean, and I am interested in shipping containers through Howland Hook. And I would like support in that area. JJ-2

And, trying to be involved as a taxpayer.

I have a child. We go fishing on these waterways. We drive up and down Richmond terrace three or four times a day. I worked at Arthur Kill Prison; in and out of there. And I think this is

- Proceeding -

very important that people who live on Richmond Terrace and who live in these waterways, their health is very important.

Also the commerce to come to Howland Hook is very important.

And I had been working with Mr. Shea. He has been doing a good job. I appreciate him. When I call him and ask him what is the update, he has given me the report.

I just would like to make sure that Staten Island people are fully informed and brought about into the total project.

Thank you very much.

MR. SHEA: Thank you. This is where I will have to apologize for my pronunciation: Mario Cinisomo.

MR. CINISOMO: Good afternoon, ladies and gentlemen. MC-1

My name is Mario Cinisomo, I am a member of Local Number 1, representing

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checkers and clerks.

We currently employ 80 members of the Howland Hook. Members and families livelihoods depends on Howland Hook competitiveness as a world class port and strategic facility.

We strongly support the Army Corps proposed planning to deepen the Kill Van Kull and Arthur Kill to 50 feet.

A 50-foot channel will allow Howland Hook to handle the largest container ships in the world, which we presently cannot handle. We could double and eventually triple the number of jobs at Howland Hook with a 50-foot deep channel.

We urge the Army Corps to continue to pursue its plans to deepened the channel to 50 feet.

I would like to take this opportunity to thank Carmine and Chris Ragucci for re-opening Howland Hook Channel. We are now in openings for

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three years.

Thank you for instilling a new spirit in all of us, and I applaud your relentless efforts.

Thank you.

MR. SHEA: Thank you. Andrew Morano.

MR. MORANO: Good afternoon.

I am Andrew Morano, member of Local 1814 representing mechanics, maintenance men, roofers and carpenters, currently employing 120 jobs at Howland Hook and members and our families also depend on their competitive as a world class strategic port and military facility. AM-1

We support the Army Corps planning to deepen to 50 feet. A 50-foot channel will allow Howland Hook to handle the largest container ships in the world, which we cannot handle now.

We continue in pursuit of the (inaudible) of deepening the channel to

- Proceeding -

50 feet. We are in support.

Thank you very much.

MR. SHEA: Thank you. Chris Ragucci.

MR. RAGUCCI: Good afternoon.

I want to thank all of the members of the Army Corps staff who are here. We solute their dedication. CR-1

This is a very big project and obviously very important to our region. And they have worked very hard on it and kept to an aggressive schedule.

So, we commend your dedication. I am the general manager of Howland Hook Container Terminal, Inc.

Howland Hook is a world class, intermodal container port, intermodal cargo handling facility of over 180 acres. We are capable of expanding our activity significantly with the deepening of the channel.

We enthusiastically support the deepening to 50 feet.

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We currently handle approximately 180 thousand containers per year servicing 13 ocean carriers, operating 8 services which covers all of the major trade lanes in the world.

Howland Hook is a full service facility with a container freight station warehousing, customs inspection, we have intermodal rail connection, and a maintenance and repair operation. It is located in a Foreign Trade Zone.

In just three years of operation Howland Hook created over 400 direct and indirect jobs Howland Hook's annual payroll is approximately $20 million per year.

Howland Hook has the capability to be expanded to almost three times its present size, with approximately 400 acres of private and publicly owned land adjoining Howland Hook.

Both the Port Authority of New York and New Jersey and the City of New York Economic Development Corporation

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have long-term capital plans that call for the investment of several hundred million dollars for the continued development and expansion of Howland Hook and related maritime and cargo uses, including more than doubling the size of the marine terminal itself, creating a super-post panamax terminal, building an intermodal rail yard along with hundreds of thousands of S.F. of warehousing and distribution facilities.

The Army Corps 50-foot deepening is consistent with these planned investments..

It is important to note that the benefits of deeper channels and bigger ships flow far beyond the maritime industry and beyond the economic benefits for communities with Ports.

Having the most efficient Ports, calls for handling the largest and deepest ships possible. Ships have been found to be the most efficient and environmentally friendly mode of

Page 1

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transportation. The more efficient our port, the better the quality of our life, and the lower our cost of living.

We in the industry know very well that the cargo that can't come by ship still comes to our region, but comes by truck, thereby fouling our air and clogging and destroying our roads.

The cost of these goods is also greatly increased.

Separate from Howland Hook's commercial role, and of significance rising to the level of national security, is Howland Hook's military role. Howland Hook is the SeaPort of Embarkment for the US Military Traffic Management Command and the Military Sealift Command.

With the closing of MOTBY, Howland Hook is the northern-most Seaport of Embarkment in the Eastern United States, and the only facility from Maine to Virginia designated for such activity.

In the time of national

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emergency, Howland Hook is assigned to load FSS, and LMSR class ships, with military equipment and material of the 10th Mountain Division, and numerous other service and reserve commands located in the Northern United States.

These are very large high speed cargo ships which capable of carrying hundreds of thousands of tons of cargo.

This past summer Howland Hook employed a contingent of the 10th Mountain Division, including its helicopters, to Bosnia as part of the United Nations peacekeeping force, replacing another unit that was returning home.

In order to allow Howland Hook to serve in this vital strategic role, in addition to our commercial role, and fully accomodate these military vessels it is charged with loading, it is necessary that the Kill Van Kull and the Arthur Kill Channel be deepened to 50 feet.

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We commend the Army Corps on its results of its Harbor Navigational Study and we urge the Army Corps in the strongest possible terms, to pursue its plans vigorously with the utmost sense of urgency.

Thank you.

MR. SHEA: Thank you.

William Sherwood.

MR. SHERWOOD: Good afternoon, ladies and gentlemen. WS-1

I would also like for welcome the Army Corps of Engineers and staff here. It is much appreciated.

I am a Staten Islander, which is very important. I am very happy to have this meeting on Staten Island; I think it is important to get the message out to the people of Staten Island. I live on Staten Island; I fish off the shores of Staten Island, I boat around Staten Island.

I find no threat in this. It is pivotally important. I worked in the

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Port of New York for 25 years. I have seen this port decline. I have seen very few people take interest in it, and what little interest has been shown has been blocked, very often with rather inane reasoning as to why these projects may not be completed.

Now we are seeing a research, some interest in the development of the port, and it is wonderful. It is absolutely terrific, and it is terrific for the people of Staten Island.

Howland Hook is an extremely important port here, for the Port of New York and particularly important for Staten Island, to see this project go forward.

Thank you.

MR. SHEA: Thank you.

James Stolpinsky.

MR. SCOLPINSKY: Good afternoon. JS-1

I am James Stolpinsky, president of International Longshoreman's

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Organization, Local 920.

I, too, am a local Staten Islander, third generation. I represent approximately 175 longshoremen at Howland Hook and IILS represents probably about 350 to 400 ILA workers at Howland Hook.

We back the Army Corps plan to dredge the channel to 50 feet. We feel it is economically vital to the survival and of the port of New York and New York City in general.

We hope to double and even triple the membership of the ILA in the port of Staten Island within the next few years. Dredging to 50 feet is absolutely essential in reaching that goal.

We would like to see this happen as as soon as possible.

And, thank you for your time.

MR. SHEA: Thank you.

Joe Assante.

MR. ASSANTE: Good afternoon.

I am Joe Assante, director of

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operations for APL, Limited, which most of you who don't know: We are the guys with the big ships. JA-1

Fifty feet is something we need desperately, or you need desperately to maintain competitiveness as far as what goes on on in the shipping communities. I am responsible for the East Coast operation.

APL is the fifth largest containers carrier in the world, mainly a west coast operation, planning to (inaudible) and operate east coast operations.

As everyone knows, New York is a key to that. We have offices in Norfolk, Charleston, Halifax.

Every one of these ports has no problem with dredging, of getting big ships in. New York is vital for us and we think is vital for you to maintain economic and maintain what goes on around here.

The jobs that we present,

- Proceeding -

everyone knows.

The economic pluses that are around, everybody knows.

I have a couple of questions. Because I am involved up and down the east coast I am somewhat involved in what goes on in the other ports, which everybody is kind of looking at New York here. But in the port of Norfolk, they can dispose of some of this contaminated sill for about 5 cents a yard, where here it is in the neighborhood of $38 dollars.

I just don't understand: This is federally regulated. How there is such a big difference in the cost of disposal.

I also see up and down the east coast people taking the sill and rebuilding it, putting it back into making terminals, different areas of land. Which anyone involved in the New York area knows they need more planned mass and more terminals here.

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Other ports are doing it. New York needs to do that also. So this dredging proposal is extremely important.

I would like to thank the Army Corps. I think it is something that needs to be done, and done tomorrow. We have the ships, the cargo: We need the place to put them.

Thank you.

MR. SHEA: Thank you. Lawrence DeMarcia.

MR. DeMARCIA: Good afternoon.

I am Lawrence Demaria, president and CEO of the Staten Island Chamber of Commerce. I will be very brief. LD-1

This is a no-brainer for the Chamber. I represent 1,000 businesses on Staten Island. We are an island.

I think 50 feet is vital to the life of New York in general and to Staten Island in particular. I can't imagine Staten Island and the Chamber of Commerce

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not being successful in the next millennium without enough room to let the largest ships in the world come in.

I am giving you, the Corps of Engineers, our unbiased support with your plans to dredge the harbor.

We really need this on Staten Island, and anything you can do, we would appreciate.

It is vital to us.

Thank you.

MR. SHEA: Is there anyone else who have unable to register and would like to speak in.

(No response).

MR. SHEA: All right, then, that concludes our formal comments period, and we thank you.

If you still have any questions or you need to ask the staff anything, I ask that you join us back at the poster session.

(Time Noted: 5:15)

EVENING SESSION

(Time Noted: 8:15)

MR. SHEA: Our first speaker representing State Senator John Marchi, is Robert Helbock.

MR. HELBOCK: I just have a brief statement on behalf of Senator Marchi. I have actually taken the liberty of omitting part of it because it appears it isn't part of what the Environmental Impact Statement addresses tonight. RH-1

I would like to thank you for the opportunity to address the issue of dredging the harbor, and in particular the rivers that surround New York and Staten Island.

I have long been a supporter of the Port of New York and supports Governor Pataki's efforts to promote the

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economic development of the Port by dredging the channel to 50 feet. This means jobs and commerce for the region and in particular Staten Island. With those potential benefits I believe that most people would support the proposal on it's face.

History, however, has given us more to be concerned about. I must indicate my opposition to any dredging of the Kill Van Kull or Arthur Kill that that involves disposing of the dredged spoil on the eastern shores of Staten Island in borrow pits. RH-2

If they were the only solution I might have to say I might have to be reasonable for the interests of the Port.

However, the use of borrow pits is the cheapest solution, not the only solution. If the engineering skills that will be needed to take the draft of channels to 50 feet, are applied to this solution, I am confidence that American

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ingenuity will prevail.

The proposal for dredging should not proceed forward without a satisfactory response to the issue of the borrow pits.

My second concern is the blasting of bed rock that will be required by the Corps of Engineers to take the channel to 50 feet. Prior blasting has caused damage to local buildings and been a source of disruption to the communities.

While I understand that the communities must share in the burdens to reap the rewards of the Port, I do not feel that enough was done to warn, protect, and mitigate the damages to the community.

While public forum such as this are good educational tools, significant improvement needs to be made in community outreach and responses to the issues generated by the dredging and blasting. RH-3

I am proud to be a Staten

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Islander: We are a community that understands our responsibilities to the city, state and region.

However, we also will not be taken advantage of even in the face of significant economic development.

I am calling upon all involved with this dredging proposal, to give priority to these and others concerns of the people of Staten Island.

As an elected official of this community I stand ready to reach mutually beneficial goals.

MR. SHEA: Thank you.

Next speaker is an Andrew Genn.

MR. GENN: Thank you for this opportunity to provide testimony on the Draft Main Report and Draft Environment Impact Statement for the Army Corps of Engineers Habor Navigation Study.

I am Andrew Genn. I serve as the director of strategic port planning at the New York City Economic Development

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Corporation.

Today I am going to be delivering oral comments, I will also be delivering comments at the Brooklyn session on Monday, and will be following up with written comments before the November 25th deadline. AG-1

By way of introduction: EDC is a public benefit corporation empowered by the City of New York to do, among other things, implementing freight transportation projects in the City of New York.

EDC is also empowered to recruit and retain businesses in the city. These seemingly desperate responsibilities are fundamentally linked; indeed, the growth and success of New York regions economy is highly dependent on a efficient freight transportation network.

EDC was pleased to play an active role in formulating Habor Navigation Study: HNS.

We are also pleased with the

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recommendations contained in the draft report are complementary with the findings of EDC's Strategic Plan for the Redevelopment of the Port of New York, which identified port improvement and expansion opportunities at the city's port facilities in Brooklyn and Staten Island.

In particular, the Harbor Navigation Study found that deepening channels to the Howland Hook Marine Terminal and south Brooklyn Marine Terminal to 50 feet is consistent with Staten Island and to the South Brooklyn Marine Terminal to 50 feet is consistent with the National Economic Development Plan.

As we enter the 21st Century, the New York region, the nations largest and most densely populated metropolitan area, faces new opportunities in addressing some long-standing problems of our transportation network. Earlier in the century we built a system of highways

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in or to provide for the more efficient movement of people and goods.

Today, these highways are heavily congested, to the point of"unsustainability". Yet, as we enter a new era of increased global economic competition we are becoming ever increasingly dependent on our transportation infrastructure.

Because of the world-wide changes in business logistics and consumer habits, the movement of freight within the region are expected to grow tremendously over the next decade and beyond.

International Maritime Container volume is expected to double as early as 2010 and double again by the year 2020. Over the past five years container traffic has grown by nearly six percent annually, and in 1998 cargo growth rose by nearly eleven percent over the previous year.

Cost effective freight

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distribution system, the recommendations for deeper shipping channels contained in if Harbor Navigation Study are sound.

We commend the Army Corps of Engineers for their good works, deserve particular praise for Tom Shea who has been shepherding the project through from the beginning, and going to school full-time and.

At the same time we want to draw attention to the plans that EDC has forwarded including the strategic plan for the Port of New York Cross Harbor Investment Study. The strategic plan in the context of this meeting, found that the Howland Hook Marine Terminal, HHMT, is a viable facility. Since its re-opening in 1996, the terminal has seen tremendous growth in spite of having the shallowest channel depths in the harbor and no rail service.

Now we believe that the recommendations of the strategic plans Harbor Navigational Study will put it in

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the forefront into the future.

The second efforts taken is by the Cross Harbor Freight Movement Major Investment Study: MIS. This federally funded study examines ways in which alternative means of transportation can be used to move cargo across the Hudson River and New York Harbor.

As you know the George Washington Bridge and Varrazano Bridge are the only facility among (inaudible) these two vital crossing are highly congested.

I cannot I emphasize enough how critical all of these transportation studies are for our future. Vast population will continue to demand goods. If the goods are unable to move by one mode of transportation, they will come in by another.

If the shipping channels are not sufficiently deep, or the marine terminals and rail facilities are not in place, then the ships will call other

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ports and the rail lines will continue to terminate outside of New York City.

And the goods on which we depend will come in through the back door: In other words, by truck.

A higher quality of life cannot be achieved without sustainable transportation network. Would not only improve, enhance commerce, but also improve the local environment.

It is in this context that transportation is at the heart of the nexus between global and local development. Unlike the industrial age when cities were rich but dirty. We now have the opportunity economically and (inaudible) places to live. Commitment to this regions network will be a critical determinant to the city's and nation's future.

Again, thank you for giving us this opportunity to speak.

MR. SHEA: Thank you.

Is there anyone who was unable

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to register and would like to speak?

(No response).

MR. SHEA: At this time we will adjourn the meeting until 9:00 in case anyone comes in late. If you still have questions you can join us in the back. If someone comes in who would like to make a statement, we will reconvene.

(Whereupon, there was a recess).

MR. SHEA: All right, the time is now 9:00 p.m.

Is there anyone else who wishes to be heard?

(No response).

MR. SHEA: We will close the meeting.

Thank you all for coming.

(Time Noted: 9:00 p.m.).

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Lawyer's Notes

In The Matter Of:

New York and New Jersey Harbor
Navigation Study

Hearing
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Transcript of the minutes of:

NEW YORK and NEW JERSEY HARBOR
NAVIGATION STUDY

Public Meeting Briefing

November 8, 1999
4:00 p.m.

Reported by:
GARY MANCINO

THOMAS J. SHEA, III: Our first speaker is Ida Sanoff from the Friends of the Boardwalk Coalition against Water Disposal.

MS. IDA SANOFF: I am Ida Sanoff from the Friends of the Boardwalk Coalition against Water Disposal. IS-1

This is about the economic development of this project and the issue of jobs, but the community is addressing their concerns about the environmental contamination and also what will be occurring during dumping.

I read the DMMP and I was astounded to find out what happened to the bald eagles on the Tappanzee Bridge and on the web and I looked where there is a bird alert in Prospect Park.

The oceanfront property in Brighton Beach and Coney Island is especially vulnerable to what would occur in the environment. If we have a major fish kill, the property value would be lowered. The concern of the community is the contaminated fish. We are addressing the contaminated fish issue and the fish eat and live in the toxins and it builds up in their body and

what happens is that poor families that fish along Coney Island and Jamaica Bay eat what they catch and there are no concerns for the health of the poor families who eat this fish.

Finally people of Coney Island have seen first hand what can happen when the Army's Engineers Report is done. It was done and it was fantastic. On West 37th Street, the effort was to keep the sand on the beach. Instead of keeping the sand, they did just the opposite and eroded two basins in Coney island and all the sand washed around on the wrong side, the northern side of the peninsula and there are 15-foot long blocks of sand. IS-2

That is giving us the most imaginable problem and why do I have to leave you with this. If they say what could happen is that you wind up with clean sand, think what can happen when they're going to dredge up the bottom of the bays. Contamination. The stuff contains dioxins, PCBs, heavy metals and substances that cause neurological problems and cause cancer, birth defects, IS-3

infertility and those are the other concerns I want to address.

Last but not least, the environment has sound disposal which does exist in New York State. What is happening? Nobody seems to know. If you're really thinking that this plan is going to economically increase the number of jobs that would be produced in New York State, the only thing this is going to do is make environmental disposal of dredging up materials. IS-4

Thank you, folks. Please keep in mind that there are people out there who eat fish and live near the ocean. Thank you.

THOMAS J. SHEA, III: The next speaker is Alric Nembuard.

MR. ALRIC NEMBUARD: I am Alric Nembuard and I am a member of the Community Planning Board Number 6 in Brooklyn and I have a concern and that is the second order that is in effect of this proposed Draft Report of the New York and New Jersey Harbor. AN-1

We have within the board 86 members and on the board as well and we have

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unutilized inland bodies of waterways within the City of New York that need a considerable sum of cleaning up and if you will, some of the mechanics of the channel that we're talking about is the Flushing tunnel and pumping station at the head of it and we thought we might view the floor project as an opportunity to restore this canal to full use and currently the channel is only used for commercial purposes.

We should then require opening of the Hamilton Street Bridge at rush hour and when the bridge is open, then nobody could say that the traffic pollution and all the effects stem from the second order.

What I would like to do is request a pumping station be built in the canal to its closest channel and that would be the Bay Ridge channel which is the electrical extension of the waterway downstream from the Gowanis canal.

Again, the tenure to restore a midland body of water to full economic use for the jobs and activity could generate benefits as well as be an environmental benefit in that

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we reduce the amount of traffic and pollution and those are effective results immediately.

There are so many things, but what I would like to do is request incorporating bringing the canal and it doesn't entail much facts, but allow us to benefit more economically.

So I request, if you would, to plan that because there are some benefits. The previous speaker raised questions about whether they have a thought out plan for straightening out waste disposal and incorporating it as part of this extension.

For example, the citizens of New York City are currently looking at this only as points of major commercial asset insight and currently it is a struggle for a body of water.

THOMAS J. SHEA, III: The third speaker is George Haikalis.

MR. GEORGE HAIKALIS: My name is George Haikalis and I am from the Institute For Rational Urban Mobility, Inc., which is a not-for-profit research entity concerned with the market based strategies to improve

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transportation in urban areas. I am also speaking with considerable experience in the benefit cost area.

I wanted to make some commentary particularly on that. The government is building numerous highways for years. We have to deal with economic feasibility of channel navigation improvements. We're talking about substantial sums of $1.781 billion of public funds to be invested and I am basing my comments on the initial report and I have since gotten a copy of the economic report and reviewed it and provided further written comments by the 15th. $1.781 billion is a substantial sum for transportation investment by anyones imagination.

If you recommend the incremental analysis of the last added pathway, it is appropriate where they looked obviously at the channel and tried to assess the economic impact by picking the most productive one and heading off to that. We're talking about direct benefits and costs that are in the analysis. GH-1

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Now, there are substantial indirect benefits that are not included and many of them have been counted by some elected officials and we're also talking about substantial direct environmental costs that are also not included and some of them we heard today. We're also talking about other indirect costs that haven't been dealt with.

We're talking about benefits that in some ways perhaps benefit shipping companies and the costs born by taxpayers locally and nationally. Obviously they are more communicated then that however.

I am just mentioning shortcomings of the economic analysis. The Federal interest rate of 6 7/8 percent which is certainly far below what we could do in the market today. I think there is a 10 percent opportunity cost that would be more appropriate. A 50 year life - assumes no breakthroughs in shipping technology in 50 years and that is kind of preposterous and 25 years might be more appropriate.

The economic assessment for Pathway 2 - Port New Jersey is a 50 foot channel that has GH-2

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a benefit-cost ratio of 2.88 and more stringent economic parameters which would be an attractive investment and the economic assessment of Pathway 4 - Kill Van Kull to Port Newark/Elizabeth has a 50 foot channel that has a benefit-cost ratio of 1.05 that is marginal with current parameters and fails with a slightly higher interest rate or slightly shorter economic life and it suggests what it ought to be then, but the total comes out to a 1.5 benefit to cost that is very very near to being 1.0 or .19 and certainly marginal by a numerous dollar amount to be proposed spent on this environmental impact.

We think it makes a lot more sense to invest in the Port Jersey channel, but to hold off on the Kill Van Kull to see whether the 3 percent annual growth rate which is the same odds with the past growth rate in this area actually does develop.

Then the Brooklyn channel investment decision to close the harbor rail down and decide how we want it to be developed and there are more detailed comments in the

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handout and there will be more to come.

Thank you.

THOMAS J. SHEA, III: The fourth speaker is Herzyl Eisenstudt.

MR. HERZYL EISENSTUDT: My name is Herzyl Eisenstudt and I am representing the International Longshoremens Association and those are the people who work in the Port of New York. Actually we came here to make a point. It looks like I have to make a counterpoint. The point that I am first going to make is one of the points that was made by the first speaker, jobs.

Once upon a time, it wasn't that long ago, maybe 35 years ago, there was 301,000 longshoremen in Brooklyn, Manhattan, Queens, Staten Island, the Bronx and New Jersey. The longshoremen that were working in the Ports of New York, et cetera, that was our friends, that was our neighbors. Those were the people who make this board work.

Today if you're lucky, you have 3,000 who would be working. One of the reasons that that number is going lower and lower is because some of those vessels that should be

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stopping here with all their cargos are going to Halifax or going to other ports and unloading at other ports lightening themselves so they can come into our channels. They tried to get into this port several months and they just couldn't make it under the bridge.

The point I am trying to make is that unless these channels are deepened and quickly, we are not going to be able to get the ships in here and going to make this economic move. HE-1

The gentleman that just spoke before me talked about economics of it. Well, the economics of it you have right outside. You have them right on your posters. You're talking about billions and billions of dollars coming in and out of the Port of New York and in our economy.

It says right here in the actual poster that you're talking about 500,000 manufacturing jobs in the state, 166,500 port and labor jobs and 53.5 billion, not million, dollars worth of goods that go out of New York State to 200 countries around the

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world and, of course, from Jersey as well.

The point I am trying to make is that we can't wait around. In the Navigation News that was published, the Corp of Engineers, it says deeper channels allow current classes of container ships to enter the Harbor without any restrictions. These ships like the Regina need a depth of 47 and a half feet and 50 feet mean low water floor for safe transit.

In the display we have out there, we talk about the present classes of vessels and we talk about the future classes of vessels and the present class of vessels is 43 feet and you have the Post-Panamax vessel which needs one or two more.

We can't wait until 2009 and we certainly can't wait until 2006 to see these channels deepened. We need them right now because the immersing sealand is a gamble and we need those depths. If we don't get those deepened ports in New York, it is going to be given up. All we're asking for from the Corps of Engineers is to be consistent.

Ladies and Gentlemen, the future is

here. These vessels are coming in now. We need to deepen those channels now and you have to get the funds and so on.

Finally as part of the toxic elements and so on, lady, you don't have to swim off Coney Island, but the fish are very happy because we're taking toxic stuff out of the depths and burying it somewhere else. Every time a ship comes in and scrapes the bottom of the harbor, that toxic stuff is brought up. We're getting rid of it. We're doing you a favor. We're not creating problem. This is not going to contaminate the fish and we certainly can't wait one day longer.

THOMAS J. SHEA, III: The next speaker is Carter Craft.

MR. CARTER CRAFT: My name is Carter Craft. The New York and New Jersey metropolitan areas are the most densely populated regions in the United States. The fact is that we as Americans are high volume shoppers and consumers.

The question is not will the port expand, but how will the port expand. If it is deepened, the channel, suddenly CC-1

50 million cubic yards of material needs someplace to go. 70 percent of the material is your own unsuitable material.

We are currently demonstrating to show promise I believe in any solution that relies on export. Look at where their garbage went. If the State of New Jersey has dredge spoil, then New York has the same on the U.S. Postal service side on the Gowanis side.

If the State of New Jersey builds a golf course over a sewer with dredge spoil, then New York can construct a golf course around a former wetland in the Bronx.

Reliance on any single method is as foolish as relying on any single port, a facility.

New York State has as much as 40 million in the bank for demonstration projects. With an optimistic timetable set by this study, it is clear that we need not just larger, but more demonstration projects.

Thank you.

THOMAS J. SHEA, III: The next speaker is Rita Schwartz.

MS. RITA SCHWARTZ: My name is Rita

Schwartz and I am the Director of Government Relations from the General Contractors Association of New York. The GCA was founded as a trade organization for New York's heavy construction industry 90 years ago, in 1909. The founding members of the Association were the contractors who built, among other major projects, the piers, harbors and structures critical to the then burgeoning water related industry in New York Harbor.

Since its inception, the Association has represented its members in both government relations and labor relations. We negotiate collective bargaining agreements with 14 different local unions in the building trades, building airports, tunnels, bridges, roadways, transit systems and maritime facilities. Our 113 member firm usually holds prime contracts with the owners for whom they work and hire directly for such agencies as the Port Authority, the City of New York, the State of New York and the MTA family of operating units.

Our members who work primarily in

marine construction will be involved in the work proposed in this review and represent the highest quality of skills in the nation. RS-1

The recent improvements in dredging technology and the increased dedication of dredging companies to environmentally sound practices and procedures will enable this work to be performed at the lowest level of environmental impact in history.

Further, the projects envisioned will create new blue collar employment opportunities. Historically, these opportunities have gone to the newest members of our society and those who are most economically disadvantaged. For a strong vibrant regional economy, it is critical that we create this type of work opportunity.

We have participated in these discussions for years about the need to deepen the channels in our harbor to accommodate the new class of container ships that are becoming the standard in the Maritime Industry and fully support the Army Corps of Engineers recommendations that all the major channels in the harbor be deepened

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to 50 feet.
It is clear that the Environmental Impact Statement component of the study concludes that since the proposed projects simply deepened existing channels there are no significant environmental impacts.
Dredged material removed from the channels for the deepening projects will be used either as remediation at the Historic Area Remediation Site or in beneficial reuse applications at upland locations. It is noted as well, that no expansion of marine terminals through the use of landfills of wetlands or land underwater will be required to support the deepening projects.
This sends a strong positive message to the environmental community for their support and to communities, concerned about materials which might be environmentally unsound. This work can be done with the minimum impact and will have a positive result in our maritime industry.
For years, we have been concerned about the need for deepening the harbor. The new technology of container ships such as the

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Regina Maersk that require up to 50 feet of water are already calling on the port but are operating less efficiently with lightened loads to accommodate the current shallower channel depths. It is of critical economic importance to the region to provide technology and facilities for the movement of cargo into our region. Without deeper channels, we risk the loss of cargo and the jobs which go with them, to ports such as Halifax and Baltimore. Goods moved to those ports would then have to make the remainder of the destination to the New York City region by truck, further clogging our already at capacity roadways, further polluting the environment and creating higher prices at the end of the line to the consumer.
Marine Terminal enhancement, proposed as an $1,574 million public/private million investment will bring not only direct construction jobs to the area, but, long term, will strengthen the regions economic competitiveness by providing the highest quality and most efficient services in port commerce.

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It is projects that these improvements will bring 2,616 new jobs to the region (direct and indirect) 4145 million in wages and $545 million in additional income. We cannot afford to lose these benefits. Our port facilities and the harbor are no longer first class efficient facilities that create regional jobs and stimulate economic growth.
Although the Army Corps of Engineers has made estimates of the construction schedules for the deepening projects, it has pledged to work with the Port Authority and the two states in an effort to advance the completion dates for the projects, such as the goal to deepen the Kill Van Kull/Newark Bay Channel to 50 feet in 2009.
Deepening the harbor will help provide the capacity needed to prevent a critical shortfall and shifts in port activity and will pave the way for additional transportation/good movement necessary for the region's economic growth.
We are ready to work with the Port Authority or other owners to assure the highest level of technology to protect worker

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safety as well as the environment.
We fully endorse the recommendations in this statement and urge the Corps of Engineers to move forward and develop the memorandum of understanding between the Corps and the Port Authority.
We look forward to working with the Port Authority and local communities to help complete this work and to do so in as professional and technologically appropriate way as possible.
THOMAS J. SHEA, III: The next speaker is Robert Gotham.
MR. ROBERT GOTHAM: My name is Robert Gotham and I am here on behalf of the Congressman who could not be here today, but I have a statement I want to put on the record.
I would like to begin by thanking the Army Corps of Engineers for this opportunity to comment on the Draft Report of the New York and New Jersey Harbor Navigation Study. To begin with, I must state that I basically agree with the recommended plan as outlined in the draft report. The channel depths of

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the Port of New York must be dredged to 50 feet. It is essential for the economic well being of this region that the Port Authority of New York, and especially Brooklyn, be able to handle 50-foot draft ships thus enabling New York to become the hub port on the eastern seaboard.

Seaborne trade, like air traffic, is moving to a pattern of "hub" and "feeder" ports. Shipping is changing its patterns because ships do not fit through the Panama Canal and they won't fit into our harbor. They won't fit through the Kill Van Kull or the Arthur Kill. You need a 50-foot depth for these ships. Because the ships are getting larger and more expensive, the shipping companies are going to follow the airlines to a hub and feeder system. Ten to fifteen years from now there will be only one hub port to handle the bulk of the East Coast shipping business. We must insure that the Port of New York and New Jersey including Brooklyn become the hub port.

Some statistics to put this into context. Currently we are doing about 2

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million TEU's a year for the Port of New York/New Jersey combined. Those 2 million TEU's support 180,000 jobs throughout the region — a very large fraction of our job base. The Port Authority's 1995 Study said that if we don't become the hub port subsequent City and Port Authority studies agree that we have the potential of going from 2 million TEU's to 14 to 16 million TEU's in the next 40 years. A seven to eightfold increase. So we have two possibilities; lose 40 percent of business and jobs or septuple it, depending on whether we become the hub port.

In concluding, I must add that today. we stand the closest that we have in decades to building a container port in Brooklyn and revitalizing the City's manufacturing economy. Both the Port Authority and New York City EDC in their own port studies released a couple of months ago, see great potential in building a container port in Brooklyn and capturing the lion share of the expected rise in the shipping trade on the Eastern Atlantic coast.

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Also, the preliminary reports of EDC's Cross Harbor Freight Study, which is due out early next year, appear to be leaning towards building a rail freight tunnel connecting Brooklyn to either Staten Island or New Jersey.

In addition, in discussions I've had with the United States Department of Transportation, they have indicated significant interest in the construction of a rail freight tunnel.

Therefore, as we are so close to these projects becoming the East Coast Hub Port, I strongly agree that the channel depths of the Port of New York must be dredged to 50 feet.

THOMAS J. SHEA, III: Thank you. Is there anyone else that wants to speak that registered or wants to make a statement?

Then that concludes this portion and thank you all for coming out.

If you have any further questions, we. will join you in the back and you can get with staff or meet by the poster boards.

Thank you.

(Time noted 4:45 p.m.)

Transcript of the minutes of:

NEW YORK and NEW JERSEY HARBOR
NAVIGATION STUDY

Public Meeting Briefing

November 8, 1999
7:00 p.m.

Reported by:
GARY MANCINO

THOMAS J. SHEA, III: Our first speaker is the Reverend Joseph Parrish from the St. John's Episcopal Church.

THE REV. JOSEPH PARRISH: My name is Joseph Parrish and I am from St. John's Episcopal Church, which is located at 61 Broad Street in Elizabeth, New Jersey. I live in Manhattan and I spoke earlier and my point is that I too urge you to make an effort and take a few moments and listen to this. I am part of the Citizen's Advisory Team for the EPA Decontamination Project for the Newark Bay.

JP-1

I was making three arguments why the channel is necessary and why I work with the EPA and the community of Newark. You see from this chart where 70 percent of the material comes from and this is not HARS suitable. Seventy percent comes from the New Jersey portion of the project: Port Jersey, especially Kill Van Kull and Newark Bay and Arthur Kill.

So that contributes to almost 6 million of the 8 million cubic yards that

have become contaminated or the majority of it. We do not have adequate decontamination techniques to decontaminate a large quantity.

The material at this point, we're working with the Pilot Project to do the labor and it is not approved to work yet.

Now, the second point is that there are ships on the drawing board which we believe require deeper channels of 50 feet and to make 50 feet is too conservative. You would suspect the channel to be 65 feet and it is necessary and more likely through the Bay Ridge channel here in Brooklyn. 65 feet without less rock below.

Now, the third point is that most of the traffic pollution goes through Manhattan, Queens and the New Jersey area and it is from diesel trucks. Approximately 800 micrograms per cubic meters particulates, per truck are generated from these trucks in our area and 300 micrograms per cubic meter per car. A 113 zero to one ratio of truck to car particles are in our air.

So we have that portion of the project potentially generating truck traffic and

unsightly we believe that anything which will create truck traffic should not be found to be acceptable.

The only real way to go is railroad track, the viable way and healthy way of transporting this extra amount and that's the reason we believe the Brooklyn Cross Harbor to Staten Island deep rail tunnel should be built and should be a necessary part of this plan to work. We're going to authorize the fact that the minimal is 50 feet and read the first chart and it says first 50 feet and we believe the planning should go to 65 feet and the initial draft was to stop at 50 feet.

Thank you.

THOMAS J. SHEA, III: Thank you. Is there anyone else that wants to make a statement?

Then we will adjourn the case. Thank you.

(Time noted 8:30 p.m.)

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RESPONSES TO PUBLIC COMMENTS

November 3, 1999, 5:10 PM

JP-1 Comments Noted
The DMMP addresses decontamination technology.

November 3, 1999, 8:00 PM

JC-1 Comments Noted

DM-1 Comments Noted
The economic analyses included in the Main Report was prepared in accordance with the USACE's regulations.

November 4, 1999 4:15 PM

DJ-1 (For Borough President Molinari) Comments Noted

JJ-1 The wide distribution of project material and information is noted.

JJ-2 Issues related to Environmental Justice are addressed in Section 6.8 of the FEIS.

MC-1 Comments Noted

AM-1 Comments Noted

CR-1 Comments Noted

WS-1 Comments Noted

JS-1 Comments Noted

JA-1 Comments Noted

LD-1 Comments Noted

November 4, 1999, 8:15 PM

RH-1 (For State Senator John Marchi) Comments Noted.

RH-2 Dredged material from channel deepening will be disposed of in accordance with the DMMP. As described in Appendix B-1 B1-5 of the FEIS there is no plan to use borrow pits on the eastern shores of Staten Island.

RH-3 Blasting, where necessary, will be conducted using best management practices that minimize disruption to neighboring communities. A community outreach program will precede construction.

AG-1 Comments Noted

November 8, 1999, 4:00 PM

IS-1 Bald eagles have not been spotted in the New York New Jersey Harbor however, other threatened and endangered species are addressed in the EIS.

IS-2 Comments Noted

IS-3 Comments Noted

IS-4 Comments Noted
Dredged material disposal will be conducted in accordance with the DMMP.

AN-1 Comments Noted
The harbor deepening project does not include inland waterways, only existing federal channels.

GH-1 The economic analysis was conducted in accord with the USACE's regulations. There are substantial local, regional and indirect benefits that are not included in the assessment which focuses on the net economic benefits to the nation.

GH-2 Comments Noted.

HE-1 Comments Noted

CC-1 The DMMP provides for a variety of disposal methods and sites.

RS-1 Comments Noted

RG-1 For Congressman Jerrold Nadler - Comments Noted.

November 8, 1999, 7:00 PM

JP2-1 Comments Noted

FEIS APPENDIX A-1.3

GENERAL PROJECT CORRESPONDENCE

FEIS APPENDIX A-1.3a

GENERAL CORRESPONDENCE

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October 27, 1999

Colonel William H. Pearce
District Engineer
Department of the Army
New York District, Corp of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0090

Attn: Thomas J. Shea

Re: Extension of the comment period for the New York and New Jersey Navigation Study. (Study).

Dear Colonel Pearce:

Thank you for responding to my October 5, 1999 letter concerning the Navigation Study, and its relationship to the Dredged Materials Management Plan (DMMP). I must admit I was caught a little off guard by the implication in your October 21, 1999 letter to me that there could be discussion about whether or not there is a relationship between the Study and the DMMP. The connection is obvious – if you dig you must dispose.

However, my concern is deeper than just the connection between the two documents. We believe that the two aforementioned studies and EIS's are premature because there are missing pieces to the puzzle of port planning, navigation, habitat restoration, open space preservation, and materials management. One of the most import missing pieces are the land side aspects of Port Planning. We were told by Port Authority officials that their "investment" plan and master plan for the port would be available to the public in October. My most recent information is that the Port Authority's Board is holding up the plan. *It is impossible to plan for channels and channel deepening, without knowing where the port intends to expand, or if it does!*

Both New York and New Jersey are developing port expansion, dredging, and toxic reduction programs, and I believe they also need to be complete before it is appropriate for the Corps to move forward with proposals for channel deepening and materials management.

Page 2, Extension of the comment period for the New York and New Jersey Navigation Study. (Study).

Finally and most importantly, we have just, last Friday, been made aware of a Draft Memorandum of Understanding for a Comprehensive Port Improvement Plan for the Port of New York and New Jersey. We have only begun to review this document and are very concerned that, although it begins to deal with coordination of port planning and dredging and disposal, the signatories do not include the federal resource agencies – the United States Fish and Wildlife Service and the National Marine Fisheries Service.

I believe it is impossible for us to comment on any of the outstanding EIS's without having the above mentioned documents available and coordinated. Because the Corps is apparently moving on a separate and divergent track from the rest of the region, we believe now that not only is it important to extend the time period for public review of the Study and the DMMP, but that they should be withdrawn until such time as the Port's Master Plan and Investment Plan, the EPA's MOU, and the State's plans are published and made available for public review.

If given this explanation, you are still interested in meeting on this issue, we would make our conference room at the American Littoral Society at Sandy Hook available for such a meeting. I would also suggest that representatives of the Port Authority, New Jersey Maritime Resources, New York Empire State Development Authority, US EPA, NJDEP, and NYDEC be in attendance. In addition, I will share this letter with my public interest organization colleagues. Thank you.

Sincerely,

Andrew J. Willner
Baykeeper

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

Planning Division
Flood Control and Navigation Section

7 Dec 99

Mr. Andrew Willner
Baykeeper
American Littoral Society
Building 18, Sandy Hook
Highlands, New Jersey 07732

Dear Mr. Willner:

Thank you for your letter dated October 27, 1999 regarding the New York and New Jersey Harbor Navigation Study draft feasibility report and draft environmental impact statement. I assure you that the study is being conducted in concert with the other Federal and regional initiatives for the Harbor.

I share your concern for placement of the material generated from channel deepening in an environmentally sound manner. That is why this study will use the Dredged Material Management Plan (DMMP) to account for the potential volumes generated at the time needed. Complete public outreach was done for the DMMP and the report is now under public review. Accordingly, material generated as a result of the New York and New Jersey Harbor study will only be placed at a site that is fully coordinated, approved and permitted through this process.

Regarding the future development of port terminal facilities, the District also shares your concern to ensure that the deepened channels lead to viable terminals and infrastructure. Therefore, due to the uncertainly of non-Federal plans, the recommend project was formulated based on the current port terminal configuration. No expansion of land areas was used in the analysis. This is clearly stated in the District's statement of the without project conditions and the plan formulation sections of the main report. The recommended project will not cause additional commerce to enter the region; rather, the project would merely allow cargo to enter the region in an economically efficient and environmentally safer way. However, in response to concerns for the complete environmental assessment of the region's infrastructure plans, the District, in concert with others including the US Environmental Protection Agency and the Port

Authority of New York and New Jersey, initiated and supports the Comprehensive Port Improvement Plan and its associated Environmental Impact Statement. At this time, the Memorandum of Understanding, which outlines the organizational structure and responsibilities, is being coordinated.

My point of contact is Mr. Thomas J. Shea, III, Project Planner, Flood Control and Navigation Section, who can be reached at (212) 264-5570, facsimile (212) 264-6040 or e-mail: thomas.shea@usace.army.mil.

Sincerely,

William H. Pearce
Colonel, Corps of Engineers
District Engineer

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE

Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

November 2, 1999

Frank Santomauro, P.E.
Chief, Planning Division
U.S. Army Corps of Engineers
New York District
405 General Lee Avenue
Brooklyn, New York 12209-8400

Dear Mr. Santomauro:

Re: CORPS
NY & NJ Harbor Navigation Study
Manhattan, New York County
99PR3466

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have reviewed the Geomorphological and Archeological Study in accordance with Section 106 of the National Historic Preservation Act of 1966 and the relevant implementing regulations.

Based upon this review, the SHPO accepts and approves the report and concurs with the recommendations of the report. We look forward to reviewing the additional studies and the draft Memorandum of Agreement for this project when they are completed.

When responding please be sure to refer to the SHPO project review (PR) number noted above. If you have any questions, please feel free to call me at (518) 237-8643 ext. 3255.

Sincereiy,

Robert D. Kuhn
Assistant Director

RDK:bsd

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State of New Jersey
Department of Environmental Protection

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

November 9, 1999

Frank Santomauro
Chief, Planning Division
Department of the Army
New York District, Corps of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0090

RE: New York and New Jersey Harbor Navigation Study

Dear Mr. Santomauro:

The Office of Coastal Planning and Program Coordination and the Office of Dredging and Sediment Technology of the New Jersey Department of Environmental Protection are currently reviewing the Draft Feasibility Report for [the] New York and New Jersey Harbor Navigation Study (September 1999). This includes a Main Report and a Draft Environmental Impact Statement. The Department has only recently received copies of Appendices B through I. The Department's review is being conducted pursuant to the requirements of the National Environmental Policy Act.

The New York and New Jersey Harbor Navigation Study is extremely important to the State of New Jersey and the surrounding region. The proposed plan to deepen various navigation channels in New York-New Jersey Harbor has the potential to produce significant beneficial as well as adverse impacts. Finally, given the size, scope, and complexity of the Draft Feasibility Report, the Department believes that a thorough and comprehensive review of this document is needed.

Therefore, the Department requests that the comment period for the Draft Feasibility Report be extended to no earlier than December 3, 1999. Thank you for your consideration of this request.

Sincerely,

Lawrence Schmidt
Director
Office of Coastal Planning and Program Coordination

c. Lawrence Baier, Office of Dredging
Frank McDonough, Maritime Resources
Beverly Fedorko, Commissioner's Office

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DEPARTMENT OF CITY PLANNING
CITY OF NEW YORK

WATERFRONT AND OPEN SPACE PLANNING

Joseph B. Rose, *Director*
Department of City Planning

November 22, 1999

Mr. Frank Santomauro
Chief, Planning Division
US Army Corps of Engineers - New York District
26 Federal Plaza
New York, New York 10278

Re: **Harbor Navigation Study Main Report and DEIS**

Dear Mr. Santomauro:

We have completed our review of the Main Report, DEIS and Appendix A for the Harbor Navigation Study for issues of consistency with the policies and intent of the New York City Waterfront Revitalization Program. Our particular concerns in reviewing this project have been the impacts to the aquatic and wetland habitats and the stability of the surrounding shorelines and upland areas.

Based on the information and documents submitted our office, as advisors to the City Coastal Commission, finds that the project does not raise significant issues of consistency with the New York City Waterfront Revitalization Program. We will continue to review any additional information and future documentation relating to the project to ensure that balance is maintained between the needs of the working waterfront for adequate shipping channels and the needs of the natural waterfront to maintain the health and function of aquatic and wetland habitats. In addition, we are interested in any information that discusses the relationship of this project's efforts to deepen the shipping channels and the efforts by the Port Authority and Economic Development Corporation to expand the landside facilities.

If you would like to discuss this review further or have any questions relating to the Waterfront Revitalization Program, please contact me at the number below or Omie Medford Ryan at 212-720-3623.

Sincerely,

Wilbur L. Woods

c: Steve Resler, DOS

Wilbur L. Woods, *Director*
22 Reade Street, New York, N.Y. 10007-1216 Room 6W (212) 720-3620
FAX (212) 720-3490

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE
Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

November 23, 1999

Frank Santomauro, P.E.
Chief, Planning Division
U.S. Army Corps of Engineers
New York District
405 General Lee Avenue
Brooklyn, New York 12209-8400

RE: NY & NJ Harbor Navigation Study
Kings, Queens, and Richmond Counties, New York
99PR3466

Dear Mr. Santomauro:

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have reviewed the "Cultural Resource Summary and Preliminary Case Report New York and New Jersey Harbor Navigation Study" and the Draft Programmatic Agreement.

Based upon this review, the SHPO concurs with the recommendations of the report and approves the wording of the draft PA.

If you have any questions, please feel free to call me at (518) 237-8643, ext. 3266. When responding please be sure to refer to the SHPO project review (PR) number noted above.

Sincerely,

Kathleen A Howe

Kathleen A. Howe
Historic Preservation Specialist

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June 4, 1998

Thomas J. Shea, III
Study Manager, Flood Control & Navigation Section
Department of the Army
New York District, Corps of Engineers
New York, NY 10278-0090

Re: Scope of Work for the New York and New Jersey Harbor Navigation Study

Dear Mr. Shea:

Since we have not heard from you regarding our letter to you of November 28, 1997, we are resubmitting that letter to you as part of our testimony for the Scope of work. Many of the questions we asked, and statements we made nearly eight months ago, are still pertinent.

We intend to continue to review the Scope of work, and participate in the EIS process, however we continue to have serious reservations about the – project purpose, the project scope, the benefits implied, the environmental consequences, and the citizen participation process of the Navigation Study.

It seems to us that events are unfolding around the Corps, and you have elected not to consider the consequences of developing your plan outside of the context of: regional transportation plans, the cross bay railroad tunnel, the cross harbor "rail barge" proposals, plans by New York and New Jersey, and the environmental consequences of attempting to create a deep water port in a shallow estuary.

We intend to submit more extensive written comments on the Scope of Work. We also look forward to your answers to the questions raised in our November 18, 1997 letter, and meeting with you and Col. Pearce on this and other issues germane to the Corps mandate. Thank you.

Sincerely,

Andrew J. Willner
Baykeeper

Enclosure

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

June 30, 1998

Planning Division
Flood Control & Navigation Section

Andrew J. Willner
Baykeeper
American Littoral Society
Building 18, Sandy Hook
Highlands, NJ 07732

Dear Mr. Willner:

Thank you for your letters of November 28, 1997 and June 4, 1998, concerning the New York & New Jersey Harbor Navigation Study. I appreciate you expressing your concerns regarding the study.

First, I would like to state that the District has not yet developed any plans or recommendations for any improvements in the Harbor as a result of this study. The analysis and Fact Sheet required by §905(b) of the Water Resources Development Act of 1986 completed last April, which you received, only identified that there are likely to be sufficient benefits to cover the costs of some type of improvement in the Harbor. The Executive Summary of the Project Study Plan (PSP), which was provided to you, outlines the investigations and scopes of studies needed to identify and recommend Harbor improvements. Neither document makes any project recommendations, nor does any other document yet produced by the Corps of Engineers.

The integration of various regional transportation plans is of concern to both of us. During the development of the PSP for this study, we dealt with many questions as to how this issue ought to be handled. In coordination with our study partners, we have recognized that many of the studies/initiatives that you mention were the responsibility of the sponsors or others, and that the results of those efforts must be integrated into our study as the "existing conditions" and "future without-project conditions". As a result, we have formed a work group composed of various federal, state and local transportation planning and execution agencies whose sole purpose is to ensure that this study includes their input. The result of this integration will be an interim report entitled "Without-Project Conditions". When completed, it will be sent to both advisory groups for comment. This will occur prior to its inclusion in the final report.

From the beginning of this study, our partners and we have felt that the two advisory groups should convene separately so that both groups could speak freely. A member of the Business and Labor Group echoed this view at the November 1997 meeting, who felt that anything said at a joint meeting would be used to initiate legal action against them. In order to overcome these concerns, we have decided to conduct

two phases of meetings. The first phase is a separate session with the Business & Labor Group to accommodate their concerns regarding the uses made of their remarks. The second phase is a joint session of both groups, as you and others have requested. This was the format that we followed this past May and June and will continue to follow, subject to the desires of our study partners.

I feel that this exchange of letters is serving as an impediment to dealing effectively with matters of our mutual concern. Therefore, I would like to renew my invitation to you to meet with my staff and I to discuss these matters in greater detail. Please contact Mr. Thomas J. Shea, III, Study Manager, Flood Control & Navigation Section at (212) 264-5570 to arrange the meeting.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

CF:
Mr. Kevin Corbett, Empire State Development Corporation
Mr. Frank McDonough, Esq., New Jersey Maritime Resources
Mr. Thomas Wakeman, The Port Authority of New York and New Jersey
Ms. Shirley Jaffe, New York City Economic Development Corporation

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November 28, 1997

Thomas J. Shea, III
Study Manager, Flood Control & Navigation Section
Department of the Army
New York District, Corps of Engineers
New York, NY 10278-0090

Re: Citizen Advisory Group, New York and New Jersey Harbor Navigation Study

Dear Mr. Shea:

I am disappointed that we did not receive the full *New York and New Jersey Harbor Navigation Study Feasibility Study* in a timely enough manner to read, analyze and comment on it. I am additionally disappointed that we did not receive the *Project Study Plan Executive Summary* until two days before the Citizen Advisory Group meeting, and would not have been aware that it existed except through a chance meeting at the Dredging Conference last Tuesday. We also continue to be disappointed that there is an arbitrary division between the Citizen Advisory Group and the Business group.

As I quickly read the summary, it became apparent that few or none of our comments from the February 14, 1997 Advisory meeting were incorporated. I saw no mention of other regional transportation initiatives or plans. What happened to discussion about the Brooklyn to New Jersey or Staten Island Rail Tunnel, or the Cross Harbor Railroad? Where is there mention of the Port Authority's Port planning initiative. Where is mention of the MOTBY conversion?

Why would the Army attempt to assume to make market decisions about shipments, transshipments, alternative freight carrying methods, when the market will make those decisions? If a decision is made, not to deepen channels, and cargo goes elsewhere, the market area for consideration just gets larger. It may cost more, but it is offset by other benefits..

There are too many assumptions made, which attempt to say that any diversion from the Army's course of deeper and deeper channels will have catastrophic national consequences. One assumption is that "If container handling facilities of the Port are accessible only by relatively inefficiently sized vessels, the profit motive will guide shipping lines to seek out alternative loading and routing practices." *So, what.* If containers are routed elsewhere, there is status quo for the national economy, neutral affect. In fact under certain circumstances: more rail line construction, and capital investment in rail cars and locomotives, may result in a net increase in economic activity and jobs nationally and regionally, offsetting a possible loss locally.

The report goes on to say, "The decision as to whether or not an investment should be made to improve a given navigation channel depends on a comparison of the economic cost of the channel improvements with the economic cost of not improving the channel. In this case, an important part of the economic cost of not improving the channel would come in the form of the economic cost of cargo diversion and

transshipment." Again the assumption is made that this region is isolated economically from the rest of the north eastern United States, the rest of the nation and the world.

What if -- Port Newark and Elizabeth became container barge hub port for the entire North East, and larger ships called only on Bayonne, and Brooklyn. Jobs would be created in Tunnel building, or tug and barge construction, barge and tug crews, rail car and locomotive construction, train crews, engineers, architects, investment professionals, (and will result in more sustainable development resulting in cleaner air, less crowded roads, and busier waterways and rails).. Hundreds of thousands of new jobs could be created. Why look at the change in the port as a negative. Why not increase the scope of the port so that smaller ports in New Haven or Providence become part of a barge, ship, rail network?

I would suggest that your distribute the entire plan to the Citizen Advisory Group members, and then have another meeting in two months. It is important that if the Corps does not have the authority or the vision to be able to see how this opportunity to really plan, could improve the region's transportation infrastructure while protecting the quality of life and the environment of the region, then they should find others who can.

Sincerely,

Andrew J. Willner
Baykeeper

cc. Col. Gary Thomas

Williams

Gas Pipelines - Transco
214 Carnegie Center, Suite 300
Princeton, New Jersey 08540
Tel: 609-951-0990
Fax: 609-936-2430

April 21, 1998

Ms. Jenine Gallo
U.S. Army Corps of Engineers – New York District
Environmental Analysis Branch
CENAN-PL-EA
Jacob K. Javits Federal Building
26 Federal Plaza
New York, New York 10278-0090

RE: Environmental Impact Statement for the New York and New Jersey Harbor Navigation Study
24" Long Island Extension, L.L. No. 1-9 and 3-1
Dual 24" 72nd Street Lateral, L.L. No. SEV 4-4
26" Mainline "A", L.L. No. NYC 1-1
26" Lower N.Y. Bay Extension – Mainline "C", L.L. No. NYC 1-1

Dear Ms. Gallo:

In reference to your letter postmarked April 1, 1998, please be aware that Transco has the following high-pressure natural gas steel pipelines in the New York harbor areas:

- The 24" Long Island Extension crosses the Arthur Kill as shown on NOAA chart 12333 where the channel depth is currently maintained at 35' MLLW. The 24" Long Island Extension also crosses the Narrows as shown on NOAA chart 12334.

- The dual 24" 72nd Street Lateral crosses the Hudson River as shown on NOAA chart 12341 where the channel depth is currently maintained at 30' MLLW.

- The 26" Mainline "A" crosses the Hudson River as shown on NOAA chart 12341 where the channel depth is currently maintained at 30' MLLW.

- The 26" Lower N.Y. Bay Extension – Mainline "C" crosses the Raritan Bay East Reach and the

Ambrose Channel as shown on NOAA chart 12327 where the channel depth is currently maintained at 35' MLLW and 45' MLLW respectively.

Other facilities may be involved depending upon the scope of work yet to be developed by the Corps of Engineers. Our pipelines may need to be lowered or re-laid as a result of increasing the current channel depth of various waterways. This will cause significant cost and disruption of service to our customers in New York City.

If you have any questions, please feel free to call Mr. Colin Wisser at (609) 936-2425.

Cordially yours,

Mario DiCocco
Director - Princeton Division

By: Colin S. Wisser
Colin S. Wisser
Transmission Engineer

cc: M. DiCocco
R. Hollmann

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

2 September 1999

Planning Division

Mr. John Ferguson
Regional Permit Administrator
New York State Department of Environmental Conservation
Division of Compliance Services, Region II Office
47-40 21st Street
Long Island City, NY 11101

Dear Mr. Ferguson,

The Draft Environmental Impact Statement (DEIS) for the New York & New Jersey Harbor Navigation Study is about to be completed with public and agency review scheduled for late September 1999. We are currently finalizing biological sampling in the project area to describe the affected environment and define any project-related potential impacts to resources.

As was discussed at the permitting issues meeting, coordinated by the District on November 10, 1998, with New York Department of Environmental Conservation (NYDEC), New Jersey Department of Environmental Protection (NJDEP) and New York City Department of City Planning and Office of the Mayor in attendance the District must be able to clearly define seasonal dredging restrictions on construction activities being planned for the Study. The District's coordination with all of the participating agencies at the twelve Environmental Work Group (EWG) meetings, most recently the 9 August meeting, has also served as a forum to address potential permit restrictions and their application in the proposed project. At this last EWG meeting, NYDEC indicated that the winter flounder and blue claw crab overwintering dredging restrictions would be removed in the KVK reaches. The District is currently developing a construction-sequencing schedule for the Harbor Navigation Study and the states' dredging restriction windows are a critical component of this endeavor.

Attached please find a copy of the seasonal dredging restrictions recently supplied to the District by your agency. We shall proceed with our analyses of potential impacts to the environment and develop the construction schedule using these modifications to your most recent submittals unless you inform us otherwise.

Should you have any questions regarding this request for confirmation please contact Jenine Gallo, Project Biologist, or Roselle Henn, Chief, Environmental Assessment Section at (212) 264-0912/2119. Thank you for your prompt response.

Sincerely,

for Frank Santomauro, P.E.
Chief, Planning Division

Encl.

Cf: Lawrence Baier (NJDEP)
Charles deQuillfeldt (NYSDEC)
Thomas Wakeman (PA)
Wilbur Woods (NYC WOSP)
Annette Barbaccia (NYC-Office of Mayor)

resources at risk. I have been attempting for some months now to establish a region-wide list/map of seasonal restrictions that addresses all resource agency concerns; pulling together the lists from NMFS, USF&WS, USEPA, NJDEP, NYSDOS, and DEC to create a single comprehensive list to be referenced for any project. This has proven to be more challenging than I had anticipated. The list has gotten quite long, particularly since the implementation of the Essential Fish Habitat Program at NMFS. This effort will continue, but in the meantime, below I provide a **DRAFT** outline of the DEC proposed seasonal restrictions, just to give you an idea of the type of restrictions we are considering. Our expectation is that these will be modified based on discussions among the resource agencies, including the Corps.

1) The Kills

Dredging is prohibited between March 1 and September 1 within 1000' of Isle of Meadows, Pralls Island, and Shooters Island *to protect the heron and wading bird populations*

Dredging is prohibited between March 1 and September 1 *to protect Peregrine Falcon*

Dredging is prohibited between November 15 and May 31 *for overwintering blue crab and winter flounder.*

Dredging is prohibited June 1 - September 30 *for fish spawning.*

3) Hudson North of the Battery

Dredging is prohibited November 15 - April 15 *for overwintering Striped Bass and Winter Flounder*

4) East River North of Hell Gate to Western Long Island Sound

Dredging is restricted* July 1 - September 30 - *water quality DO*
Operational

5) East River Hell Gate to Battery

Dredging is restricted* July 1 - September 30 - *water quality DO*

6) Upper Bay

Dredging is prohibited November 15 - April 15 *for overwintering Striped Bass*

7) Lower Bay
none

8) Rockaway Inlet & Sheepshead Bay

Dredging is prohibited between November 15 and May 31 *for overwintering blue crab and winter flounder.*

Dredging is restricted* between July 1 and September 30 - *water quality DO*

9) **Jamaica Bay**

Dredging is prohibited between April 1 - September 1 *to protect wading birds*

Dredging is prohibited between November 15 and May 31 *for overwintering blue crab and winter flounder.*

Dredging is prohibited June 1 - September 30 in channels only *for fish spawning*

Dredging is restricted* between July 1 and September 30 - *water quality DO*

*subject to water quality monitoring

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

2 September 1999

Planning Division

Mr. Lawrence Baier
Chief, Office of Dredging and Sediment Technology
PO Box 028, 6th Fl.
Assistant Commissioner's Suite
New Jersey Department Of Environmental Protection
Trenton, NJ 08625

Dear Mr. Baier,

The Draft Environmental Impact Statement (DEIS) for the New York & New Jersey Harbor Navigation Study is about to be completed with public and agency review scheduled for September 1999. We are currently finalizing biological sampling in the project area to describe the affected environment and define any project-related potential impacts to resources.

As was discussed at the permitting issues meeting, coordinated by the District on November 10, 1998, with New York Department of Environmental Conservation (NYDEC), New Jersey Department of Environmental Protection (NJDEP) and New York City Department of City Planning and Office of the Mayor in attendance the District must be able to clearly define seasonal dredging restrictions on construction activities being planned for the Study. The District's coordination with all of the participating agencies at the twelve Environmental Work Group (EWG) meetings, most recently the 9August meeting, has also served as a forum to address potential permit restrictions and their application in the proposed project. At this last EWG meeting, NYDEC indicated that the winter flounder and blue claw crab overwintering dredging restrictions would be removed in the KVK reaches. The District is currently developing a construction-sequencing schedule for the Harbor Navigation Study and the states' dredging restriction windows are a critical component of this endeavor.

Attached please find a copy of the seasonal dredging restrictions recently supplied to the District by your agency. We shall proceed with our analyses of potential impacts to the environment and develop the construction schedule using these modifications to your most recent submittals unless you inform us otherwise.

Should you have any questions regarding this request for confirmation please contact Jenine Gallo, Project Biologist, or Roselle Henn, Chief, Environmental Assessment Section at (212) 264-0912/2119. Thank you for your prompt response.

Sincerely,

for Frank Santomauro, P.E.
Chief, Planning Division

Encl.

Cf: John Ferguson (NYDEC)
Charles deQuillfeldt (NYSDEC)
Thomas Wakeman (PA)
Wilbur Woods (NYC WOSP)
Annette Barbaccia (NYC-Office of Mayor)

New York / New Jersey Deepening Study
Expected Permit Conditions

Mechanical Dredging Standard Conditions for Contaminated Material:

1. No barge overflow
2. Dredging to be accomplished with a closed clam shell "environmental" bucket
3. Dredge bucket lift speeds not to exceed 2 feet per second
4. Dredge to be operated so as to maximize the "bite" of the clam shell
5. Dredged material to be placed deliberately in barges to prevent accidental spillage
6. Barges or scows to be of solid hull construction or to be permanently sealed (unless open water disposal is approved)
7. No hosing or rinsing of material from the sides or gunwales of the barges
8. Decant water shall be shunted and diffusers employed to minimize resuspension of sediments
9. Dredging only on flood tide (where warranted due to contamination patterns in the effected water body)
10. Independent Corps' certified on board inspectors to ensure compliance with permit conditions
11. Silt curtains to be employed where currents generally do not exceed 1 knot
12. Dredging to be accomplished to a uniform depth so as not to create anoxic holes

Timing restrictions:

Hudson River and Upper New York Bay – winter flounder, blue crab and striped bass - no dredging between November 15 and April 15

Raritan and Sandy Hook Bays – winter flounder, blue crab and striped bass – no dredging between November 1 and May 31

Lower Newark Bay – heron rookery – no dredging between March 1 and September 1

Arthur Kill and Kill van Kull – [illegible] dependent spawning finfish – no dredging between June 1 and September 30; anadromous finfish migration – no dredging between April 1 and May 31 (if entire cross section is blocked by turbidity); winter flounder and blue crab – no dredging between January 1 and May 31; heron rookery – no dredging between March 1 and September 1

Passaic, Hackensack and Raritan Rivers – anadromous finfish spawning – no dredging between April 1 and May 31

Additional Conditions for Raritan and Sandy Hook Bay Channels:

1. Sandy Hook Channel, Raritan Bay Reach Channel and Chapel Hill Channel may require recovery of shellfish resources if present in the areas being dredged.
2. For hopper dredges – NMFS Certified Observer Protocol for sea turtles and marine mammals

** TOTAL PAGE.02 **

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

October 26, 1998

REPLY TO
ATTENTION OF
Planning Division

Mr. Vance Barr
Division of Coastal Resources and Waterfront Revitalization
New York State Department of State
Albany, NY 12231-0001

Dear Mr. Barr,

The New York and New Jersey Harbor Navigation Study, Feasibility Phase, is authorized by Section 435 of the Water Resources Development Act (WRDA) of 1996. The study area is the Port of New York and New Jersey (the Port) and includes, but is not limited to, the Ambrose and Anchorage Channels; New York and New Jersey Channels (Kill Van Kull and Arthur Kill to Gulfport); Newark Bay Channel; Bay Ridge and Red Hook Channel; Buttermilk Channel; Port Jersey Channel; Claremont Channel; and the Stapleton, Red Hook and Gravesend Anchorages. This is the first comprehensive study of the entire port complex undertaken by the New York District (District), Army Corps of Engineers.

The preparation of an Environmental Impact Statement (EIS) is about to be initiated in which comparisons of comprehensive navigation improvement plans and criteria for selecting suitable alternatives will be analyzed and presented. We are currently performing environmental surveys and conducting biological sampling in the project area to describe the affected environment and any project-related potential impacts. We expect to collect samples through September of 1999. The active participation of NYS DEC Region II staff in the Environmental Workgroup for this study has helped to define the data collection efforts underway.

At the advice of the Executive Committee for the project, we would like to precoordinate regulatory requirements between our two state partners to the fullest extent practicable. As discussed with representatives from the states at the last Environmental Work Group meeting (23 September 1998), we are scheduling a meeting with the involved state permit administrators to begin preliminary coordination for Water Quality Permit review proceedings. We would also take this opportunity to review our incorporation of the State's Coastal Zone Management Program in our study planning process for this project. We would like to schedule a meeting, at the District, between the two states (NY/NJ), the City and the District for November. Please provide dates that you are available so that we may coordinate a tentative schedule.

Should you have any questions regarding this request please contact Jenine Gallo, EIS Coordinator or Roselle Henn, Chief, Environmental Assessment Section at (212) 264-0209/2119. Thank you for your prompt response.

Sincerely,

for Frank Santomauro, P.E.
Chief, Planning Division

Cf: Charles deQuillfeldt(NYSDEC)
T.Wakeman (PA)
Lawrence Baier (NJDEP)
J.Ferguson (NYSDEC)
W. Woods (NYC)
A.Barbaccia (NYC)

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

October 26, 1998

REPLY TO
ATTENTION OF
Planning Division

Mr. Wilbur Woods
Division of Waterfront and Open Space Planning
New York City Department of City Planning
22 Reade Street
New York, NY 10278

Dear Mr.Woods,

The New York and New Jersey Harbor Navigation Study, Feasibility Phase, is authorized by Section 435 of the Water Resources Development Act (WRDA) of 1996. The study area is the Port of New York and New Jersey (the Port) and includes, but is not limited to, the Ambrose and Anchorage Channels; New York and New Jersey Channels (Kill Van Kull and Arthur Kill to Gulfport); Newark Bay Channel; Bay Ridge and Red Hook Channel; Buttermilk Channel; Port Jersey Channel; Claremont Channel; and the Stapleton, Red Hook and Gravesend Anchorages. This is the first comprehensive study of the entire port complex undertaken by the New York District (District), Army Corps of Engineers.

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At the advice of the Executive Committee for the project, we would like to precoordinate regulatory requirements between our two state partners to the fullest extent practicable. As discussed with representatives from the states at the last Environmental Work Group meeting (23 September 1998), we are scheduling a meeting with the involved state permit administrators to begin preliminary coordination for Water Quality Permit review proceedings. We would also take this opportunity to review our incorporation of the State's Coastal Zone Management Program, as well as the City's Waterfront Revitalization Program, in our study planning process for this project. We would like to schedule a meeting, at the District, between the two states (NY/NJ), the City and the District for November. Please provide dates that you are available so that we may coordinate a tentative schedule.

Should you have any questions regarding this request please contact Jenine Gallo, EIS Coordinator or Roselle Henn, Chief, Environmental Assessment Section at (212) 264-0209/2119. Thank you for your prompt response.

Sincerely,

for Frank Santomauro, P.E.
Chief, Planning Division

Cf: Charles deQuillfeldt(NYSDEC)
T.Wakeman (PA)
Lawrence Baier (NJDEP)
J.Ferguson (NYSDEC)
A.Barbaccia (NYC)
V.Barr (NYSDOS)

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

October 26, 1998

REPLY TO
ATTENTION OF
Planning Division

Mr. Lawrence Baier
Office of Dredging and Sediment technology
P.O. Box 128, 6th Fl.
Ass't. Commissioner Suite
New Jersey Department of Environmental Protection
Trenton, NJ 08625

Dear Mr.Baier,

The New York and New Jersey Harbor Navigation Study, Feasibility Phase, is authorized by Section 435 of the Water Resources Development Act (WRDA) of 1996. The study area is the Port of New York and New Jersey (the Port) and includes, but is not limited to, the Ambrose and Anchorage Channels; New York and New Jersey Channels (Kill Van Kull and Arthur Kill to Gulfport); Newark Bay Channel; Bay Ridge and Red Hook Channel; Buttermilk Channel; Port Jersey Channel; Claremont Channel; and the Stapleton, Red Hook and Gravesend Anchorages. This is the first comprehensive study of the entire port complex undertaken by the New York District (District), Army Corps of Engineers.

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Should you have any questions regarding this request please contact Jenine Gallo, EIS Coordinator or Roselle Henn, Chief, Environmental Assessment Section at (212) 264-0209/2119. Thank you for your prompt response.

Sincerely,

for Frank Santomauro, P.E.
Chief, Planning Division

Cf: Charles deQuillfeldt(NYSDEC)
T.Wakeman (PA)
W.Woods (NYC)
J.Ferguson (NYSDEC)
A.Barbaccia (NYC)
V.Barr (NYSDOS)

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

October 26, 1998

REPLY TO ATTENTION OF
Planning Division

Mr. John Ferguson
Regional Permit Administrator
New York State Department of Environmental Conservation
Division of Compliance Services, Region II Office
47-40 21st Street
Long Island City, NY 11101

Dear Mr. Ferguson,

The New York and New Jersey Harbor Navigation Study, Feasibility Phase, is authorized by Section 435 of the Water Resources Development Act (WRDA) of 1996. The study area is the Port of New York and New Jersey (the Port) and includes, but is not limited to, the Ambrose and Anchorage Channels; New York and New Jersey Channels (Kill Van Kull and Arthur Kill to Gulfport); Newark Bay Channel; Bay Ridge and Red Hook Channel; Buttermilk Channel; Port Jersey Channel; Claremont Channel; and the Stapleton, Red Hook and Gravesend Anchorages. This is the first comprehensive study of the entire port complex undertaken by the New York District (District), Army Corps of Engineers.

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Should you have any questions regarding this request please contact Jenine Gallo, EIS Coordinator or Roselle Henn, Chief, Environmental Assessment Section at (212) 264-0209/2119. Thank you for your prompt response.

Sincerely,

for Frank Santomauro, P.E.
Chief, Planning Division

Cf: Charles deQuillfeldt(NYSDEC)
T.Wakeman (PA)
Lawrence Baier (NJDEP)
V.Barr (NYDOS)
W. Woods (NYC)
A.Barbaccia (NYC)

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

June 3, 1999

Mr. Wilbur Woods
Department of City Planning
City of New York
Waterfront and Open Space Planning
22 Reade Street, Room 6W
New York, NY 10007-1216

Dear Mr. Woods:

In response to your comments (letter dated 12 May 1999) addressing the New York and New Jersey Harbor Baseline Biological Reconnaissance Survey, the New York District - US Army Corps of Engineers will identify the Arlington Marsh and "wetlands habitat" in South Brooklyn in the New York- New Jersey Harbor Navigation Study Draft Environmental Impact Statement (DEIS) as your office has suggested.

We thank you for your participation in this review process. If you have any questions, please do not hesitate to call Jenine Gallo, of my staff, at 212-264-0209.

Sincerely,

Frank Santomauro

Frank Santomauro, P.E.
Chief, Planning Division

DEPARTMENT OF CITY PLANNING
CITY OF NEW YORK

WATERFRONT AND OPEN SPACE PLANNING

Joseph B. Rose, *Director*
Department of City Planning

May 12, 1999

Ms. Jeannine Gallo
US Army Corps of Engineers
New York District
26 Federal Plaza
New York, New York 10278-0090

Dear Ms. Gallo:

As a follow-up to our meetings with the New York and New Jersey Harbor Navigation Study Team, we have reviewed the *New York and New Jersey Harbor Baseline Biological Reconnaissance Survey.* This general survey of shoreline conditions throughout the harbor should prove to be very useful in initially identifying and evaluating impacts along the waterfront.

I would like to share some preliminary comments with you and the consultants:

1. The survey does not label the Arlington Marsh area along the Kill Van Kull shore of Staten Island. This area is just north of Mariner's Marsh and it should be fully described and labeled. On the maps for Shooters Island, it is not labeled and on the Arthur Kill-Newark Bay map there is a label for the area around Port Ivory that includes a notation for Low Salt Marsh and for Bridge Creek Wetlands. The area of concern is the marsh to the east Of Port Ivory. We are concerned that it may appear less important than other wetland areas since it is not discussed.

2. The survey is also silent on the portion of the Sunset Park piers on the Brooklyn waterfront where some filling has taken place and a "wetlands habitat" has begun to develop. This area is not labeled on the map of the area and there is no mention of it in the written description.

Wilbur L. Woods, *Director*
22 Reade Street, New York, N.Y. 10007-1216 Room 6W (212) 720-3620
FAX (212) 720-3490

I hope you will find these comments helpful. If you have any questions, please give me a call.

Sincerely,

Wilbur L. Woods

WLW:mr

State of New Jersey
Department of Environmental Protection

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

February 18, 1999

Jenine Gallo
U.S. Army Corps of Engineers
CENAN-PL-EA
Room 2146
26 Federal Plaza
New York, NY 10278-0090

RE: NY-NJ Harbor Navigation Study (Environmental Work Group)
Draft Environmental Impact Statement

Dear Ms Gallo:

The Office of Program Coordination of the New Jersey Department of Environmental Protection has completed its review of the draft "New York and New Jersey Harbor Navigation Study: Table of Contents for the Draft Environmental Impact Statement" (undated) that was distributed at the January 26, 1999 meeting of the Environmental Work Group. Please note the following comments on this document.

(1) Section 2.6.2: should also include the following topics -- Acceptable/Beneficial Use Options, Dredged Material Volumes and Quality/Classification, and Maintenance Dredging requirements for the various channel deepening alternatives.

(2) Section 3.2.2: also include the Maintenance Dredging requirements for the various channel deepening alternatives.

(3) Section 3.2.4: should also include Acceptable/Beneficial Use Options.

(4) Section 4.4.1.4: should also include the areas designated by the U.S. Fish and Wildlife Service as "Significant Habitats", State and federal Threatened/Endangered Species, and Essential Fish Habitats (if designated by the time the Draft EIS is prepared).

(5) Section 4.5: each of the Landside Elements should also include evaluations of the topics discussed in Sections 4.4.1, 4.4.3, 4.4.4, and 4.4.5.

(6) A "Future Condition With Project" section should be included between Sections 5 and 6.

(7) Section 6 should evaluate the potential effects of all the alternatives.

(8) Section 6.4: should also include a discussion of potential impacts to structures/cultural resources due to blasting operations.

(9) Section 6.6.2: add a section on Cultural Resources.

(10)Section 9: should include sections on Coastal Zone Management consistency.

Thank you for providing the Department the opportunity to review this draft document. If you have any questions, I may be contacted at (609) 292-2662.

Sincerely,

Lawrence Schmidt
Director
Office of Program Coordination

c. Lawrence Baier, Office of Dredging

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

November 3, 1998

REPLY TO
ATTENTION OF

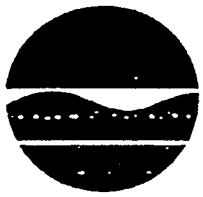
Dear EWG Member,

The primary objective of the EWG meeting, September 23, 1998, was to obtain concurrency on the proposed biological sampling program as described in the attached MFR. Comments received at the meeting have been addressed. Sampling permits from both states have been received and the Harbor sampling program described in the MFR is currently being conducted.

Sincerely,

Jenine Gallo
EIS Coordinator
USACE-NYD

New York State Department of Environmental Conservation
Division of Environmental Permits, Region 2
47-40 21st Street Long Island City, NY 11101
Tel: (718) 482-4997 Fax: (718) 482-4975



John P. Cahill
Commissioner

April 8, 1999

Frank Santomauro, P.E.
Chief, Planning Division
New York District, Corps of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0090

Dear Mr. Santomauro:

The New York State Department of Environmental Conservation expects to continue to work closely with the Army Corps in the development of the EIS for the Harbor Navigation Study. Most recently, we have provided comments on the Species Report, Water Quality Modeling, Preliminary Scoping Document and the Without Project Conditions Report in addition to our participation in the discussions at the Environmental Work Group.

The Harborwide and Site-Specific Biological Sampling Program is currently ongoing and has been revised based on presentations and discussions at the EWG. DEC has no additional comments at this time. We look forward to updates on the progress of the study in future meetings.

DEC has reviewed the proposed Table of Contents for the Harbor Navigation Study Draft EIS. We believe that it provides a reasonable framework for the assessment of issues and impacts related to the Navigation Study. We expect from our review of our EWG files that our comments at the meetings and on previous documents will be addressed. Of course, we will provide additional comments as needed and requested during the preparation of the EIS.

There remain outstanding issues regarding the development assumptions in the Without Project Conditions Report. Although it is clear that Port expansion will occur in the absence of channel deepening, it is not apparent to us that each specific project will move forward as projected. We hope that a requested joint meeting with the Infrastructure Work Group will be scheduled to address this.

If you have any questions, please contact me at the above address or telephone me at (718) 482-4077.

Sincerely,

Charles de Quillfeldt
Environmental Analyst 2

cc: J. Ferguson
P. Gallay
K. Corbett, NY ESD
S. Zahn
R. Henn, USACE
J. Gallo, USACE

FEIS APPENDIX A-1.3b

ESSENTIAL FISH HABITAT (EFH)

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO ATTENTION OF

August 24, 1999

Planning Division

Mr. Stanley Gorski
National Marine Fisheries Service
Habitat & Protected Resources Division
Sandy Hook Biological Laboratory
Highlands, NJ. 07732

Dear Mr. Gorski,

The New York - New Jersey Harbor Navigation Study has entered into the preliminary phase of the Draft Environmental Impact Statement (DEIS) being prepared by the New York District (District), US Army Corps of Engineers. Due to active participation in the Study's environmental workgroup and as a cooperating agency for the Study the National Marine Fisheries Service (NMFS) is aware of the District's goal of compliance with the Essential Fish Habitat (EFH) under the Magnuson-Stevens Fisheries Management and Conservation Act. To date, we have incorporated information received from NMFS regarding pending EFH for the entire study area and the habitat designations that have been provided by your agency, thus far, will be fully evaluated in the DEIS.

As a result of conversations with NMFS staff, we understand that, under the EFH policy guidelines titled "NEPA- The EIS Process" subheading "Notification", formal notification of EFH compliance occurs upon your agency's receipt of the DEIS. The DEIS is scheduled for distribution for late September 1999 and will address the evaluations required per EFH policy guidelines.

Meanwhile, the District will be forwarding sections of the Preliminary DEIS, as they become available, for your agency's review. If you have any questions or concerns regarding the EFH assessment please do not hesitate to contact Jenine Gallo, Project Biologist or Roselle Henn, Chief, Environmental Assessment Section, at 212-264-0912/2119. Thank you.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

Cf: Karen Greene , NMFS
Michael Ludwig, NMFS

FILE No.123 08/27 '99 11:54 ID:Planning Division FAX:12122646040 PAGE 2

FEIS APPENDIX A-1.3c

CULTURAL RESOURCES CORRESPONDENCE

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE
Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189 518-237-8643

November 2, 1999

Frank Santomauro, P.E.
Chief, Planning Division
U.S. Army Corps of Engineers
New York District
405 General Lee Avenue
Brooklyn, New York 12209-8400

Dear Mr. Santomauro:

Re: CORPS
NY & NJ Harbor Navigation Study
Manhattan, New York County
99PR3466

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have reviewed the Geomorphological and Archeological Study in accordance with Section 106 of the National Historic Preservation Act of 1966 and the relevant implementing regulations.

Based upon this review, the SHPO accepts and approves the report and concurs with the recommendations of the report. We look forward to reviewing the additional studies and the draft Memorandum of Agreement for this project when they are completed.

When responding please be sure to refer to the SHPO project review (PR) number noted above. If you have any questions, please feel free to call me at (518) 237-8643 ext. 3255.

Sincerely,

Robert D. Kuhn
Assistant Director

RDK:bsd

An Equal Opportunity/Affirmative Action Agency
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ENVIRONMENTAL REVIEW

USACE/106-Y — PROJECT NUMBER

11/24/99 — DATE RECEIVED

PROJECT HARBOR NAVIGATION STUDY

[ ] No architectural significance

[ ] No archaeological significance

[X] Designated New York City Landmark or Within Designated Historic District

[X] Listed on National Register of Historic Places

[X] Appears to be eligible for National Register Listing and/or New York City Landmark Designation

[X] May be archaeologically significant; requesting additional materials

COMMENTS

The text of the Programmatic Agreement needs a Blast Plan addressing effects to architectural properties identified under the Agreement. The Blast Plan should be added to the list of Standard Mitigation Agreements (Section E). The text of the Programmatic Agreement appears to adequately address archaeological properties. Please notify the Commission of future work under this Agreement.

cc: SHPO

SIGNATURE

12/01/99 — DATE

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE
Bernadette Castro
Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, PO Box 189, Waterford, New York 12188-0189
518-237-8643

November 23, 1999

Frank Santomauro, P.E.
Chief, Planning Division
U.S Army Corps of Engineers
New York District
405 General Lee Avenue
Brooklyn, New York 12209-8400

RE: NY & NJ Harbor Navigation Study
Kings, Queens, and Richmond Counties, New York
99PR3466

Dear Mr. Santomauro:

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have reviewed the "Cultural Resource Summary and Preliminary Case Report. New York and New Jersey Harbor Navigation Study" and the Draft Programmatic Agreement.

Based upon this review, the SHPO concurs with the recommendations of the report and approves the wording of the draft PA.

If you have any questions, please feel free to call me at (518) 237-8643, ext. 3266. When responding please be sure to refer to the SHPO project review (PR) number noted above.

Sincerely,

Kathleen A Howe

Kathleen A. Howe
Historic Preservation Specialist

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printed on recycled paper

State of New Jersey
Department of Environmental Protection
Division of Parks & Forestry
Historic Preservation Office
PO Box 404
Trenton, NJ 08625-0404
TEL: (609)292-2023
FAX: (609)984-0578

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

HPO-K98-100
106/00-85
November 17, 1999

Frank Santomauro, P.E.
Chief, Planning Division
Department of the Army
New York District, Corps of Engineers
Jacob K. Javits Federal Building
New York, N.Y. 10278-0090

ATTN: Lynn Rakos, Project Archaeologist

Re: New York and New Jersey Harbor Navigation Study
Geomorphological and Archaeological Study of the
New York and New Jersey Harbor Navigation Channels

Dear Mr. Santomauro:

Thank you for having provided the opportunity to review the September 1999 draft Geomorphological and Archaeological Study of the New York and New Jersey Harbor Navigation Channels prepared by Geoarchaeological Research Associates (GRA). The Office has no specific comments on the study other than that the final should incorporate USGS mapped locations for all study loci in the report (i.e. Figures 11, 12 and 13). This report has facilitated identifying areas with a likelihood of possessing early land surfaces which may contain prehistoric sites. I concur with the results of the GRA study and your assessments, as stated in your October 18, 1999 letter regarding areas where respectively the ACOE proposes to conduct further work or no further studies for prehistoric resources and early land surfaces. The Office has received the preliminary case report and draft Programmatic Agreement for the Harbor Navigation Study, and will be responding in the next couple of weeks.

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Thank you again for the providing this opportunity for review and Consultation, and for your continuing stewardship of New Jersey's historic and prehistoric resources. If you have any questions, please do not hesitate to contact Deborah Fimbel, staff reviewer for this project, at 609-984-6019.

Sincerely,

Dorothy P. Guzzo
Deputy State Historic
Preservation Officer

DPG:DRF

State of New Jersey
Department of Environmental Protection
Division of Parks & Forestry
Historic Preservation Office
PO Box 404
Trenton, NJ 08625-0404
TEL: (609)292-2023
FAX: (609)984-0578

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

HPO-J99-121
106/00-0004 + 00-153
October 29, 1999

Mr. Frank Santomauro, P.E.
Chief, Planning Division
Department of the Army
New York District, Corps of Engineers
Jacob K. Javits Federal Building
New York, N.Y. 10278-0090

ATTN: Lynn Rakos

Dear Mr. Santomauro:

Thank you for having provided the opportunity to review the September 1999 draft *Feasibility Report for New York and New Jersey Harbor Navigation Study Volume I Main Report, Draft Environmental Impact Statement (DEIS) and Appendix A Pertinent Correspondence & Public Involvement.* On the basis of the draft project document and previous coordination with the Planning Division, it appears that cultural resource concerns are being taken into account. In our June 26, 1997 letter we discussed the potential need to undertake architectural survey to comprehensively identify properties in areas where blasting is proposed, if it is possible that there would be impacts to buildings and structures. The current draft project document discusses this potential contingency should it ultimately be necessary. However, as stated in the draft Feasibility Report, damaging blast vibrations are not anticipated at this time.

Thank you again for providing this opportunity for review and consultation. If you have any questions, please do not hesitate to contact Deborah Fimbel of my staff.

Sincerely,

Dorothy P. Guzzo
Deputy State Historic
Preservation Officer

DPG:DRF
c. Larry Schmidt, Office of Program Coordination

New Jersey is an Equal Opportunity Employer
Recycled Paper

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

October 28, 1999

Environmental Assessment Section
Environmental Analysis Branch

Ms. Dorothy P. Guzzo
Deputy Chief Historic Preservation Officer
Historic Preservation Office
New Jersey Department of Environmental Protection
CN 404
Trenton, New Jersey 08625

Dear Ms. Guzzo:

The U.S. Army Corps of Engineers, New York District (Corps), recently conducted a feasibility study to evaluate the need for federal participation in navigation improvements for the New York and New Jersey Harbor (Harbor). The Harbor Navigation Study examined a number of options to provide economically efficient and environmentally sound navigation to meet current and future needs. The National Economic Development Plan resulting from the feasibility study provides for navigation improvements to nine channels in the Harbor, which will permit access by larger, deeper-draft vessels to four main container terminals. Navigation improvements consist of channel deepening, widening and realignment. Selected for improvement are the Ambrose, Anchorage, Port Jersey, Kill Van Kull, Arthur Kill (to Howland Hook), Newark Bay, Elizabeth, South Elizabeth, and Bay Ridge Navigation Channels (Enclosure 1). The Area of Potential Effect (APE) for this project has been defined as the locations within and adjacent to the above listed channels. In light of the fact that much of the area under consideration has been addressed previously through earlier Corps projects a document has been prepared summarizing the previous studies and Section 106 coordination. This document, "Cultural Resource Summary and Preliminary Case Report, New York and New Jersey Harbor Navigation Study", is submitted for your review and comment (Enclosure 2) together with a Draft Programmatic Agreement (Enclosure 3). The submitted document includes copies of all relevant correspondence for each channel.

Geoarchaeology Research Associates (GRA) conducted a geomorphological study, specifically for the Harbor Navigation Study, to assess the potential for prehistoric resources within APE. This report was recently submitted for your review. Pending SHPO(s) concurrence with the results and recommendations of the GRA study we would like to undertake further geomorphological studies as outlined in the Preliminary Case Report and in the draft Programmatic Agreement.

Previous studies connected with the Corps Collection and Removal of Drift Program have identified resources along the Harbor's shorelines that are eligible for the National Register of Historic Places (NRHP). A number of Memorandums of Agreement (MOA) have been signed or have been drafted in coordination the appropriate SHPO(s) to address adverse effects. Preliminary designs for the Harbor navigation study indicate that dredging associated with the Harbor Navigation Study will impact no NRHP eligible resources along the shorelines. Should alignments shift towards the shorelines and resources are effected, the stipulations agreed to in existing MOAs will be implemented.

It may be necessary to blast in certain locations to dislodge hard materials. Architectural surveys will be undertaken along the shorelines of the Kill Van Kull, Arthur Kill, Newark Bay and Bay Ridge in areas where the force of the blast is anticipated to experience a force of 0.5 peak particle velocity or greater. A survey is not required along the other channels under study due to the distance of the channel to a shoreline or in areas that lack sensitivity for standing historic structures such as Port Elizabeth. A monitoring plan will then be developed and coordinated with the appropriate SHPO(s). This type of work has been coordinated successfully in the past.

Remote sensing surveys will be undertaken adjacent to navigation channels where channel widening may impact undisturbed areas to determine if any shipwrecks are present. The need for, and nature of, further work will be coordinated with the appropriate SHPO(s).

Please review the enclosed documents and provide Section 106 comments, pursuant to 36 CFR 800.5. A 30-day response time would be appreciated in order to ensure the project schedule is maintained. If you or your staff require additional information or have any questions, please contact Lynn Rakos, Project Archaeologist, at (212) 264-0229

Sincerely,

Enclosures

Frank Santomauro, P.E.
Chief, Planning Division

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

October 28, 1999

Environmental Assessment Section
Environmental Analysis Branch

Ms. Ruth L. Pierpont
New York State Office of Parks,
Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, P.O. Box 189
Waterford, NY 12188-0189

Dear Ms. Pierpont:

The U.S. Army Corps of Engineers, New York District (Corps), recently conducted a feasibility study to evaluate the need for federal participation in navigation improvements for the New York and New Jersey Harbor (Harbor). The Harbor Navigation Study examined a number of options to provide economically efficient and environmentally sound navigation to meet current and future needs. The National Economic Development Plan resulting from the feasibility study provides for navigation improvements to nine channels in the Harbor, which will permit access by larger, deeper-draft vessels to four main container terminals. Navigation improvements consist of channel deepening, widening and realignment. Selected for improvement are the Ambrose, Anchorage, Port Jersey, Kill Van Kull, Arthur Kill (to Howland Hook), Newark Bay, Elizabeth, South Elizabeth, and Bay Ridge Navigation Channels (Enclosure 1). The Area of Potential Effect (APE) for this project has been defined as the locations within and adjacent to the above listed channels. In light of the fact that much of the area under consideration has been addressed previously through earlier Corps projects a document has been prepared summarizing the previous studies and Section 106 coordination. This document, "Cultural Resource Summary and Preliminary Case Report, New York and New Jersey Harbor Navigation Study", is submitted for your review and comment (Enclosure 2) together with a Draft Programmatic Agreement (Enclosure 3). The submitted document includes copies of all relevant correspondence for each channel.

Geoarchaeology Research Associates (GRA) conducted a geomorphological study, specifically for the Harbor Navigation Study, to assess the potential for prehistoric resources within APE. This report was recently submitted for your review. Pending SHPO(s) concurrence with the results and recommendations of the GRA study we would like undertake further geomorphological studies as outlined in the Preliminary Case Report and in the draft Programmatic Agreement.

Previous studies connected with the Corps Collection and Removal of Drift Program have identified resources along the Harbor's shorelines that are eligible for the National Register of Historic Places (NRHP). A number of Memorandums of Agreement (MOA) have been signed or have been drafted in coordination the appropriate SHPO(s) to address adverse effects. Preliminary designs for the Harbor navigation study indicate that dredging associated with the Harbor Navigation Study will impact no NRHP eligible resources along the shorelines. Should alignments shift towards the shorelines and resources are effected, the stipulations agreed to in existing MOAs will be implemented.

It may be necessary to blast in certain locations to dislodge hard materials. Architectural surveys will be undertaken along the shorelines of the Kill Van Kull, Arthur Kill, Newark Bay and Bay Ridge in areas where the force of the blast is anticipated to experience a force of 0.5 peak particle velocity or greater. A survey is not required along the other channels under study due to the distance of the channel to a shoreline or in areas that lack sensitivity for standing historic structures such as Port Elizabeth. A monitoring plan will then be developed and coordinated with the appropriate SHPO(s). This type of work has been coordinated successfully in the past.

Remote sensing surveys will be undertaken adjacent to navigation channels where channel widening may impact undisturbed areas to determine if any shipwrecks are present. The need for, and nature of, further work will be coordinated with the appropriate SHPO(s).

Please review the enclosed documents and provide Section 106 comments, pursuant to 36 CFR 800.5. A 30-day response time would be appreciated in order to ensure the project schedule is maintained. If you or your staff require additional information or have any questions, please contact Lynn Rakos, Project Archaeologist, at (212) 264-0229

Sincerely,

Enclosures

Frank Santomauro, P.E.
Chief, Planning Division

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

October 28, 1999

Environmental Assessment Section
Environmental Analysis Branch

Dr. Arthur Bankoff
New York City Landmarks Preservation Commission
100 Old Slip
New York, New York 10005

Dear Dr. Bankoff:

The U.S. Army Corps of Engineers, New York District (Corps), recently conducted a feasibility study to evaluate the need for federal participation in navigation improvements for the New York and New Jersey Harbor (Harbor). The Harbor Navigation Study examined a number of options to provide economically efficient and environmentally sound navigation to meet current and future needs. The National Economic Development Plan resulting from the feasibility study provides for navigation improvements to nine channels in the Harbor, which will permit access by larger, deeper-draft vessels to four main container terminals. Navigation improvements consist of channel deepening, widening and realignment. Selected for improvement are the Ambrose, Anchorage, Port Jersey, Kill Van Kull, Arthur Kill (to Howland Hook), Newark Bay, Elizabeth, South Elizabeth, and Bay Ridge Navigation Channels (Enclosure 1). The Area of Potential Effect (APE) for this project has been defined as the locations within and adjacent to the above listed channels. In light of the fact that much of the area under consideration has been addressed previously through earlier Corps projects a document has been prepared summarizing the previous studies and Section 106 coordination. This document, "Cultural Resource Summary and Preliminary Case Report, New York and New Jersey Harbor Navigation Study", is submitted for your review and comment (Enclosure 2) together with a Draft Programmatic Agreement (Enclosure 3). The submitted document includes copies of all relevant correspondence for each channel.

Geoarchaeology Research Associates (GRA) conducted a geomorphological study, specifically for the Harbor Navigation Study, to assess the potential for prehistoric resources within APE. This report was recently submitted for your review. Pending SHPO(s) concurrence with the results and recommendations of the GRA study we would like undertake further geomorphological studies as outlined in the Preliminary Case Report and in the draft Programmatic Agreement.

Previous studies connected with the Corps Collection and Removal of Drift Program have identified resources along the Harbor's shorelines that are eligible for the National Register of Historic Places (NRHP). A number of Memorandums of Agreement

(MOA) have been signed or have been drafted in coordination the appropriate SHPO(s) to address adverse effects. Preliminary designs for the Harbor navigation study indicate that dredging associated with the Harbor Navigation Study will impact no NRHP eligible resources along the shorelines. Should alignments shift towards the shorelines and resources are effected, the stipulations agreed to in existing MOAs will be implemented.

It may be necessary to blast in certain locations to dislodge hard materials. Architectural surveys will be undertaken along the shorelines of the Kill Van Kull, Arthur Kill, Newark Bay and Bay Ridge in areas where the force of the blast is anticipated to experience a force of 0.5 peak particle velocity or greater. A survey is not required along the other channels under study due to the distance of the channel to a shoreline or in areas that lack sensitivity for standing historic structures such as Port Elizabeth. A monitoring plan will then be developed and coordinated with the appropriate SHPO(s). This type of work has been coordinated successfully in the past.

Remote sensing surveys will be undertaken adjacent to navigation channels where channel widening may impact undisturbed areas to determine if any shipwrecks are present. The need for, and nature of, further work will be coordinated with the appropriate SHPO(s).

Please review the enclosed documents and provide any comments you may have. A 30-day response time would be appreciated in order to ensure the project schedule is maintained. If you or your staff require additional information or have any questions, please contact Lynn Rakos, Project Archaeologist, at (212) 264-0229

Sincerely,

Enclosures

Frank Santomauro, P.E.
Chief, Planning Division

THE CITY OF NEW YORK LANDMARKS PRESERVATION COMMISSION
100 Old Slip, New York, NY 10005 (212) 487-6800

ENVIRONMENTAL REVIEW

USACE/106-Y
PROJECT NUMBER

10/20/99
DATE RECEIVED

PROJECT HARBOR NAVIGATION STUDY

[ ] No architectural significance

[ ] No archaeological significance

[ ] Designated New York City Landmark or Within Designated Historic District

[ ] Listed on National Register of Historic Places

[ ] Appears to be eligible for National Register Listing and/or New York City Landmark Designation

[X] May be archaeologically significant; requesting additional materials

COMMENTS The Geomorphological and Archaeological Study of New York and New Jersey Harbors is Acceptable. Notify the Commission of the results of further investigations when they are completed.

SIGNATURE

10/21/99
DATE

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

October 26, 1999

Environmental Assessment Section
Environmental Analysis Branch

Don L. Klima, Director
Eastern Office of Review
The Advisory Council on Historic Preservation
The Old Post Office Building
1100 Pennsylvania Avenue, NW, #809
Washington, DC 20004

Dear Mr. Klima:

The U.S. Army Corps of Engineers, New York District (Corps), recently conducted a feasibility study to evaluate the need for federal participation in navigation improvements for the New York and New Jersey Harbor (Harbor). The Harbor Navigation Study examined a number of options to provide economically efficient and environmentally sound navigation to meet current and future needs. The National Economic Development Plan resulting from the feasibility study provides for navigation improvements to nine channels in the Harbor, which will permit access by larger, deeper-draft vessels to four main container terminals. Navigation improvements consist of channel deepening, widening and realignment. Selected for improvement are the Ambrose, Anchorage, Port Jersey, Kill Van Kull, Arthur Kill (to Howland Hook), Newark Bay, Elizabeth, South Elizabeth, and Bay Ridge Navigation Channels (Enclosure 1). The Area of Potential Effect (APE) for this project has been defined as the locations within and adjacent to the above listed channels. In light of the fact that much of the area under consideration has been addressed previously through earlier Corps projects a document has been prepared summarizing the previous studies and Section 106 coordination. This document was submitted to the New York and New Jersey State Historic Preservation Offices for review and comment together with a Draft Programmatic Agreement (PA). The Harbor Navigation Study Draft PA is enclosed for your review (Enclosure 2).

The Harbor Navigation Study Draft PA was based on the Green Brook Flood Control Project PA. The Corps developed the earlier PA in close consultation with Charlene Dwin-Vaughn of your staff. Changes in the current PA reflect the nature of this project. As work associated with the Harbor Navigation Study will be undertaken off shore certain stipulations concerning standing historic structures have been removed since they do not apply.

A geomorphological study was conducted specifically for the Harbor Navigation Study, to assess the potential for prehistoric resources within APE. A number of sensitive areas were identified. Pending SHPO(s) concurrence with the results and recommendations of the GRA study the Corps will undertake further geomorphological studies as outlined in the draft PA.

Previous studies connected with the Corps Collection and Removal of Drift Program have identified resources along the Harbor's shorelines that are eligible for the National Register of Historic Places (NRHP). A number of Memorandums of Agreement have been signed or have been drafted in coordination the appropriate SHPO(s) to address adverse effects. Preliminary designs for the Harbor navigation study indicate that dredging associated with the Harbor Navigation Study will impact no NRHP eligible resources along the shorelines. Should alignments shift towards the shorelines and resources are effected, the stipulations agreed to in existing MOAs will be implemented.

It may be necessary to blast in certain locations to dislodge hard materials. Architectural surveys will be undertaken along the shorelines of the Kill Van Kull, Arthur Kill, Newark Bay and Bay Ridge in areas where the force of the blast is anticipated to experience a force of 0.5 peak particle velocity or greater. A survey is not required along the other channels under study due to the distance of the channel to a shoreline or in areas that lack sensitivity for standing historic structures such as Port Elizabeth. A monitoring plan will then be developed and coordinated with the appropriate SHPO(s). This type of work has been coordinated successfully in the past.

Remote sensing surveys will be undertaken adjacent to navigation channels where channel widening may impact undisturbed areas to determine if any shipwrecks are present. The need for, and nature of, further work will be coordinated with the appropriate SHPO(s).

In light of the new regulations, please review the enclosed draft PA and indicate whether you would like to be a signatory to the agreement. A 30-day response time would be appreciated in order to ensure the project schedule is maintained. If you or your staff require additional information or have any questions, please contact Lynn Rakos, Project Archaeologist, at (212) 264-0229.

Sincerely,

Frank Santomauro

Frank Santomauro, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

October 14, 1999

Environmental Assessment Section
Environmental Analysis Branch

Ms. Ruth L. Pierpont
New York State Office of Parks,
Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, P.O. Box 189
Waterford, NY 12188-0189

Dear Ms. Pierpont:

The U.S. Army Corps of Engineers, New York District (Corps), recently conducted a feasibility study to evaluate the need for federal participation in navigation improvements for the New York and New Jersey Harbor (Harbor). The Harbor Navigation Study examined a number of options to provide economically efficient and environmentally sound navigation to meet current and future needs. The National Economic Development Plan resulting from the feasibility study provides for navigation improvements to nine channels in the Harbor, which will permit access by larger, deeper-draft vessels to four main container terminals. Navigation improvements consist of channel deepening, widening and realignment. Selected for improvement are the Ambrose, Anchorage, Port Jersey, Kill Van Kull, Arthur Kill (to Howland Hook), Newark Bay, Elizabeth, South Elizabeth, and Bay Ridge Navigation Channels (Figure 1). The Area of Potential Effect (APE) for this project has been defined as the locations within and adjacent to the above listed channels. A geomorphological study was conducted to assess the potential for prehistoric resources within APE, which at the time the study was conducted included several locations no longer under consideration, including Port Newark (and Port Newark Point), Claremont, Buttermilk, and Stapleton Channels. The report, by Geoarchaeology Research Associates entitled "Geomorphological and Archaeological Study of New York and New Jersey Harbor Navigation Channels" is enclosed for your review.

During the late Pleistocene and Holocene periods, much of the Harbor was on a relatively dry coastal plain that may have been inhabited by Native American populations. The geomorphological study concentrated on the analysis of pollen, foraminifera, and grain size coupled with limited radiocarbon dating of sediments obtained from vibracores and borings. These data were used to reconstruct the paleoenvironment and ascertain areas that may have been favorable for site locations and that are more likely to be preserved, having withstood geological and human scouring processes.

The analysis suggests that several areas examined have some potential to preserve

prehistoric sites although some are more sensitive than others. The areas rated to have a high-moderate potential are Anchorage, Claremont and Port Jersey. The Newark Bay area was designated as having a moderate potential. Stapleton Channel and the Ambrose Channel have been tentatively assessed as moderate but more borings will be required. Port Newark, Port Newark Point and the Elizabeth Channel were classified as low. The Kill Van Kull, which has been dredged to bedrock, was evaluated as a low potential within channel however the side slopes have been determined sensitive. The Bay Ridge Channel was studied in connection with the Corps' Dredged Material Management. The New York SHPO concurred with the Corps' opinion that several additional borings will be excavated from this channel. South Elizabeth Channel was not assessed but an evaluation of resources will be undertaken. Cultural resource tasks on the Arthur Kill have been previously coordinated with your office in connection with deepening the channel to 40 feet. Additional borings will be excavated in the autumn of 1999 and the resulting report will be submitted for your review.

It is the Corps opinion that no further studies for prehistoric resources will be required in those areas designated as having a low potential. Those areas are Port Newark, Port Newark Point, and the Elizabeth Channel. Additional studies to evaluate and delimit the potential archeologically sensitive areas will be undertaken for locations designated as moderate or high-moderate and include Newark Bay, Anchorage, Claremont, Port Jersey Stapelton and Ambrose Channels. As noted above several locations evaluated for prehistoric resources are no longer under consideration for the Harbor Navigation Study but have been included within this correspondence as the cultural resource evaluation was already undertaken. To reiterate, Port Newark, Port Newark Point, Claremont and Stapleton are no longer included in the Harbor Navigation Study and no further work will be undertaken in these channels at this time.

Cultural resource investigations have been conducted and coordinated with your office for historic period resources along most of the channels under consideration. A summary of this previous work and Section 106 coordination is being prepared and will be submitted to your office together with a Draft Memorandum of Agreement for the overall Harbor Navigation Study.

Please review the enclosed document and provide Section 106 comments, pursuant to 36 CFR 800.5. A 30-day response time would be appreciated in order to ensure the project schedule is maintained. If you or your staff require additional information or have any questions, please contact Lynn Rakos, Project Archaeologist, at (212) 264-0229

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

Enclosure

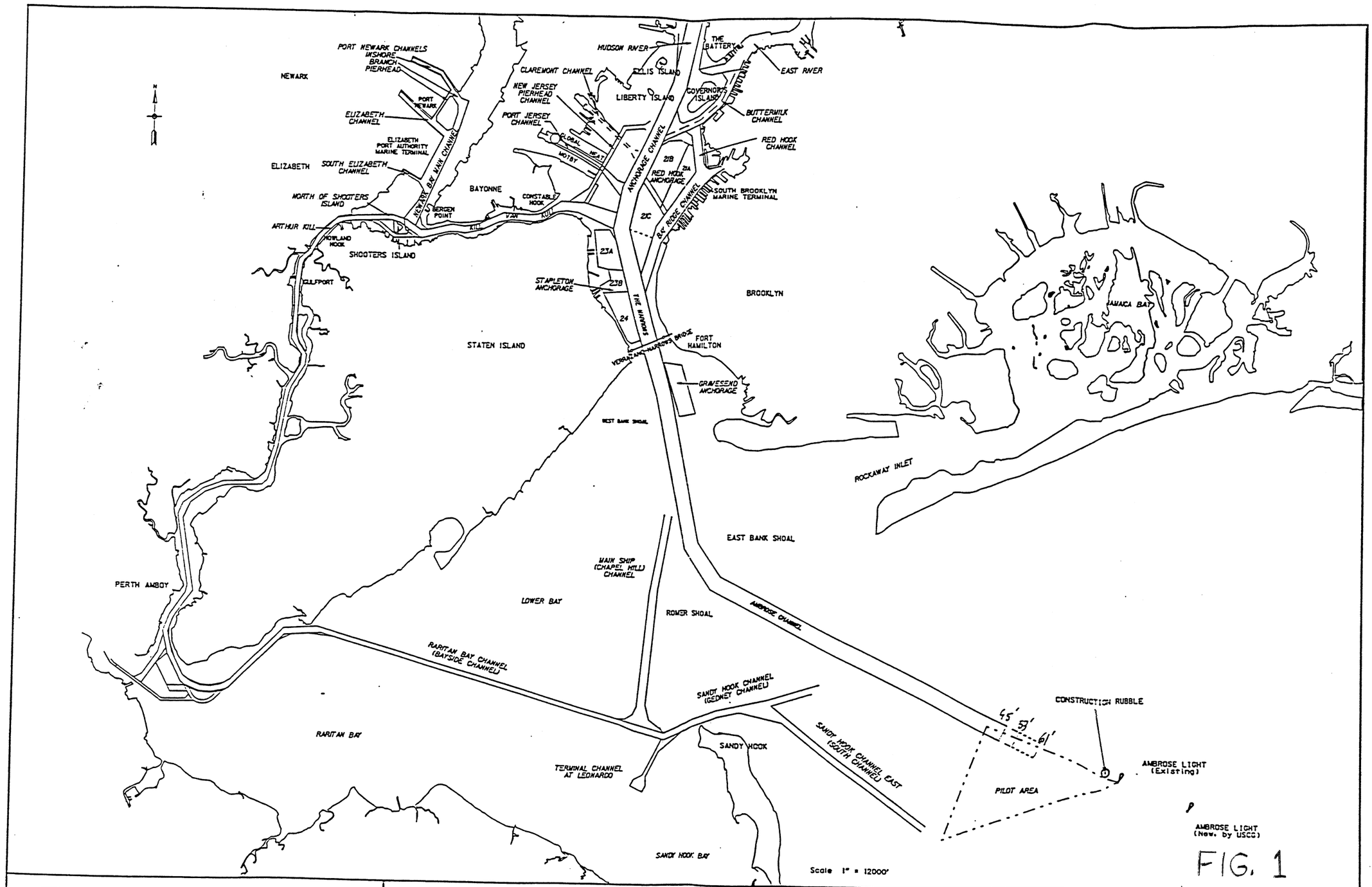

FIG. 1

U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
NEW YORK, NEW YORK

NEW YORK AND NEW JERSEY HARBOR
NAVIGATION STUDY
CHANNEL DESIGN APPENDIX

FIGURE 1
EXISTING NAVIGATION CHANNELS
NEW YORK HARBOR

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

October 14, 1999

Environmental Assessment Section
Environmental Analysis Branch

Ms. Dorothy P. Guzzo
Deputy Chief Historic Preservation Officer
Historic Preservation Office
New Jersey Department of Environmental Protection
CN 404
Trenton, New Jersey 08625

Dear Ms. Guzzo,

The U.S. Army Corps of Engineers, New York District (Corps), recently conducted a feasibility study to evaluate the need for federal participation in navigation improvements for the New York and New Jersey Harbor (Harbor). The Harbor Navigation Study examined a number of options to provide economically efficient and environmentally sound navigation to meet current and future needs. The National Economic Development Plan resulting from the feasibility study provides for navigation improvements to nine channels in the Harbor, which will permit access by larger, deeper-draft vessels to four main container terminals. Navigation improvements consist of channel deepening, widening and realignment. Selected for improvement are the Ambrose, Anchorage, Port Jersey, Kill Van Kull, Arthur Kill (to Howland Hook), Newark Bay, Elizabeth, South Elizabeth, and Bay Ridge Navigation Channels (Figure 1). The Area of Potential Effect (APE) for this project has been defined as the locations within and adjacent to the above listed channels. A geomorphological study was conducted to assess the potential for prehistoric resources within APE, which at the time the study was conducted included several locations no longer under consideration, including Port Newark (and Port Newark Point), Claremont, Buttermilk, and Stapleton Channels. The report, by Geoarchaeology Research Associates entitled "Geomorphological and Archaeological Study of New York and New Jersey Harbor Navigation Channels" is enclosed for your review.

During the late Pleistocene and Holocene periods, much of the Harbor was on a relatively dry coastal plain that may have been inhabited by Native American populations. The geomorphological study concentrated on the analysis of pollen, foraminifera, and grain size coupled with limited radiocarbon dating of sediments obtained from vibracores and borings. These data were used to reconstruct the paleoenvironment and ascertain areas that may have been favorable for site locations and that are more likely to be preserved, having withstood geological and human scouring processes.

The analysis suggests that several areas examined have some potential to preserve

prehistoric sites although some are more sensitive than others. The areas rated to have a high-moderate potential are Anchorage, Claremont and Port Jersey. The Newark Bay area was designated as having a moderate potential. Stapleton Channel and the Ambrose Channel have been tentatively assessed as moderate but more borings will be required. Port Newark, Port Newark Point and the Elizabeth Channel were classified as low. The Kill Van Kull, which has been dredged to bedrock, was evaluated as a low potential within channel however the side slopes have been determined sensitive. The Bay Ridge Channel was studied in connection with the Corps' Dredged Material Management. The New York SHPO concurred with the Corps' opinion that several additional borings will be excavated from this channel. South Elizabeth Channel was not assessed but an evaluation of resources will be undertaken. Cultural resource tasks on the Arthur Kill have been previously coordinated with your office in connection with deepening the channel to 40 feet. Additional borings will be excavated in the autumn of 1999 and the resulting report will be submitted for your review.

It is the Corps opinion that no further studies for prehistoric resources will be required in those areas designated as having a low potential. Those areas are Port Newark, Port Newark Point, and the Elizabeth Channel. Additional studies to evaluate and delimit the potential archeologically sensitive areas will be undertaken for locations designated as moderate or high-moderate and include Newark Bay, Anchorage, Claremont, Port Jersey Stapelton and Ambrose Channels. As noted above several locations evaluated for prehistoric resources are no longer under consideration for the Harbor Navigation Study but have been included within this correspondence as the cultural resource evaluation was already undertaken. To reiterate, Port Newark, Port Newark Point, Claremont and Stapleton are no longer included in the Harbor Navigation Study and no further work will be undertaken in these channels at this time.

Cultural resource investigations have been conducted and coordinated with your office for historic period resources along most of the channels under consideration. A summary of this previous work and Section 106 coordination is being prepared and will be submitted to your office together with a Draft Memorandum of Agreement for the overall Harbor Navigation Study.

Please review the enclosed document and provide Section 106 comments, pursuant to 36 CFR 800.5. A 30-day response time would be appreciated in order to ensure the project schedule is maintained. If you or your staff require additional information or have any questions, please contact Lynn Rakos, Project Archaeologist, at (212) 264-0229

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

October 14, 1999

Environmental Assessment Section
Environmental Analysis Branch

Dr. Arthur Bankoff
New York City Landmarks Preservation Commission
100 Old Slip
New York, New York 10005

Dear Dr. Bankoff:

The U.S. Army Corps of Engineers, New York District (Corps), recently conducted a feasibility study to evaluate the need for federal participation in navigation improvements for the New York and New Jersey Harbor (Harbor). The Harbor Navigation Study examined a number of options to provide economically efficient and environmentally sound navigation to meet current and future needs. The National Economic Development Plan resulting from the feasibility study provides for navigation improvements to nine channels in the Harbor, which will permit access by larger, deeper-draft vessels to four main container terminals. Navigation improvements consist of channel deepening, widening and realignment. Selected for improvement are the Ambrose, Anchorage, Port Jersey, Kill Van Kull, Arthur Kill (to Howland Hook), Newark Bay, Elizabeth, South Elizabeth, and Bay Ridge Navigation Channels (Figure 1). The Area of Potential Effect (APE) for this project has been defined as the locations within and adjacent to the above listed channels. A geomorphological study was conducted to assess the potential for prehistoric resources within APE, which at the time the study was conducted included several locations no longer under consideration, including Port Newark (and Port Newark Point), Claremont, Buttermilk, and Stapleton Channels. The report, by Geoarchaeology Research Associates entitled "Geomorphological and Archaeological Study of New York and New Jersey Harbor Navigation Channels" is enclosed for your review.

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The analysis suggests that several areas examined have some potential to preserve prehistoric sites although some are more sensitive than others. The areas rated to have a high-moderate potential are Anchorage, Claremont and Port Jersey. The Newark Bay area

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It is the Corps opinion that no further studies for prehistoric resources will be required in those areas designated as having a low potential. Those areas are Port Newark, Port Newark Point, and the Elizabeth Channel. Additional studies to evaluate and delimit the potential archeologically sensitive areas will be undertaken for locations designated as moderate or high-moderate and include Newark Bay, Anchorage, Claremont, Port Jersey Stapelton and Ambrose Channels. As noted above several locations evaluated for prehistoric resources are no longer under consideration for the Harbor Navigation Study but have been included within this correspondence as the cultural resource evaluation was already undertaken. To reiterate, Port Newark, Port Newark Point, Claremont and Stapleton are no longer included in the Harbor Navigation Study and no further work will be undertaken in these channels at this time.

Cultural resource investigations have been conducted and coordinated with your office for historic period resources along most of the channels under consideration. A summary of this previous work and Section 106 coordination is being prepared and will be submitted to your office together with a Draft Memorandum of Agreement for the overall Harbor Navigation Study.

Please review the enclosed document and provide comments. A 30-day response time would be appreciated in order to ensure the project schedule is maintained. If you or your staff require additional information or have any questions, please contact Lynn Rakos, Project Archaeologist, at (212) 264-0229

Sincerely,

Frank Santomauro

Enclosure

Frank Santomauro, P.E.
Chief, Planning Division

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

June 5, 1997

REPLY TO
ATTENTION OF

Environmental Assessment Section
Environmental Analysis Branch

Ms. Gina Santucci
New York City Landmarks Commission
100 Old Slip
New York, NY 10005

Dear Ms. Santucci,

The U.S. Army Corps of Engineers, New York District (Corps) has been authorized by Section 435, Water Resource Development Act of 1996, to conduct a comprehensive study of navigation needs at the Port of New York-New Jersey (the Port) to address improvements required to provide economically efficient and environmentally sound navigation to meet current and future requirements. The Port's channels to be examined include, but are not limited to, the Ambrose and Anchorage Channels; New York and New Jersey Channels; New Bay Channel; Hudson River Channel; Bay Ridge and Red Hook Channel; Buttermilk Channel; and Raritan Bay and Sandy Hook Channels (Attachment 1). Attached is the most recent version of the cultural resource component of the overall Port Deepening Project Study Plan (PSP) for the next phase of work, designated as the Feasibility Phase (Attachment 2), and a draft copy of the PSP which contains an earlier version of the proposed cultural resources tasks (Attachment 3). The final PSP document will be used to define and manage the development and conduct of the Feasibility study.

As recently discussed with you, we are defining the Port of New York and New Jersey as the study area. One of the initial goals of the Feasibility Phase will be to identify the Area of Potential Effect. The array of alternatives to be examined in the Feasibility study includes structural and non-structural improvements to the above listed channels. For each of these channels, alternative combinations of channel depth, width, and alignment will be examined, and the optimal combination will be identified in light of relevant current and future environmental, engineering, and economic considerations. A program of blasting may be necessary in certain reaches to loosen hard materials for removal. Disposal sites, both upland and aquatic, may also be considered during these studies. The expansion of existing Port facilities and/or creation of new infrastructure may also be evaluated as part of the Port Deepening Study if proposed facilities are directly related to the Port deepening. The outcome of these efforts will amount to a master plan for the location and timing of navigation related infrastructure investments Port-wide.

Currently, two comprehensive cultural resource studies are proposed for the Port as a whole. One study will address the sensitivity for paleoenvironmental remains through a critical review and evaluation of existing studies and an examination of geophysical borings proposed for the overall Port study. This assessment will allow the Corps to develop a program of borings in areas that may have been habitable locations prior to sea level rise and may have survived inundation intact. The second comprehensive survey involves a documentary study coupled with limited field work to assess the sensitivity of the shoreline areas for significant historic resources. This study will concentrate on locations containing existing infrastructure that might be subject to expansion or where the potential

exists for new facilities to be constructed. These studies will also result in data in a format compatible with the overall project Geographical Information System. This data will eventually be available in digital form for distribution to other agencies. Access to sensitive archaeological information will be restricted.

Additional cultural resource studies may also be conducted but are contingent upon the direction of the overall project. Activities associated with blasting, if proposed, will be limited to agency coordination and monitoring of significant resources. Disposal sites will receive remote sensing or standard archaeological surveys depending the locations proposed for such facilities. As with the "Preliminary Assessment of Cultural Resources Sensitivity and Scoping Document for Additional Studies in Connection with the New York Harbor Apex Region Dredged Material Management Plan (DMMP), New York and New Jersey Dredged Material Management Plan," recently submitted to your office, the project areas have not been clearly defined but a variety of alternative actions have been proposed. The general outline of cultural resource studies which would be undertaken for each type of construction activity proposed is presented in Attachment 2.

Additional cultural resources studies will be programmed, as necessary, for all Port deepening alternatives selected for detailed investigation and a Programmatic Memorandum of Agreement (PMOA) for the entire Port Deepening study will be developed. The PMOA will be based on initial cultural resource studies and project plans as they develop. This document will specify the process associated with each alternative for identifying historic properties within areas of potential effect, evaluating effects, avoiding adverse effects and minimizing or mitigating for unavoidable impacts. The PMOA will also specify which actions, if any, will have no effect on historic properties.

Please provide comments on the PSP. Any suggestions you may have at this stage in this project will be very valuable in the programming of the cultural resources studies for the Port. We are also presently coordinating this effort with the New York and New Jersey State Historic Preservation Offices. A meeting can be arranged for your staff and the Corps or, if all parties determine it necessary at this time, a meeting can be convened with staff from all concerned agencies. If you or your staff require additional information or have any questions, please contact Lynn Rakos, Project Archaeologist, at (212)264-0473.

Sincerely,

for Stuart Piken, P.E.
Chief, Planning Division

Attachments

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

June 5, 1997

REPLY TO
ATTENTION OF

Environmental Assessment Section
Environmental Analysis Branch

Ms. Ruth L. Pierpont
New York State Office of Parks,
Recreation and Historic Preservation
Historic Preservation Field Services Bureau
Peebles Island, P.O. Box 189
Waterford, NY 12188-0189

Dear Ms. Pierpont,

The U.S. Army Corps of Engineers, New York District (Corps) has been authorized by Section 435, Water Resource Development Act of 1996, to conduct a comprehensive study of navigation needs at the Port of New York-New Jersey (the Port) to address improvements required to provide economically efficient and environmentally sound navigation to meet current and future requirements. The Port's channels to be examined include, but are not limited to, the Ambrose and Anchorage Channels; New York and New Jersey Channels; New Bay Channel; Hudson River Channel; Bay Ridge and Red Hook Channel; Buttermilk Channel; and Raritan Bay and Sandy Hook Channels (Attachment 1). Attached is the most recent version of the cultural resource component of the overall Port Deepening Project Study Plan (PSP) for the next phase of work, designated as the Feasibility Phase (Attachment 2), and a draft copy of the PSP which contains an earlier version of the proposed cultural resources tasks (Attachment 3). The final PSP document will be used to define and manage the development and conduct of the Feasibility study.

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Sincerely,

for Stuart Piken, P.E.
Chief, Planning Division

Attachments

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

June 5, 1997

REPLY TO
ATTENTION OF

Environmental Assessment Section
Environmental Analysis Branch

Ms. Dorothy P. Guzzo
Deputy Chief Historic Preservation Officer
Historic Preservation Office
New Jersey Department of Environmental Protection
CN 404
Trenton, NJ 08625

Dear Ms. Guzzo,

The U.S. Army Corps of Engineers, New York District (Corps) has been authorized by Section 435, Water Resource Development Act of 1996, to conduct a comprehensive study of navigation needs at the Port of New York-New Jersey (the Port) to address improvements required to provide economically efficient and environmentally sound navigation to meet current and future requirements. The Port's channels to be examined include, but are not limited to, the Ambrose and Anchorage Channels; New York and New Jersey Channels; New Bay Channel; Hudson River Channel; Bay Ridge and Red Hook Channel; Buttermilk Channel; and Raritan Bay and Sandy Hook Channels (Attachment 1). Attached is the most recent version of the cultural resource component of the overall Port Deepening Project Study Plan (PSP) for the next phase of work, designated as the Feasibility Phase (Attachment 2), and a draft copy of the PSP which contains an earlier version of the proposed cultural resources tasks (Attachment 3). The final PSP document will be used to define and manage the development and conduct of the Feasibility study.

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Please provide comments on the PSP. Any suggestions you may have at this stage in this project will be very valuable in the programming of the cultural resources studies for the Port. We are also presently coordinating this effort with the New York State Historic Preservation Office and the New York City Landmarks Commission. A meeting can be arranged for your staff and the Corps or, if all parties determine it necessary at this time, a meeting can be convened with staff from all concerned agencies. If you or your staff require additional information or have any questions, please contact Lynn Rakos, Project Archaeologist, at (212)264-0473.

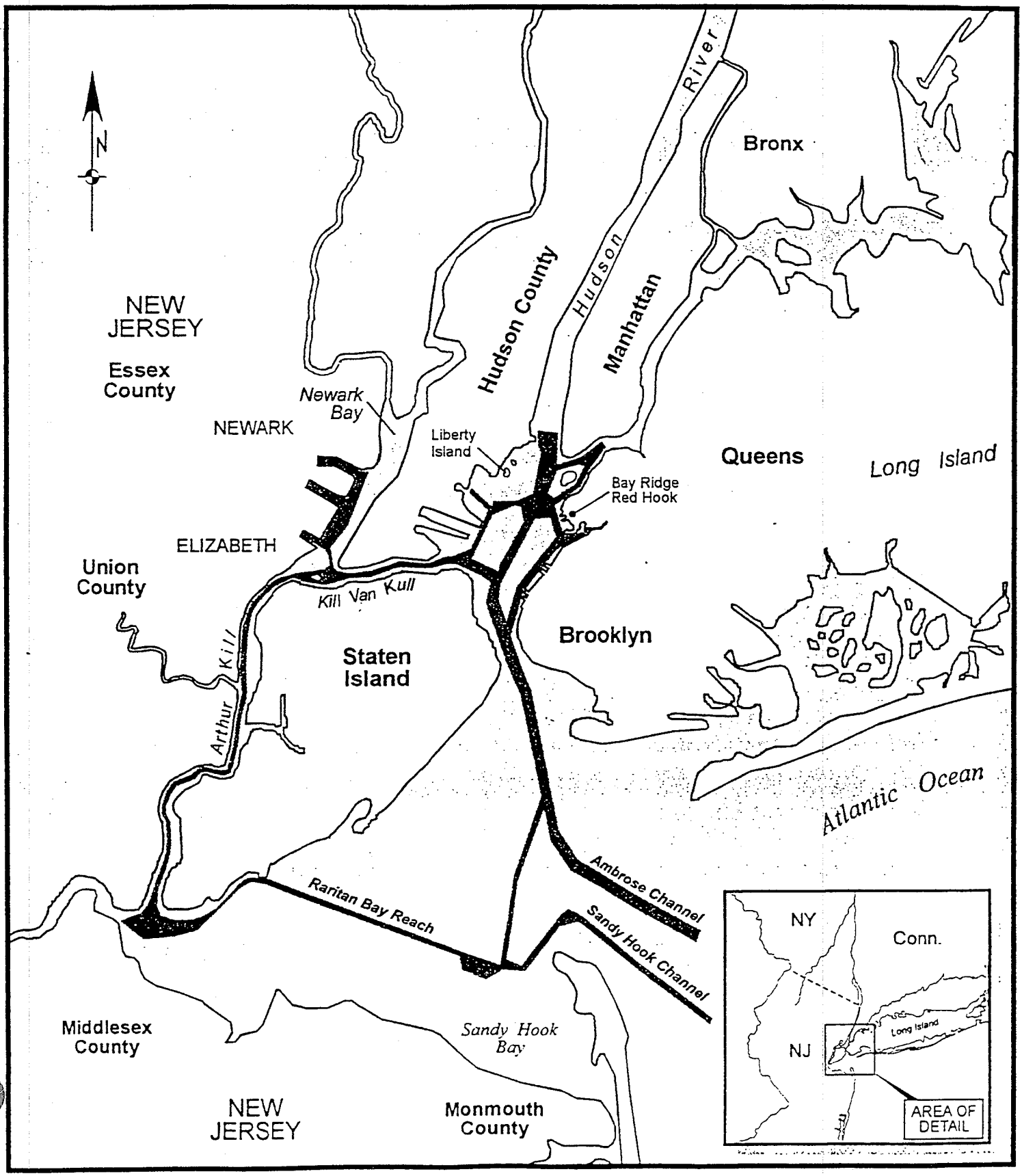
Sincerely,

for Stuart Piken, P.E.
Chief, Planning Division

Attachments

US Army Corps
of Engineers
New York District

New York and New Jersey Harbor,
New York and New Jersey



DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

July 24, 1997

REPLY TO
ATTENTION OF

Environmental Assessment Section
Environmental Analysis Branch

Ms. Dorothy P. Guzzo
Deputy Chief Historic Preservation Officer
Historic Preservation Office
New Jersey Department of Environmental Protection
CN 404
Trenton, New Jersey 08625

Dear Ms. Guzzo:

The New York District, U.S. Army Corps of Engineers (Corps), is proceeding with the Port Jersey Channel Project in Bayonne, Hudson County, New Jersey. The plan provides for the deepening the channel from 38 feet to 41-feet below mean water from its confluence with the Anchorage Channel to its head of navigation in Bayonne, and includes a 41-foot deep, 1,200-foot diameter turning basin at the head of navigation (Attachments 1 and 2). Port Authority of New York and New Jersey will deepen the existing 35 foot deep channel to 38 feet. The Corps' plan was the preferred alternative as determined in the Feasibility Report which was finalized in May 1987 and revised in December 1987. A Preconstruction Engineering and Design (PED) study conducted in 1989 concluded that the channel must also be widened.

Two locations in the project vicinity were determined sensitive for prehistoric resources. These areas, the shallows on the south side of the Global Terminal Pier and the Jersey Flats, situated immediately north of the entrance to the Port Jersey Channel, will not be impacted by the proposed project. Section 106 coordination for this project was completed in 1986 and reinitiated in 1990 when project plans were revised. The Corps concluded that the initial project and the revised project plans would have No Effect upon cultural resources. The Historic Preservation Office concurred with this assessment (Attachment 3).

The dredged material will be disposed of in an existing upland facility (Attachment 4). If other sites are considered that are not already permitted they will be subject to cultural resource investigations which will be coordinated through your office.

It is in the Corps' opinion that the proposed Port Jersey Channel Deepening Project will have No Effect upon historic properties if project plans remain as proposed. Please

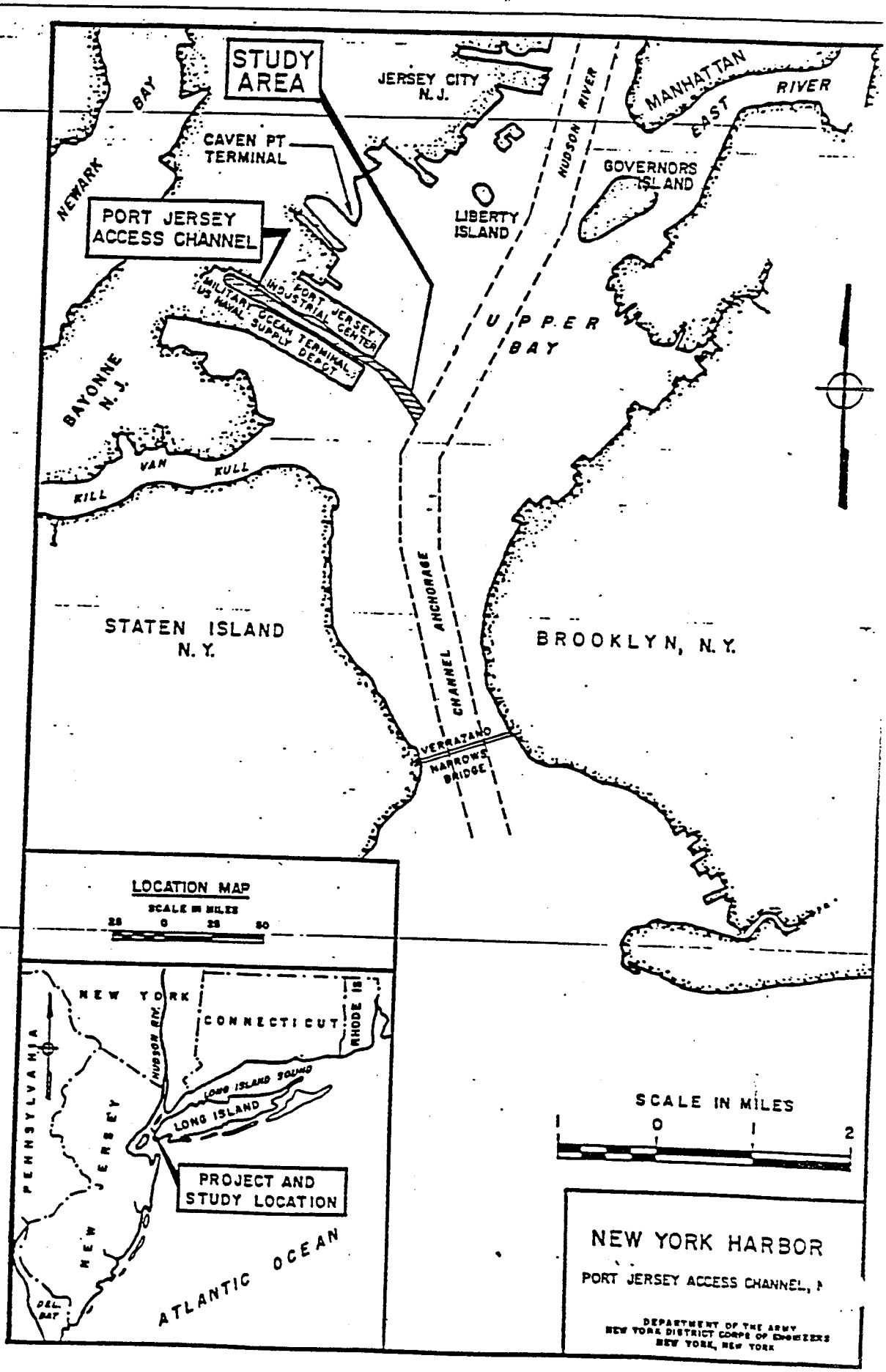
provide Section 106 comments, pursuant to 36 CFR 800.5. If you or your staff require additional information or have any questions, please contact Lynn Rakos, Project Archaeologist, at (212)264-0473.

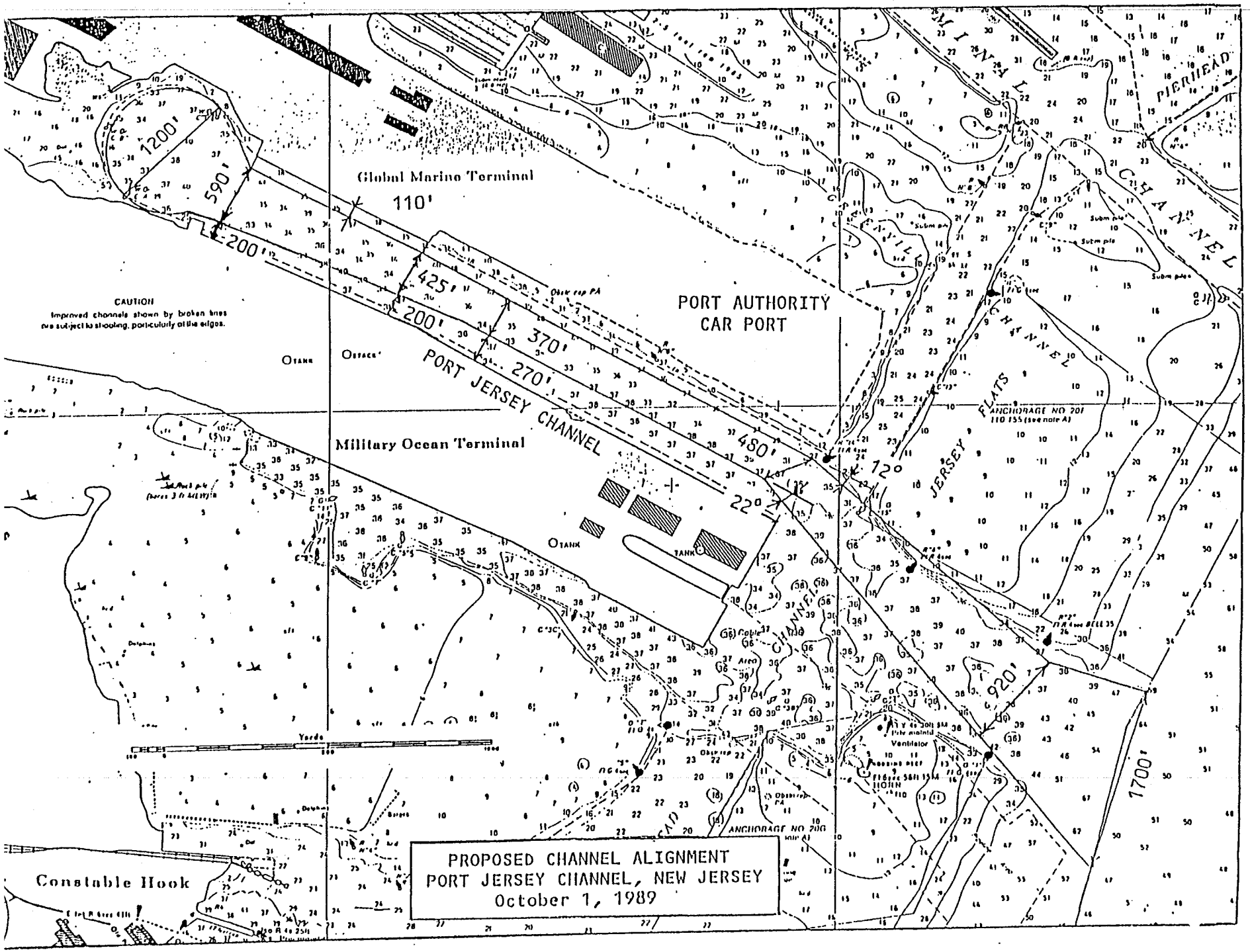
Sincerely,

John Sassi, P.E.
Chief, Planning Division

Attachments

ATTACHMENT 1





PROPOSED CHANNEL ALIGNMENT
PORT JERSEY CHANNEL, NEW JERSEY
October 1, 1989

ATTACHMENT 2

THE CITY OF NEW YORK LANDMARKS PRESERVATION COMMISSION
100 Old Slip, New York, NY 10005 (212) 487-6800

ENVIRONMENTAL REVIEW

USACE/NEPA-Y — PROJECT NUMBER

06/10/97 — DATE RECEIVED

PROJECT

PORT NY/NJ DEEPENING STUY: PORT NY/NJ DEEPENING STUDY

[ ] No architectural significance

[ ] No archaeological significance

[ ] Designated New York City Landmark or Within Designated Historic District

[ ] Listed on National Register of Historic Places

[ ] Appears to be eligible for National Register Listing and/or New York City Landmark Designation

[ ] May be archaeologically significant; requesting additional materials

COMMENTS

"New York and New Jersey Harbor Navigation Study, Feasibility Phase, Project Study Plan, March 1997," is accepted.

SIGNATURE

09/04/97 — DATE

State of New Jersey

Christine Todd Whitman
Governor

Department of Environmental Protection
DIVISION OF PARKS AND FORESTRY
HISTORIC PRESERVATION OFFICE
CN-404
TRENTON, N.J. 08625-0404
TEL: (609) 292-2023
FAX: (609) 984-0578

Robert C. Shinn, Jr.
Commissioner

HPO-F97-183
June 26, 1997

Mr. Stuart Piken, P.E.
Chief, Planning Division
Department of the Army New York District
Corps of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0090

ATTN: Ms. Lynn Rakos

Re: Multiple Counties, Multiple Municipalities
Port of New York/New Jersey Plan to Conduct a
Comprehensive Navigation Study

Dear Mr. Piken:

Thank you for providing the opportunity for Consultation under Section 106 on this project: specifically for the opportunity to review the March 1997 **The New York and New Jersey Harbor Navigation Study Feasibility Phase Project Study Plan.** It appears that this plan will successfully take into account the potential for significant resources and identifies means to identify, evaluate and treat resources associated with various types of activities which could be associated with the navigation study project. The only concern I have at this time is that for any necessary blasting (e.g. see page 13), it is stated that the ACOE will locate "all properties in the vicinity of blasting areas that have already been listed on or previously identified as eligible for listing on the National Register of Historic Places". For locations where blasting may occur, unless previous survey and evaluation of historic properties has been fully comprehensive, additional survey of potentially historic properties within the area of potential project effect would be necessary under Section 106. If later versions of this study plan are produced, this portion of the document should be revised.

In preparing a Programmatic Memorandum of Agreement for the project, I recommend keeping abreast of the emergent PMOA for the Green Brook Flood Control Project, and possibly involving the Advisory Council on Historic Preservation (ACHP) early in its review. The ACHP has significantly revised the structure of model PMOA's so that this early consultation might avoid the need for revisions of the PMOA later in time.

Thank you again for this opportunity for consultation under Section 106 of the National Historic Preservation Act. If you have any questions please do not hesitate to contact Deborah Fimbel, staff reviewer for this project.

Sincerely,

Dorothy P. Guzzo
Deputy State Historic
Preservation Officer

DPG:DRF
C:\PW\wd\106\971824
c. Bernard Moore, Administrator, Division of Engineering and Construction

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

September 30, 1998

REPLY TO
ATTENTION OF
Environmental Assessment Section
Environmental Analysis Branch

Dear Sir or Madam:

The U.S. Army Corps of Engineers, New York District, is currently the lead agency on a comprehensive study to evaluate the feasibility of navigation improvements in the Port of New York and New Jersey. This study will address the improvements required to provide economically efficient and environmentally sound navigation to meet current and future requirements. The Port's channels to be examined include: the Ambrose and Anchorage Channels; Kill Van Kull and Newark Bay channels to include the Elizabeth Channel; Arthur Kill Channel to Howland Hook Marine Terminal and Gulfport Reach; the Bay Ridge, Red Hook, Buttermilk, Port Jersey and Claremont Terminal Channels; and Red Hook, Stapleton, and Gravesend anchorages.

As part of our responsibilities under Section 106 of the National Historic Preservation Act of 1966, as amended, the Corps has begun to conduct cultural resource investigations in connection with the New York and New Jersey Harbor Navigation Study. We are seeking to identify interested parties to participate in the Section 106 process. We would be pleased to include you, or the organization you represent, on the mailing list for the cultural resource component of this Harbor-wide project. You will be kept informed of cultural resource activities and will have the opportunity to provide input and comments on the direction and results of the cultural resource work. If you would like to be included on the mailing list please write to the Study Archaeologist at the address below:

Ms. Lynn Rakos
U.S. Army Corps of Engineers
CENAN-PL-EA
26 Federal Plaza
New York, NY 10278

Thank you for your interest in this important New York and New Jersey Harbor Navigation study. If you require additional information or have any questions, please contact Ms. Rakos, at (212)264-0229.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

MAILING LIST - INTERESTED PARTIES - HARBOR NAVIGATION

Ms. Susan P. Coen, Director
Union County Office of Cultural and Heritage Affairs
24-52 Rahway Avenue, 4th Floor
Elizabeth, N.J. 07202

Bonnie Nalwaski, Acting Director
Staten Island Institute for the Arts
75 Stuyvesant Avenue
Staten Island, N.Y 10301

Dr. Hermalyn
Bronx County Historical Society
3309 Bainbridge Avenue
Bronx, N.Y 10467

Rebecca Yamin, Ph.D, President
Professional Archaeologists of New York City
c/o John Milner Associates
1216 Arch Street, 5th Floor
Philadelphia, PA 19107

Lee Ellen Griffith, Executive Director
Monmouth County Historical Association
70 Court Street
Freehold, New Jersey 07728

Director
Bayonne Historical Society
P.O. Box 3034
Bayonne, New Jersey 07002-0297

Ms. Bierce Riley, President
Roebling Chapter
Society for Industrial Archaeology
19 Budd Street
Morristown, New Jersey 07960

New York Historical Society
Stewart Desmond
Director of Public Affairs
2 West 77th Street
New York, N.Y. 10024

David Sharps, President
The Hudson Waterfront Museum
290 Conover Street
Pier 45
Brooklyn, New York 11231

Newark Landmarks and Historic Preservation Commission
Harry Hines, City Planning Officer
55 Liberty Street
Newark, NJ 07102

Ms. Anna Aschkenes, Executive Director
Middlesex County Cultural and Heritage Commission
841 Georges Road
North Brunswick, New Jersey 08902

Catherine Abrams, Curator
Queens Historical Society
143-35 37th Avenue
Flushing, N.Y 11354

Mr. Richard Heaps, Director
Brooklyn Historical Society
128 Pierrepont Street
Brooklyn, N.Y 11201

Norman Brouwer
Ships Historian and Librarian
South Street Seaport Museum
207 Front Street
New York, New York 10038

Gail Hunton
Principal Historic Preservation Specialist,
Monmouth County Parks System
805 Newman Springs Road
Lincroft, New Jersey 07738-1695

Mr. Charles Bello
President
Archaeological Society of New Jersey
19 Ledge Street
Pipersville, PA 18947

Diane Dallal
President, New York State Archaeological Association-Metropolitan Chapter
c/o New York Unearthed
17 State Street
New York, N.Y. 10004

Diane Dallal
Director of Archaeology
New York Unearthed
17 State Street
New York, N.Y. 10004

Erin M. Urban, Director
John A. Noble Collection
Snug Harbor Cultural Center
1000 Richmond Terrace
Staten Island, New York 10301

Jersey City Historic Preservation Commission
Charles Balcer, Senior Planner
30 Montgomery Street
Jersey City, NJ 07302

Middlesex County Cultural & Heritage Commission
841 Georges Road
North Brunswick, New Jersey 08902

Union County Office of Cultural & Heritage Affairs
633 Pearl Street
Elizabeth, New Jersey 07202

Friends of Liberty State Park
c/o Sam Pesin, President
P.O. Box 3407
Jersey City, New Jersey 07303-3407

New Jersey Coastal Heritage Trail
c/o Janet Wolf, Project Director
P.O. Box 568
Newport, New Jersey 08345

New Jersey Marine Educator Association
c/o Warren Marcioni, President
85 Brookside Drive
Caldwell, New Jersey 07006

Twin Lights Historical Society
c/o Richard Scheuing
Lighthouse Road
Highlands, New Jersey 07732

Middletown Township Landmarks Commission
George Rudolph, Chair
1 King's Highway
Middletown, NJ 07748-2594

Director
Union County Historical Society
P.O. Box 241
Elizabeth, New Jersey 07207

Paul Kuchynskas
445 State Street
Brooklyn, N.Y 11217

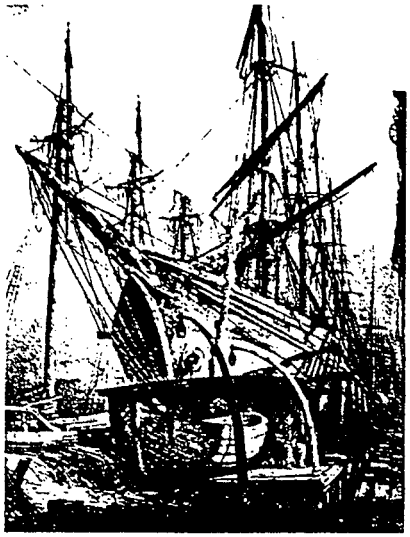
Director
New Jersey Historical Society
230 Broadway
Newark, New Jersey 07104

Director
Preservation New Jersey
The Proprietary House
149 Kearny Avenue, 2nd Floor
Perth Amboy, New Jersey 08861-4700

Union County Office - Cultural and Historic Affairs
c/o William Higginson
633 Pearl Street
Elizabeth, New Jersey 07202

Dr. Lorraine Williams
State Archaeologist
New Jersey State Museum
Bureau of Archaeology and Ethnology
205 Sate Street
Trenton, New Jersey 08625

The John A. Noble Collection



October 19, 1998

Ms. Lynn Rakos
Project Archaeologist
U.S. Army Corps of Engineers
CENAN-PL-EA
26 Federal Plaza
New York, NY 10278

Dear Ms. Rakos,

We received notice from Mr. Frank Santomauro about your Dredged Material Management study for New York Harbor, and would like to be included on your cultural resource mailing list.

The John A. Noble Collection
1000 Richmond Terrace
Building D
Staten Island, NY 10301

Thank you.

Sincerely,

Barbara E. Stanwick
Assistant to the Executive Director

Board of Trustees

Steven P. Kalil
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Nancy L. Pouch
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Executive Director

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Trustee Emeritus

NEW
ERSEY
HISTORICAL
SOCIETY

October 22, 1998

Ms. Lynn Rakos
U.S. Army Corps of Engineers
CENAN-PL-EA
26 Federal Plaza
New York, NY 10278

Dear Ms. Rakos:

We recently received two slightly different letters from the Department of the Army, one of which concerned a Dredged Material Management Plan for the Port of New York and New Jersey, and the other regarding a New York and New Jersey Harbor Navigation Study. Please place the New Jersey Historical Society on the cultural resource component mailing list for both of these projects. Correspondence should be sent to the attention of Sally Yerkovich, Executive Director.

Thank you.

Sincerely,

Tom Bolze

Tom Bolze
Assistant to the Director

52 Park Place
Newark, NJ 07102-4302
Telephone: (973) 596-8500
Telefax: (973) 596-6957

SIIAS
STATEN ISLAND INSTITUTE OF ARTS & SCIENCES

October 29, 1998

Ms. Lynn Rakos
Project Archaeologist
U.S. Army Corps of Engineers
CENAN-PL-EA
26 Federal Plaza
New York, NY 10278

Dear Mrs. Rakos:

We are interested in participating in the Secion 106 process as outlined in your letter of September 30, 1998.

Please include our Curator of History as follows on your mailing list:

Vincent Sweeney
Curator of History
Staten Island Institute of Arts and Sciences
75 Stuyvesant Place
Staten Island, NY 10310-1998

Thank you.

Sincerely,

Mary S. De Silva

(Mrs.) Mary S. De Silva
Librarian/Asst. Archivist

Any information, advice or opinion (opinion) concerning the identification, provenance or other attributes of an object or item is given on the understanding that the addressee is the owner or authorized agent of the owner of the item in question and is not seeking and will not use such opinion in connection with any past or contemplated commercial transaction. It is further given on the understanding that the addressee will not assert any claim with respect to such opinion and will indemnify the Staten Island Institute of Arts & Sciences, its trustees, officers, employees and agents against any and all liability and expenses arising out of the provision of such opinion.

75 STUYVESANT PLACE STATEN ISLAND, NY 10310-1998 [illegible] 718 273 5683

GROWING FOR OUR COMMUNITY

METROPOLITAN CHAPTER

Mr. Frank Santomauro, P.E.
Chief, Planning Division
U.S. Army Corps of Engineers
CENAN-PL-EA
26 Federal Plaza
New York, NY 10278

October 30, 1998

Dear Mr. Santomauro

On behalf of the New York State Archaeological Association, Metropolitan Chapter, I would appreciate being kept apprised of cultural resource activities related to the Army Corps' Dredged Material Management Plan for the Port of New York and New Jersey.

I look forward to the opportunity of commenting on the direction and results of the cultural resource work.

Sincerely,

Diane Dallal

Diane Dallal
President, Metropolitan Chapter
New York State Archaeological Association

SOUTH STREET SEAPORT MUSEUM

Mr. Frank Santomauro, P.E.
Chief, Planning Division
U.S. Army Corps of Engineers
CENAN-PL-EA
26 Federal Plaza
New York, NY 10278

October 30, 1998

Dear Mr. Santomauro

The South Street Seaport Museum would appreciate being kept informed about the cultural resource activities related to the Army Corps' Dredged Material Management Plan for the Port of New York and New Jersey.

We look forward to the opportunity of reviewing and commenting upon the direction and results of any cultural resource work.

Sincerely,

Diane Dallal
Director of Archaeology
South Street Seaport Museum

copy to Lyn

207 FRONT STREET • NEW YORK, NY 10038 • TEL 212-748-8600 • FAX 212-748-8610 • WWW.SOUTHSTSEAPORT.ORG

THE TOWNSHIP OF MIDDLETOWN
Landmarks Commission
1 Kings Highway
Middletown, NJ 07748-2594

Organized December 14, 1667
"Pride In Middletown"

November 19, 1998

Ms. Lynn Rakos
U.S. Army Corps of Engineers
CENAN-PL-EA
26 Federal Plaza
New York, N.Y. 10278

Dear Ms. Rakos,

I am writing to you on behalf of the Middletown Landmarks Commission to respond to a letter from Mr. Frank Santomauro, P.E., Chief, Planning Division. He invited the commission to be on your mailing list for the cultural resource component of the New York and New Jersey Harbor Navigation Study. We are most interested in any impacts which the proposed navigation "improvements" may have on New Jersey's water resources, so we accept your offer to be part of the Section 106 review process. We find that the effort to include a broad representation of public, private and non-profit groups results in a better project for all concerned.

Thank you for your consideration.

Sincerely yours,

Mary Lou Strong

Mary Lou Strong, Chairman
Middletown Landmarks Commission
732-291-2371 Fax 732-291-0007

FEIS APPENDIX A-1.3d

FISH AND WILDLIFE COORDINATION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
927 North Main Street (Bldg. D1)
Pleasantville, New Jersey 08232

FP-99/46

August 4, 1999

Frank Santomauro, P.E.
Chief, Planning Division
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, New York 10278-0090

Dear Mr. Santomauro:

This letter provides a status update regarding ongoing coordination between the U.S. Fish and Wildlife Service (Service) and the New York District, U.S. Army Corps of Engineers (Corps) on the New York and New Jersey Harbor Navigation Study. The New Jersey Field Office is currently preparing a draft Fish and Wildlife Coordination Act (48 Stat. 401; 16 U.S.C. 661 *et seq.*) Section 2(b) report for the Corps; we anticipate completion of the draft FWCA report by August 16, 1999.

This letter contains a summary of current Service concerns to assist in ongoing planning efforts. The Service provided the Corps with a Planning Aid Report (PAR) (August 1998) for the subject project, which contained more detail regarding Service concerns. In a letter dated January 29, 1999, the Corps addressed Service comments that were included in the PAR. For the most part, Service concerns regarding potential impact to fish and wildlife resources were addressed by the Corps. To date we have not identified any additional, substantial concerns beyond those discussed in our August 1998 PAR.

Since preparation of the PAR, the Corps has released its preferred project alternative, which consists of deepening the following channels: Ambrose to 53 feet; Anchorage to 50 feet; Bay Ridge to 50 feet; Port Jersey to 50 feet; Kill van Kull to 50 feet; Newark Bay to 50 feet; Arthur Kill to Port Ivory to 50 feet; and the Arthur Kill to Howland Hook to 45 feet (U.S. Army Corps of Engineers, 1999). Additionally, the Corps has determined that no fills are required for operators at current container terminals to benefit from deeper channels. Therefore, no fills in waters of the United States, that would facilitate port terminal expansion, are included in the without-project condition. Finally, the Corps has determined that dredged material unsuitable for beneficial uses will be disposed of in appropriate upland sites or disposed of in confined aquatic disposal pits in Newark Bay.

AUTHORITY

The following comments provide technical assistance only and do not constitute comments by the Service as afforded by the Fish and Wildlife Coordination Act, nor do they preclude comment on any forthcoming environmental documents pursuant to the National Environmental Policy Act of 1969 as amended (83 Stat. 852; 42 U.S.C. 4321 *et seq.*).

SERVICE COMMENTS

The Service notes that the proposed project would impact fish wildlife habitats within the Service-identified Arthur Kill Habitat Complex, which includes the northwestern corner of Staten Island in New York City, adjacent portions of the Arthur Kill and Kill Van Kull in both New York and New Jersey, and tributaries and wetlands feeding into the Arthur Kill from Union and Middlesex Counties, New Jersey. A full description of the natural resources of concern within the Arthur Kill Habitat Complex is included in the Service's August 1998 PAR.

Colonial Nesting Waterbirds

Of primary significance in this area, is the presence of major nesting colonies and foraging areas of herons, egrets, and ibises in a complex of closely associated natural habitats occurring within a major metropolitan area. Three island colonies, or heronries, (located on Shooters Island, Pralls Island, and Isle of Meadows) were established in the 1970s; in 1995 these heronries collectively contained nearly 1,400 nesting pairs of colonial wading birds of special regional emphasis or management concern, including, in declining order of abundance, black-crowned night-heron *(Nycticorax nycticorax),* glossy ibis *(Plegadis falcinellus),* snowy egret *(Egretta thula),* great egret *(Casmerodius albus),* cattle egret *(Bubulcus ibis),* yellow-crowned night-heron *(Nycticorax violaceus)*, green-backed heron *(Butorides striatus),* and little blue heron *(Egretta caerulea)* nesting pairs.

It would appear that of the three nesting colonies, only Shooters Island would be within the Corps' proposed project area. The Service is concerned about potential adverse impacts of the proposed project on colonial nesting waterbirds of Shooters Island. Potential direct impacts could result from disturbance associated with dredging and blasting. Disturbance could also result indirectly as a result of increased boat traffic within the channel or boats traveling closer to Shooters Island.

Additionally, the Service would be concerned about any dredging that would affect the long-term integrity of Shooters Island and its surrounding shallow water habitats. The Corps should ensure that direct impacts such as dredging and blasting, and indirect impacts such as increased wave energy from large vessels do not reduce the aerial extent or habitat value of Shooters Island and its nearshore shallows.

The Service is also concerned about the proposed project's impacts on nearshore shallows, wetlands, and beaches throughout the project area via direct impacts such as dredging and blasting and via indirect impacts such as increased wave energy from larger vessels and increased sedimentation or erosion due to altered hydrodynamics.

Federally Listed Species

The Service's PAR identified the need for the Corps to prepare a Biological Assessment (BA) pursuant to the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) to address potential impacts, as identified by the Corps, to federally listed species. The Service identified the following federally listed species under the Service's jurisdiction: piping plover (*Charadrius melodus*); roseate tern (*Sterna dougallii dougallii*); peregrine falcon (*Falco peregrinus*); northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*); and, Seabeach amaranth (*Amaranthus pumilus*). The Service reviewed a preliminary draft BA from the Corps and provided comments in a letter dated July 20, 1999 to Mr. Robert Kurtz.

Additionally, the Service identified the presence of federally listed species under the jurisdiction of the National Marine Fisheries Service. Endangered whales that may occasionally enter the Harbor Estuary include: blue (*Balaenoptera musculus*); finback (*B. physalus*); humpback (*Megaptera novaeangliae*); right (*Balaena glacialis*); sei (*Balaenoptera borealis*); and, sperm (*Physeter macrocephalus*). Juveniles of these species are most likely to enter the Harbor estuary. Federally listed marine turtles expected to occur within the Harbor estuary include: Atlantic Ridley (*Lepidochelys kempii*) (endangered); leatherback (*Dermochelys coriacea*) (endangered); green (*Chelonia mydas*) (threatened); and, loggerhead (*Caretta caretta*) (threatened). The federally listed (endangered) shortnose sturgeon (*Acipenser brevirostrum*) is also known to occur in the Harbor estuary.

Principal responsibility for above-listed threatened and endangered species (whales, marine turtles, and the shortnose sturgeon) is vested with the NMFS. Therefore, the NMFS must be contacted to fulfill consultation requirements pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*):

National Marine Fisheries Service
Habitat and Protected Resources Division
Sandy Hook Laboratory
Highlands, New Jersey 07732
(732) 872-3023

Environmental Contaminants

The Service is still concerned about the potential impacts on fish and wildlife resources of environmental contaminants that could be resuspended during dredging and disposal of dredged material. In the PAR, the Service recommended 11 studies that could be implemented to determine the affect contaminants and disturbance on a range of receptor organisms. It is our understanding that the Corps has decided not to conduct most of these studies. Service concerns regarding the resuspension of environmental contaminants will be more thoroughly discussed in our upcoming FWCA report.

We note that specific contaminated dredged material disposal sites have not been identified by the Corps. Therefore, only general Service comments with regard to the disposal of contaminated dredged material will be provided in the upcoming FWCA report.

Should you have any questions regarding these comments, please contact me or have your staff contact Thomas McDowell of my staff at (609) 646-9310.

Sincerely,

Clifford G. Day
Supervisor

References

U.S. Army Corps of Engineers. 1999. New York and New Jersey harbor navigation study, alternative formulation briefing (AFB) technical memorandum. U.S. Army Corps of Engineers, New York District. New York, New York. 46 pp.

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

April 23, 1999

Environmental Analysis Branch
Environmental Assessment Section

Mr. Clifford G. Day, Supervisor
U.S. Department of the Interior
Fish and Wildlife Service
New Jersey Filed Office
927 North Main Street, Building D-1
Pleasantville, New Jersey 08232

Re: New York and New Jersey Harbor Navigation Study: navigation channels Ambrose, Anchorage, Bay Ridge, Red Hook, Buttermilk, Kill Van Kull. Claremont, Port Jersey, Newark Bay (including Port Newark and Elizabeth channels), and the Arthur Kill to Gulfport; and Stapleton, Bay Ridge, and Gravesend anchorages.

Dear Mr. Day:

The above referenced project was authorized by Section 435 of the Water Resources Development Act of 1996, which reads:

> The Secretary shall conduct a comprehensive study of navigation needs at the Port of New York-New Jersey (including the South Brooklyn Marine and Red Hook Container Terminals, Staten Island, and adjacent areas) to address improvements, including deepening of existing channels to depths of 50 feet or greater, that are required to provide economically efficient and environmentally sound navigation to meet current and future requirements.

The New York and New Jersey Harbor Navigation Study (the study) consists of existing navigation channels and anchorages. Channels covered in the initial stages of the study included: Ambrose; Anchorage; Bay Ridge; Red Hook; Buttermilk; Kill van Kull; Claremont; Port Jersey; Newark Bay (including Port Newark and Elizabeth channels); and the Arthur Kill to Gulfport. The relevant anchorages are Stapleton, Bay Ridge, and Gravesend. The red Hook and Buttermilk Channels have been dropped from further consideration since current depths are sufficient for the future use of the facilities located along those Channels. Enclosed is the most recent detailed description of the project area. Enclosure 1).

At this time, these authorized channel deepening projects in the Harbor area are moving forward to help alleviate problems associated with navigation channels inadequate for deep draft vessels. The current channel deepening projects are: the Kill

Van Kull and Newark Bay Channels from -40 ft (MLW) to -45 ft (MLW); the Arthur Kill Channel- Howland Hook Marine Terminal, subject to cost reauthorization, from the Kill Van Kull to the Howland Hook marine Terminal from -35 ft (MLW) to -41 ft (MLW), and from Howland Hook to approximately one mile south of the Goethals Bridge from -35 ft (MLW) to -40 ft (MLW); and the Port Jersey Channel from -35 ft (MLW) to -41 ft (MLW) subject to cost reauthorization. In addition, two other navigation channel deepening projects are under evaluation; the first is deepening the Arthur Kill from the Kill Van Kull to Gulfport to -45 ft (MLW), and the second is to extend to Arthur Kill from Perth Amboy Channel Morses Creek.

An Environmental Impact Statement (EIS) is being prepared by the District to evaluate the impacts of the proposed alternatives upon the study area. Pursuant to the Fish and Wildlife Coordination Act (48 Sta. 401, as amended; 16 U.S.C. 661 et seq.), we request that the Service prepare a Fish and Wildlife Coordination Report (FWCR) as per the attached Scope of Work (SOW) to be incorporated into the EIS for the proposed project. (Enclosure2).

Please review the enclosed SOW and accompanying proposed actions, and provide a time and cost estimate for your services.

We will coordinate with your agency as needed to assist in your preparation of the report. Should you need additional technical information, please contact Mr. Thomas J. Shea III, Project Planner at (212) 264-5570. For ecological information, contact Ms. Judith Rugg, or Ms. Jenine Gallo of my Environmental Analysis Branch at (212) 264-0209 respectively.

Sincerely,

Frank Santomauro

Frank Santomauro, P.E.
Chief, Planning Division

Enclosures

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
927 North Main Street (Bldg. D1)
Pleasantville, New Jersey 08232

FP-99/007

April 21, 1999

Frank Santomauro, P.E.
Chief, Planning Division
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, New York 10278-0090

Dear Mr. Santomauro:

This responds to the U.S. Army Corps of Engineers' (Corps) January 29, 1999 letter, which provided comments on the U.S. Fish and Wildlife Service's (Service) Planning Aid Report (PAR), dated August 1998, for the proposed New York and New Jersey Harbor Navigation Study (HNS). We apologize for the delay in responding to the Corps letter.

AUTHORITY

The following comments provide technical assistance only and do not constitute comments by the Service as afforded by the Fish and Wildlife Coordination Act (48 Stat. 401; 16 U.S.C. 661 *et seq.*) nor do they preclude comment on any forthcoming environmental documents pursuant to the National Environmental Policy Act of 1969 as amended (83 Stat. 852; 42 U.S.C. 4321 *et seq.*) (NEPA).

SERVICE COMMENTS

The Corps stated that the Red Hook Channel has been eliminated from further consideration for the proposed project. We will incorporate this change into our upcoming Fish and Wildlife Coordination Act report for the HNS.

We also note the Corps concurrence with the majority of the Service's 13 recommendations to minimize impacts of the proposed project to the high-quality fish and wildlife habitats within the New York / New Jersey Harbor Estuary.

The Service's PAR recommended, that the Corps determine the reason for high concentrations of fish in channels versus shoals and determine key concentration areas for commercially and recreationally important fisheries. It is known that channels within Raritan Bay yield more fish per unit sampling effort using an 8.5-meter otter trawl. However, it is not known what the response of fish would be to deepening and widening existing channels. It would not be safe to conclude from existing data that there would be an increase in the number of fish using channels if the channels were widened. The Corps responded to this recommendation by stating that sampling to determine fish species composition, density, and population structure throughout the study area is currently being performed. Additionally, the Corps stated that it was beyond the scope of the current study to determine reasons behind fish distribution within the study area.

While determining the reasons for fish concentrating in channel areas may be difficult, such information would allow the Corps to more accurately predict any adverse impacts of channel alterations. Unfortunately, it appears that the schedule for the proposed project will not allow for a thorough examination of this issue prior to completion of the Environmental Impact Statement. Therefore, the Service recommends that the Corps design a sampling plan to determine the impacts of channel deepening and widening on fish populations within the study area. Such a study would presumably include sampling fish abundance and composition in channel and adjacent shoal areas prior to and after channel alterations. The Service recommends designing the study in cooperation with appropriate state and federal natural resource agencies.

The Service recommended in the PAR that the Corps evaluate the impacts of expansion of land-based port facilities on fish and wildlife resources. The Corps responded that indirect impacts anticipated from implementating a comprehensive navigation improvement plan would be analyzed. Unfortunately, the Corps concludes in its November 1998 report entitled "New York and New Jersey Harbor Navigation Study; Without-Project Condition Report" that filling over 700 acres of open water and wetlands for port facility expansion will be considered the without-project, future condition. Therefore, it is unclear what indirect impacts the Corps would evaluate as part of the HNS. To fully evaluate environmental effects consistent with Section 1502.16 of the Council on Environmental Quality's NEPA regulations, impacts to fish and wildlife resources associated with large fills proposed for land-based port facility expansions must be evaluated as potential indirect impacts for the HNS.

The Service recommended in the PAR that the Corps conduct 11 studies to determine the effect of dredging with respect to contaminants and disturbance on a range of receptors including: peregrine falcon (*Falco peregrinus*); black-crowned night-heron (*Nycticorax nycticorax*); snowy egret (*Egretta sacra*); double-crested cormorant (*Phalacrocorax auritus*); greater scaup (*Aythya marila*); and, sentinel bivalves. We note that the Corps is funding the first study that was recommended to determine the prey base of peregrine falcons within the study area. We concur with the Corps that the results of this ongoing study will determine the need for two additional studies regarding the peregrine falcon.

Since the issues related to the additional Service-recommended studies are complex, we feel it would be best to discuss the merits of these studies on a conference call or in a meeting. We understand the Corps is concerned about the usefulness of some of the studies and the tight time frames involved in completing an Environmental Impact Statement for the HNS. However, we feel that studies to document the effects of the proposed project on fish and wildlife resources are warranted, especially with regard to contaminants.

The Service looks forward to continued work with the New York District on the HNS. Should you have any questions regarding these comments, please contact me or have your staff contact Thomas McDowell or John Staples of my staff at (609) 646-9310.

Sincerely,

for Clifford G. Day
Supervisor

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

9 March 1998

REPLY TO ATTENTION OF
Planning Division

Clifford G. Day, Supervisor
U.S. Fish & Wildlife Service
New Jersey Field Office
927 North Main Street
Bldg. D-1
Pleasantville, New Jersey 08232

Dear Mr.Day:

The New York District, as part of ongoing coordination, is initiating Fish & Wildlife Coordination Act Report (FWCAR) and Endangered Species Act (ESA) consultation with the US Fish and Wildlife Service in order to identify potential effects and environmental concerns of proposed navigational improvements to the New York/New Jersey Harbor. A Planning Aid Report (PAR) is requested while the project is still in the early phases of plan formulation in an effort to identify any biological or environmental concerns and modify project plans accordingly.

Enclosed is a scope of work (SOW) specifying our requirements for a Fish and Wildlife Service Planning Aid Report (PAR) for the proposed New York and New Jersey Harbor Deepening Project.

Please provide your cost proposal as soon as possible. The cost estimate should display the personnel and the level of effort needed for each individual task described in Section 1(A) of the SOW.

Negotiations, if necessary, will be conducted via telephone after the receipt of the cost proposal by the Corps. Your proposal may be faxed to: Jenine Gallo at FAX (212)264-5472.

If you have any questions, please contact Ms. Gallo at (212)264-4740.

John Sassi

John Sassi, P.E.
Chief, Planning Division

FISH AND WILDLIFE SERVICE
Ecological Services
927 North Main Street (Bldg. D1)
Pleasantville, New Jersey 08232

Tel: 609-646-9310
FAX: 609-646-0352

MHS

IN REPLY REFER TO:
ES-96/221

January 30, 1997

Mr. Stuart Piken, P.E.
Chief, Planning Division
Department of the Army
New York District, Corps of Engineers
Jacob J. Javits Federal Building
New York, New York 10278-0090

Dear Mr. Piken:

This responds to your December 11, 1996 request to the U.S. Fish and Wildlife Service (Service) for initiation of consultation pursuant to Section 7 of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) regarding a comprehensive study of navigational needs for the Port of New York - New Jersey being conducted by the U.S. Army Corps of Engineers, New York District (Corps). The study is being conducted to address improvements to navigation channels in the Port, including a proposal to deepen existing channels to depths of 50 feet or greater, in order to provide economically efficient navigation to meet current and future Port needs. The Port of New York - New Jersey study area includes the Ambrose and Anchorage Channel, New York and New Jersey Channels, Newark Bay Channel, Hudson River Channel, Bay Ridge and Red Hook Channel, Port Jersey Channel, Claremont Channel, and Buttermilk Channel.

Your December 11, 1996 correspondence also requested that the Service's New Jersey Field Office provide a draft Scope of Work (SOW) to prepare a report pursuant to the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*) for the aforementioned study. The Service's draft SOW will be forthcoming under separate cover.

AUTHORITY

This response is provided pursuant to the Endangered Species Act to ensure the protection of endangered and threatened species and does not address all Service concerns for fish and wildlife resources. These comments do not preclude separate review and comment by the Service as afforded by the Fish and Wildlife Coordination Act, nor do they preclude comments on any forthcoming environmental documents pursuant to the National Environmental Policy Act of 1969 as amended (83 Stat. 852; 42 U.S.C. 4321 *et seq.*).

PRINTED ON RECYCLED PAPER

FEDERALLY LISTED SPECIES

This response has been coordinated with the Service's New York Field Office, and, therefore, provides information regarding federally listed threatened and endangered species occurring within both the New Jersey and New York portions of the study area.

Peregrine Falcon (*Falco peregrinus*)

The peregrine falcon, a federally listed endangered species, is known to nest on bridges and buildings within New York City and the surrounding urban areas. Several of these nests occur on bridges spanning the waterways included within the study area or on buildings directly adjacent to these waterways. The peregrine falcon breeding season is March 1 through August 1; however, peregrines have been observed wintering in the area and are considered year-round residents. Peregrines may be expected to forage for prey within the project area. Peregrines generally feed on songbirds, gulls, terns, shorebirds, and wading birds. As the peregrine falcon population continues to recover and expand, additional bridges or buildings within the study area may attract nesting peregrine falcons in future years.

Piping Plover (*Charadrius melodus*)

Nesting areas for the piping plover, a federally listed threatened species, occur within and in the vicinity of the study area at Sandy Hook, New Jersey and Long Island, New York. The piping plover breeding season is from April 1 through September 1. These small shorebirds are territorial and may nest on sand beaches, gently sloping foredunes, blowout areas behind primary dunes, washover areas cut into or between dunes, ends of sandspits, or on sites with deposits of suitable dredged or pumped sand or sandy gravel. Piping plover nests consist of a shallow scrape in the sand, frequently lined with shell fragments. Nests are often found near small clumps of vegetation. Piping plovers feed primarily on marine macroinvertebrates such as marine worms, fly larvae, beetles, and crustaceans. Feeding areas include intertidal portions of ocean beaches; ocean washover areas; mudflats; sandflats; wrack lines (organic ocean material left by high tide); and shorelines of coastal ponds, lagoons, and salt marshes.

The piping plover is susceptible to a variety of impacts including beach stabilization and renourishment projects and disturbance from human activities, which can cause parent birds to desert the nests and prevent juvenile birds from feeding during critical periods in their development.

Seabeach Amaranth (*Amaranthus pumulis*)

The seabeach amaranth, a federally listed threatened plant, has been documented to occur on coastal beaches along the south shore of Long Island, New York. The seabeach amaranth is an annual plant and primarily occurs on overwash flats at the accreting ends of barrier beach islands and lower foredunes of non-eroding beaches. The species occasionally establishes small temporary populations in other habitats, including bayside beaches, blowouts

in foredunes, and sand and shell material placed as beach replenishment or dredge spoil. The seabeach amaranth appears to be intolerant of competition and does not occur on well-vegetated sites. The seabeach amaranth growing season is generally May 1 through November 1, although the actual growing season may extend later or end earlier depending on weather conditions. Threats to the seabeach amaranth include construction of beach stabilization structures, beach erosion and tidal inundation, beach grooming, and destruction by off-road vehicles.

Northeastern Beach Tiger Beetle (*Cicindela dorsalis dorsalis*)

The northeastern beach tiger beetle, a federally listed threatened species, was historically found along the undeveloped Atlantic coastal beaches of Long Island, New York, and from Sandy Hook to Holgate, New Jersey. The Service has recently initiated recovery activities to restore this diurnal, predatory insect to portions of its former range. In fall 1994 and 1995, a project to develop and field test a larval translocation technique using larvae of the northeastern beach tiger beetle was undertaken by the Service, in cooperation with the National Park Service, at the Gateway National Recreation Area, Sandy Hook Unit, New Jersey. During subsequent summer surveys of the translocation area conducted in 1995 and 1996, adult northeastern beach tiger beetles were observed, confirming that reintroduced larvae were able to successfully over-winter, pupate, and emerge as adults. Continued monitoring and protection of the site will determine the long-term survival and viability of the translocated beetles. To meet recovery objectives for the species, the Service is considering expanding efforts at Sandy Hook to include a spring translocation of beetle larvae, and annual supplemental translocations as necessary to establish a reintroduced population of northeastern beach tiger beetles at Sandy Hook, New Jersey. Prior to the initiation of long-term reintroduction efforts, the Service will prepare an assessment of environmental impacts.

Northeastern beach tiger beetle larvae occur over a relatively narrow band of the upper intertidal to high drift zone, thus many larvae are regularly covered during high tide. Tiger beetle larvae are "sit-and-wait predators," which dig vertical burrows in the sand and wait at the burrow mouth, rapidly extending from their burrows to seize small prey passing nearby. Primary prey items are small amphipods, flies, and other beach arthropods. Additionally, adult northeastern beach tiger beetles have been observed scavenging on dead amphipods, crabs, and fish. Northeastern beach tiger beetle larvae pass through three developmental stages (or instars) during a full two-year life cycle, typically over-wintering twice as larvae, pupating at the bottom of their burrows, and emerging as winged adults during their third summer. The northeastern beach tiger beetle is threatened by destruction and disturbance of its natural beach habitat from shoreline development and beach stabilization projects, high recreational use, offshore spills of oil or other contaminants, pesticide spraying for mosquito control, and natural phenomena such as winter beach erosion, flood tides, and hurricanes.

Except for the aforementioned species and an occasional transient bald eagle (*Haliaeetus leucocephalus*), no other federally listed or proposed threatened or endangered flora or fauna under Service jurisdiction are known to occur within the vicinity of the study area.

Species Under the Jurisdiction of the National Marine Fisheries Service

Marine turtles are known to use bay habitats during summer months in the vicinity of the study area. Marine turtles that could occur in the study area include the endangered Atlantic ridley (*Lepidochelys kempii*), hawksbill (*Eretmochelys imbricata*), and leatherback (*Dermochelys coriacea*) turtles, as well as the threatened green (*Chelonia mydas*) and loggerhead (*Caretta caretta*) turtles.

Principal responsibility for threatened and endangered marine species, including marine turtles, is vested with the National Marine Fisheries Service (NMFS). Therefore, the NMFS should be contacted at the following address to fulfill consultation requirements pursuant to Section 7(a)(2) of the Endangered Species Act:

National Marine Fisheries Service
Habitat and Protected Resources Division
Sandy Hook Laboratory
Highlands, New Jersey 07732
(908) 872-3023

Potential Project-Related Adverse Impacts to Federally Listed Species

In accordance with Section 7(a)(2) of the Endangered Species Act, an assessment of potential direct, indirect, and cumulative impacts is required for all federal actions that may affect federally listed species. To assist the Corps in meeting the aforementioned requirement, the Service has reviewed the study area with regard to the proposed channel deepening and has identified potential impacts to federally listed species that may occur during or as a result of project implementation, as summarized below.

- The peregrine falcon and piping plover may be directly affected through disturbance from blasting and / or operation of dredging equipment conducted in close proximity to nesting areas during the breeding season.

- Due to its high position in the food chain, the peregrine falcon is at risk of significant dietary exposure to persistent, bioaccumulating environmental contaminants such as dioxins, polychlorinated biphenyls (PCBs), chlorinated pesticides and mercury. Channel deepening may result in the resuspension and redistribution of surface sediments that contain high levels of contaminants, including the aforementioned bioaccumulating compounds. If channel deepening were to cause resuspension of

contaminated sediments, dioxins and other bioaccumulating compounds may enter the food chain, leading to exposure and potentially adverse effects in peregrine falcon. Additionally, while resuspended, contaminated sediments may be transported into less contaminated shallow water habitats, thereby posing risks of adverse effects for directly exposed benthic organisms such as northeastern beach tiger beetle larvae or other macroinvertebrates that comprise the prey base for the tiger beetle and / or the piping plover.

- Channel deepening may cause changes in other water quality parameters such as temperature regimes, dissolved oxygen levels, and turbidity. All of these parameters affect the distribution and abundance of aquatic organisms in the project area. Therefore, even temporary degradation of water quality may result in the direct mortality of northeastern beach tiger beetle larvae or may cause a decrease in the benthic macroinvertebrate prey base for the tiger beetle and the piping plover.

- Project-related changes in water velocity, sediment transport, and increased wave action due to increased ship traffic (comprised of larger vessels) may increase erosion or otherwise result in adverse modification of the coastal beach habitat for the piping plover, northeastern beach tiger beetle, and seabeach amaranth.

- Proposed dredge disposal sites have not been identified within the current project description. However, disposal of dredged materials at sites with, or within the vicinity of, occurrences of federally listed species may adversely affect these species through: disruption of peregrine falcon or piping plover courtship, nesting or feeding activities; direct burial of piping plover nests, seabeach amaranth plants, or northeastern beach tiger beetle larvae; loss or degradation of habitat; or, changes in water quality.

To comply with requirements of the Endangered Species Act, the Service recommends that the Corps prepare a Biological Assessment to address the aforementioned potential impacts and any additional potential impacts to federally listed species, as identified by the Corps during project planning. The lead federal agency for a project has the responsibility under Section 7(c) of the Endangered Species Act to prepare a Biological Assessment, if the proposal is a major construction project that requires an Environmental Impact Statement (EIS). The assessment should contain information concerning listed or proposed species that may be present in the action area and an analysis of any potential effect of the proposed action on such species. The following may be considered for inclusion in a Biological Assessment of the proposed project, although actual contents are at the discretion of the federal authorizing agency:

- results of field surveys to determine if listed species are present or occur seasonally;

- o views of recognized experts on the species;
- o literature review;
- o analysis of direct, indirect, and cumulative effects of the action on the species; and,
- o analysis of alternative actions.

Biological Assessments may be consolidated with documents produced under interagency cooperation procedures required by other statutes such as the Fish and Wildlife Coordination Act or the National Environmental Policy Act. However, the satisfaction of the requirements of these other statutes does not in itself relieve a federal agency of its obligation to comply with the Biological Assessment procedures of the Endangered Species Act. If the Biological Assessment indicates that no listed or proposed species are present or will be affected, and the Service concurs, in writing, with the assessment, then no formal consultation pursuant to Section 7 will be required.

The Service appreciates the opportunity to be involved in review of this project early in the project planning process and looks forward to working cooperatively with the Corps to address concerns for the protection of federally listed threatened and endangered species through ongoing informal consultation.

Requests for site-specific information regarding federally listed threatened or endangered species occurring within the New York portion of the study area should be addressed to the Service's New York Field Office at the following address:

Ms. Sherry Morgan
U.S. Fish and Wildlife Service
New York Field Office
3817 Luker Road
Cortland, New York 13045
(607) 753-9334

Please contact Annette Scherer or Pete Benjamin of my staff if you have any questions regarding the information provided in this letter or require further assistance regarding federally listed threatened or endangered species occurring in the New Jersey portion of the study area.

Sincerely,

Robert Franke

for Clifford G. Day
Supervisor

FEIS APPENDIX A-1.4

DEIS DISTRIBUTION LIST

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FEIS APPENDIX B

TECHNICAL APPENDICES

FEIS APPENDIX B-1.1

HYDRODYNAMIC, WATER QUALITY AND COASTAL ZONE EROSION MODELING

APPENDIX B-1.1a: Hydrodynamic, Water Quality and Coastal Zone Erosion Modeling

1. HYDRODYNAMIC, WATER QUALITY AND COASTAL EROSION MODELING

Introduction

Simulation of the effects of channel deepening on hydraulics, salinity, water temperature, and dissolved oxygen (DO) requires the use of a sophisticated three-dimensional (3-D) model. The model selected for this study was MIKE3, a modeling system for 3-D simulation of unsteady flows in rivers, estuaries, and coastal seas. MIKE3 allows for easy integration of hydrodynamic and water quality simulations, straightforward modifications to system geometry/bathymetry, and fine-grid resolution in areas of potential deepening.

Objectives

The objectives of the modeling effort were: (1) to develop an accurate model of New York and New Jersey Harbor and surrounding waters, calibrated to and verified for existing conditions; (2) to simulate the existing hydrodynamic, salinity, temperature, and DO dynamics of the Harbor; (3) to evaluate changes in these dynamics under with- and without-project conditions; and (4) to assess the effects of various deepening alternatives under extreme conditions, including high and low freshwater flows, light winds, and high temperatures.

Previous Investigations

New York and New Jersey Harbor is part of a complex coastal ocean/estuarine system which includes the Harbor, the New York Bight, Long Island Sound, and the Hudson River and Raritan River estuaries. The system is influenced by variable tides, winds, and density gradients induced by freshwater inflows and other factors. The system also includes broad, shallow bays; and both narrow and winding, and straight and deep riverine channels.

A large volume of literature exists regarding New York Bight, Long Island Sound, and surrounding estuarine waters, an area where considerable research has been carried out. Previous studies have considered the hydrodynamics and water quality of the Harbor (Jay and Bowman 1975), and circulation patterns within the New York Bight (Beardsley and Boicourt 1981). Of particular interest in the present study are previous 3-D numerical modeling efforts. Among the first 3-D modeling studies was the work of Oey *et al.* (1985), which demonstrated a number of complex processes that exist in the Harbor, including density currents and variations in wind-forcing. More recent modeling efforts include the work of Scheffner *et al.* (1994), who developed a large-domain model that covered the Bight, Long Island Sound, and its connection to the Harbor via the East River; and Letter *et al.* (1996) who described a similar 3-D model that, in order to capture complex tidal interactions and phasing in Upper New York Bay, the Arthur Kill and Kill Van Kull, and the Harlem River, included more detailed resolution of these areas.

The complex interactions between the various sub-components of the system are important factors controlling transport in the Harbor. Blumberg and Galperin (1990), for example, demonstrated the importance of the coupling between the New York Bight and Long Island Sound during the summer months. Building on the work of Jay and Bowman (1975), Blumburg and Pritchard (1997) performed a detailed model study and analysis of the East River that supports a general pattern of long-term net flux out of Long Island Sound and into the New York and New Jersey Harbor. Most recently, Blumberg *et al.* (in review) developed a comprehensive 3-D model of the hydrodynamics and salinity of the harbor, which illustrates general patterns of long-term net transport throughout the harbor. The model achieves considerable precision, accuracy, and utility over a range of time scales.

Previous studies demonstrate the complex dynamics of the Harbor and suggest that full consideration of the system requires a 3-D model of hydrodynamics, salinity, DO, and temperature applied to an extensive, yet detailed, domain. As outlined in the following sections, the model used in the present study incorporates these features.

Adopted Model

The hydrodynamic and water quality modeling was performed using MIKE3, a general 3-D modeling system developed by the Danish Hydraulics Institute. The application of the model, which is continually updated, solves equations that represent the conservation of fluid mass and momentum, the transport of salt and temperature, and the chemical and biological interactions between BOD, nutrients, and bacteria that govern the concentrations of DO in the water. MIKE3 includes nested orthogonal grids, a bottom-resolving (bottom-fitted) coordinate system, a mixed Smagorinsky/k-ε turbulence-closure model, wind-forcing, and time-dependent point source input (over 90 point sources are used in the present model setup). Spatial discretization within the model is based on the finite-difference technique.

In developing modeling strategy it is important to create a computational grid that defines the model domain. In the present study, a nested-grid system was employed; this system uses a varying degree of refinement depending on location relative to the areas of interest. The finest resolution is applied to the Harbor proper and to its associated channels, with coarser resolution applied to surrounding areas. The model grid is illustrated in Figure B-1.1-1. Model resolution varies by study area section; horizontal resolution varies from 6645 ft in the New York Bight and eastern Long Island Sound overall, to 2215 ft in parts of the Bight and Sound, to 738 ft in Lower New York Bay and the Upper East and Hudson Rivers, and to 246 ft in the main project areas, including Upper New York Bay, the Kill Van Kull, Newark Bay, and northern Arthur Kill. Vertical resolution in all areas is 6.5 ft. This "dynamically nested" version of MIKE3 described above was adopted in order to refine the model resolution in the vicinity of the navigation channels without an excessive increase in the number of computational points (and attendant CPU time). With the present configuration the model includes on the order of 200,000 computational points.

Available Data

The bathymetry and computational grid for the MIKE 3 simulations evolved from a grid developed for the USACE Waterways Experiment Station (WES) Harbor-Apex Model (Letter *et al.* 1996). The Harbor-Apex Model (HAM) bathymetry data were compared with data from various other sources, including bathymetric surveys and NOAA coastal charts, and were revised as necessary to better define the bathymetry in areas where the MIKE 3 grid shows increased resolution. Particular attention was paid to the existing navigational channels in Kill Van Kull, Arthur Kill, and both Lower and Upper New York Bays.

Hydrodynamic data for model calibration and verification consisted of measured elevations and currents from surveys performed in 1991 and 1994-1995. NOAA predictions for elevations and currents were also used to increase the geographic extent of the comparison data. Locations of the hydrodynamic data sites are shown in Figure B-1.1-2. Additional elevation stations (not included in the figure) were located upstream on the Hudson River at Dobbs Ferry, West Point, Poughkeepsie, and Albany. The 1994-1995 data also included current measurements at College Point, Red Hook (near the Brooklyn Bridge), and the Harlem River. Water quality data, including salinity, temperature, DO, and several other parameters, were also available for the 1991 and 1994-1995 periods. Station locations from these surveys in the vicinity of the project areas are shown in Figure B-1.1-3. Additional data required for the 3-D model include air temperature, wind speed, and precipitation from surrounding airport and offshore recording stations; river discharges from USGS stream gaging stations; and the chemical composition of effluents from water pollution control facilities.

Interagency Coordination

The modeling effort has been coordinated with and received data from a number of federal and state agencies. These include USACE-WES, NYCDEP, NJDEP, NYSDEC, USGS, the National Weather Service (NWS), and NOAA. A national expert panel established by USACE-NYD provided technical review. Comments received from theses reviewers were addressed through revisions to the models.

Selection of Boundary Conditions

The model boundaries illustrated in Figure B-1.1-1 extend to approximately Atlantic City, New Jersey, to the south, to Shinnecock Inlet and Orient Point (on the Atlantic Ocean and Long Island Sound, respectively) to the east, and up the Hudson River to the Federal Dam at Troy, New York. Tidal boundary conditions at the offshore locations were created from USACE's tidal constituent database, which is based on large-domain tidal simulations using the coastal/ocean model ADCIRC (Westerink *et al.* 1993). These data were adjusted slightly to match predicted elevations at locations just inside the model boundary. Temperature and salinity boundary conditions were obtained from measured salinity and temperature profiles, where available, and

from climatological data. Measured wind speed and direction were obtained from Newark Airport and from data recorded off shore at Ambrose Light. Temperature data were obtained from the Central Park National Weather Service station as well as the Ambrose Light data set.

Daily averaged freshwater discharges at the Hudson, Passaic, Raritan, Rahway, Hackensack, Saddle, Second, and Third Rivers were specified in the model, as were discharges from the Connecticut, Quinnipaic, Norwalk, and Housatonic Rivers, all of which discharge into Long Island Sound. Additional sources of freshwater specified in the model included wastewater treatment plant discharges, which were estimated from operating records at over 70 different locations, and stormwater runoff derived from daily rainfall estimates. All sources of freshwater were entered at a constant temperature of 71.6°F.

Model simulations were initiated with a zero-velocity field and a level (or gently sloping) surface elevation, the latter depending on boundary elevations at the start of the simulation. The initial distributions of salinity and temperature were created from available measurements of temperature and salinity. These data were sufficient to create model temperature and salinity fields, which stabilized after several days' run-time, reducing the spinup period.

Model Calibration and Verification

As noted above, calibration and verification data were collected during the 1991 and 1994-1995 survey periods. Data were collected by means of tide gauges, moored velocity meters, moored and cast conductivity-temperature-density (CTD) probes, and grab samples. Hydrodynamic data from 1991 were collected for a 4-6 week period, with weekly and biweekly temperature and salinity measurements taken. The hydrodynamic calibration was performed for approximately 36 days, from 24 June through 30 July 1991. Hydrodynamic and water quality data from the 1994-1995 period were collected from approximately November 1994 to October 1995. The hydrodynamic verification and water quality calibration periods were identical, from 21 August to 29 September 1995. An additional, longer period of approximately 60 days was run between May and August 1995 for the water quality model verification. Results of these calibration and verification tests indicate that the model results reasonably matched measured data for hydrodynamic and water quality components.

To test the model response to different grid resolutions and time steps, model sensitivity analyses were conducted. The results of these investigations indicated that the grid setup shown in Figure B-1.1-1 produces an accurate and computationally efficient solution when run with a 30-sec timestep. The results also indicated that a coarser grid setup, in which the 246-ft sub-grid was removed, could provide a reasonably accurate solution throughout much of the domain using a 60-sec timestep. The hydrodynamic solution in project areas was, however, improved with the 246-ft grid included, a conclusion based primarily on improvements in elevation amplitudes and phase that occur with the finer grid. Model runs were also performed with the water quality model using up to a 3-min timestep. Water quality results also indicated that results were improved with a 60-sec timestep in the coarse grid setup and 30-sec timestep in the fine grid

setup. Additional analyses were conducted with the water quality model to evaluate sensitivity to levels of sediment oxygen demand (SOD) in the system.

Conditions Evaluated

The model was used to simulate three channel-deepening conditions: (1) existing conditions; (2) baseline, or future without-project conditions; and (3) future with-project conditions. The intent of the modeling work was to evaluate the potential impacts of channel improvements/deepening under conservative (i.e. relatively severe) conditions as regards water quality (as represented by dissolved oxygen) and salinity. Accordingly, examination of future conditions focused on summer conditions characterized by low freshwater flows, high temperatures and minimal winds. It should be recognized that this modeling scenario is not particularly realistic, but constitutes a "worst" case examination of potential impacts associated with channel improvements/deepening. Two flow conditions were examined for each channel condition, namely a low (min30Q10)[1] and high (max30Q10)[2] freshwater input. None of the channel deepening alternatives included any fill or reclamation. The assumed depths for the baseline and future scenario conditions are shown in the table below.

Navigation Channel Depths for Model Runs

Channel	Future Without-Project Conditions (ft, MLW)	Future With-Project Conditions (ft, MLW)
Ambrose	45	53
Bay Ridge	40	50
Port Jersey	41	50
Kill Van Kull	45	50
Newark Bay	45	50
Arthur Kill to Howland Hook	41	50
Arthur Kill to Gulfport	40	40

Tidal-forcing and offshore salinity, temperature, and DO boundary conditions for the evaluation runs were selected from the 1995 August-September simulation period. Initial conditions for temperature, salinity, DO, and other water quality parameters were selected from this period as well. These conditions correspond to a period of low seasonal flow in the Hudson River and other tributaries. The conditions are considered appropriate for initializing the low-flow

[1] min30Q10 is the minimum summertime 30-day average flow with a cumulative probability of occurrence of less than or equal to 0.1.

[2] max30Q10 is the maximum summertime 30-day average flow with a cumulative probability of occurrence of less than or equal to 0.1.

scenarios and conservative for initializing the high-flow scenarios. Each scenario run is long enough (more than 30 days) to allow for sufficient spin-up and response of the salinity and DO fields.

Simulations to Assess the Impacts of Future Without-Project Conditions

Model simulations were made to determine the impact of future without-project conditions. This condition is treated as a baseline and reflects the deepening (relative to existing conditions) that corresponds to the currently authorized "45 foot channel" for New York Harbor. Except where specifically noted, emphasis is placed on the low-flow scenario that produced the highest salinity and lowest DO values as discussed above. It should be noted that the impacts of the proposed deepening project are associated with the difference between future and baseline conditions. Results for baseline/existing conditions are provided for reference.

Changes in water surface elevation, temperature, salinity, and DO between channels with differing depths vary over the duration of the simulation. This is a natural consequence of the scenarios that were posed for testing the channel deepening alternatives. Accordingly, there is range of change in model output associated with the alternatives. Average and maximum values of change are referenced below where appropriate.

Low Flow Conditions

Water surface elevations for low flow conditions are virtually unchanged throughout the system. The maximum difference in tidal range is less than 0.6 in. Similarly, the changes in system temperature, salinity, and DO are small. The maximum increase in salinity occurs in the Passaic River where the maximum increase is estimated to be 0.3 ppt. There were no measurable changes in average salinity for the Hudson, East, or Harlem Rivers.

Differences in DO levels between existing and baseline conditions were negligible at all locations. The largest reduction in DO was 0.2 mg/l. It should be noted that the commonly accepted accuracy limit for DO field measurements is 0.1 mg/l.

High Flow Conditions

There is little change in water surface elevations for high flow conditions and the maximum difference in tidal range is less than 0.5 in. As was the case for low flow, the changes arising from the changes in temperature, salinity, and DO are small. The maximum increase in salinity occurs in near Howland Hook where the salinity increases about 0.2 ppt, which is lower than the increase for low flow. As was the case for low flow, there are no measurable changes in average salinity for the Hudson, East, or Harlem Rivers.

Differences in DO levels between existing and baseline conditions were negligible at all locations within New York Harbor, the Hudson River and surrounding areas, with the largest reduction in DO less than 0.1 mg/l.

Simulations to Assess the Impacts of Future With-Project Conditions

Additional runs were conducted in order to assess the impact associated with the future with project condition comprised of deepening portions of the Arthur Kill and Newark Bay, and the Kill Van Kull, Port Jersey, and Bay Ridge, to 50 ft MLW and deepening the Ambrose Channel to 53 ft MLW as indicated in the above table. Comparisons were made between the baseline (without-project) conditions and future (with-project) conditions. Results of these runs are discussed below for the low and high flow scenarios

Low Flow Conditions

The proposed future with-project deepening will produce minor changes in water surface elevations under low flow conditions (i.e., maximum difference in tidal range is less than 1.6 in).

The changes in salinity between future and baseline conditions are small with a maximum average change of 0.7 ppt. The largest relative change occurred near Howland Hook and the maximum average salinity change in the remaining areas of the study area is 0.2 ppt or less. Changes in salinity for the low flow condition are summarized in Figure B-1.1-4, which presents surface salinity contours for future and baseline conditions. A point near Howland Hook experienced the maximum instantaneous increase in salinity of 1 ppt whereas the maximum instantaneous value for the remaining areas was less than 0.5 ppt. The maximum salinity difference value coincides with a neap tide condition characterized by an unusually small tide range.

Overall, the average differences in dissolved oxygen between future and baseline conditions are very small and maximum instantaneous reduction within New York Harbor, the Hudson River and surrounding areas was 0.13 mg/l. Additionally, it should be noted that increases in dissolved oxygen are indicated for some areas of the harbor. Figure B-1.1-5 summarizes changes in dissolved oxygen, presented as surface dissolved oxygen contours, for future and baseline conditions under low flow.

High Flow Conditions

Changes in water surface elevations for high flow conditions are virtually unchanged throughout the system. The maximum difference in tidal range is less than 1.5 in.

Changes in salinity between future and baseline conditions are small with a maximum average change of 0.7 ppt (i.e., same as the 0.7 ppt value for low flow conditions). The largest relative change was again found near Howland Hook and the maximum average salinity increase at the

remaining stations is 0.4 ppt or less. Neglecting the Howland Hook location, the largest maximum instantaneous increase in salinity is 1 ppt compared to a baseline value of 15.6 ppt (7% increase).

The maximum differences in dissolved oxygen between future and baseline conditions range from –0.18 to 0.36 mg/l.

Coastal Erosion Modeling

Changes in bottom topography associated with deepening affect the direction and magnitude of wave propagation. Shoreline reaches in the Harbor and New York Bight may be affected by wave action caused by offshore storm events and by local winds. In addition, ship generated waves (wakes) in the navigation channels may be sufficient to contribute to erosion of channel banks. To address these issues, additional modeling was performed to assess the potential impacts of harbor deepening on coastal areas, specifically related to erosion of adjacent shorelines.

The objective of the coastal erosion modeling was to simulate the wave environment for existing and future with project conditions and to evaluate changes in the wave environment which may increase the potential for coastal erosion. Since the wave environment in the project area varies by location, the modeling was divided into two parts. The Lower New York Bay is open to waves propagating in from New York Bight and is sufficiently broad to allow wave generation by local winds. Channel deepening in Lower New York Bay may affect the propagation of these waves. Due to the generally uni-directional wave movement induced by the Narrows, however, channel deepening in Upper New York Bay will have little effect on the wave climatology in this region. A greater effect of deepening may be encountered in the confined navigation channels due to wakes generated from larger ships.

Two modeling approaches were adopted. For Lower New York Bay, a series of model runs were conducted using a numerical wave model (MIKE21 NSW) to evaluate the impact of deepening on wave propagation. Two depth configurations for the Ambrose Channel were considered: the presently authorized 45-ft depth at MLW and future with project conditions depth of 53 ft MLW. The model was run to examine the effects of deepening Ambrose Channel on waves propagating from offshore locations and on locally generated wind waves. The wave model grid was developed at 164 ft resolution using bathymetry from the existing hydrodynamic model.

For the offshore waves, runs were conducted for a unit wave amplitude propagating from the dominant exposure directions of east, east-northeast, east-southeast, southeast, south-southeast and south. Wave data from the New York Bight suggest that these component directions considered at 4, 6, 8, 10 and 12 second wave periods are sufficient to cover approximately 80 to 90% of wave conditions (USACE 1997). Locally generated waves were generated using winds out of 10 different directions, from west southwest clockwise to north. Wind speeds were varied

from 16.4 to 49.2 ft/s. The results of the wave model runs were evaluated by computing differences in amplification (shoaling) factors between the baseline (45 ft) and future (53 ft) runs over the entire model grid.

The numerical wave model results indicate that deepening Ambrose Channel will increase wave heights in the immediate vicinity of the channel, but that waves on adjacent shorelines will be unchanged in virtually all areas. For waves propagating from offshore the model predicts a small shift in wave energy to the west (due to refraction along the navigation channel) which may adjust the wave climate near Coney Island and Rockaway Point. These adjustments are expected to be very small, as wave heights may decrease along Coney Island and increase at the western tip of Rockaway Point by a maximum of 1-2%. There were no observable changes in the propagation of locally generated wind waves for the two depths modeled.

For Upper New York Bay, an analytical model (PIANC 1987) was applied to estimate ship generated waves that may contribute to erosion along banks of navigation channels. As water flows around the ship, waves are generated at the both bow and stern and a return current (flowing opposite to direction of ship travel) is induced. The bow, or front wave, is created by the transition between the undisturbed water level in front of the vessel and the water level behind it. These waves move obliquely out from the sailing line. The stern wave is the transition between the water level depression and the water level behind the ship. These waves follow the sailing line and may take the form of a breaking wave, depending on the vessel speed and channel depth.

The analytical model considers the effect of vessel speed (V), ship dimensions (length, beam and draft), bow shape, channel depth (d) and width. The Froude number, $F = V/(gd)^{1/2}$, is an important dimensionless parameter in the formulation. For a given vessel size and shape, wave heights generally increase with increasing Froude number. The Froude number will increase with increasing vessel speed but decrease with increasing channel depth. However, for a given Froude number and channel dimensions, wave heights generally increase with increasing vessel size.

The analytical model was run for the Kill Van Kull/Newark Bay channel, the Arthur Kill, Port Jersey and Bay Ridge channels for currently authorized and future with project dimensions. There is a diverse assortment of ships within the harbor, varying in dimension and operating speed. Three vessels were considered: a 1300 TEU container ship, a 6000 TEU container ship, and a tug. The tug functioned as a control vessel in the analysis and was evaluated for both current and future channel dimensions. The 1300 TEU container ship (approximately 33 ft draft) was considered as an example of a small draft vessel for currently authorized channel dimensions, while the 6000 TEU container ship was considered as an example of a large draft vessel for future with project channel dimensions. In order to examine the effects of channel dimensions on waves for a given ship, all three of the above vessels were considered for the current and future channel dimensions of the Kill Van Kull (with the 6000 TEU ship operating at

a reduced draft). A range of vessel speeds was considered based on conversations with harbor pilots.

The results of the analytical ship wake model suggest that ship generated waves are largest when vessels are underway in narrow channels such as the Arthur Kill and Kill Van Kull. Under these conditions, ship generated waves on the order of 2 ft may be observed. In fact, the model shows that larger (6000 TEU) vessels produce a larger wake for a given channel depth, flow area, and vessel speed. This finding suggests that larger vessels could pose a risk of larger waves. The ship wake model however, indicates that ship waves generated by most vessels will decrease under future with project conditions. This is due to the deeper channels, which result in smaller waves. More importantly, the overall decrease in the number of ship calls over the life of the project are expected to reduce the likelihood of shoreline erosion stemming from ship generated waves. For example, preliminary estimates of ship calls from cargo forecasts suggest that ship calls will be reduced by 33% in 2010 under with project conditions. As a result, it is anticipated that an overall reduction in ship passages will reduce the total wake energy absorbed at the shoreline with an attendant reduction in the potential for bank erosion.

APPENDIX B-1.1b: Biological Evaluation of Model Output

1. BIOLOGICAL THRESHOLDS

Several fish and shellfish species have been placed in groups or guilds with similar habitat requirements for the purpose of evaluating the potential impact of changes in water quality and hydrological parameters that may result from the proposed project. A guild is a group of species that exploit a class of environmental resources in a similar manner.

Guilds

The groups or guilds presented and discussed below are based on depth (i.e., shallow vs. deep) and preferred position in the water column (i.e., demersal vs. pelagic). The following are general descriptions of each guild represented:

- SHALLOW-WATER MARSH SPECIES: Species and life-stages generally occurring in intertidal and subtidal marsh habitat in <10 ft of water. Most species are resident, spending their entire life cycle within the estuary and salt marsh. These species and life-stages often rely on salt-marsh vegetation, detritus, and organic matter; which commonly occurs in both tidal pools on the marsh surface and in intertidal creeks and ditches. These species and life-stages are often highly tolerant to fluctuations in salinity and water temperature, and can often endure low (<0.5 ppm) DO concentrations. These species or life-stages may occupy high salt marsh, low salt marsh, or tidal creeks, commonly moving between intertidal and subtidal areas on flood and ebb tides.

- SHALLOW-WATER DEMERSAL SPECIES: Species and life stages generally inhabiting the shallow estuarine waters of the study area. They commonly occur on or near the bottom of tidal creeks, channel slopes, and shoals. These species and life-stages are often able to tolerate low DO levels or extreme water temperatures, often fleeing the area when DO levels in the water are hypoxic or, if they remain, reducing their metabolism or oxygen consumption and burying themselves in bottom substrates. Many species exhibit preferences for a certain type of substrate (e.g., fine sand) or vegetation (e.g., eel grass). This group includes spawning adults of winter and summer residents as well as juveniles of many species that spawn in marine and estuarine environments.

- SHALLOW-WATER PELAGIC SPECIES: Species and life-stages generally encountered in the shallow-water marine and estuarine environments of the study area, and not generally associated with bottom habitats. These species and life-stages occupy intertidal and subtidal areas, and commonly occur along barrier beaches and in shallow surf-zones (i.e., marine species) or in tidal creeks and backwater bays (i.e., estuarine species). This includes the larval and early juvenile life-stages of many marine and estuarine spawning species, which use these areas as nurseries for growth and development. Other species include resident and transient forage species that provide an important trophic link between estuarine and marine

environments. Shallow-water pelagic species and life-stages are generally tolerant of rapidly changing environmental conditions, often exhibiting diel or tide-dependent movements.

- DEEP-WATER DEMERSAL SPECIES: Species and life stages generally occurring on or near the bottom of natural occurring deep waters or channels in the estuarine and marine waters of the study area. These species and life-stages can occur over a variety of substrates, including mud, silt, and fine sand. Many deep-water demersal species are seasonal residents of the estuary, with different life stages spending only a portion of their life-cycle in the project area for spawning, feeding, or growth. These species are generally sensitive to changes in water temperature, DO levels, and salinity, and exhibit seasonal or daily movements in response to changing environmental conditions.

- DEEP-WATER PELAGIC SPECIES: Species and life stages generally occurring in the middle and upper levels of the water column. This includes planktonic egg and larval stages of many marine and estuarine species, as well as schooling pelagic adults and juveniles, which are not generally associated with bottom habitats. Many of these species are transient, spending only a portion of their life-cycle in the project area for spawning, growth, or development, while others are anadromous, migrating through the project area to upstream spawning sites. Most pelagic species and life stages, including planktonic egg and larval stages, are intolerant of rapidly changing water temperatures or DO concentrations. Less motile life-stages are dependent on prevailing tides and currents to enter or leave the area, while adult and juvenile movement patterns often reflect responses to changes in water temperature or DO levels.

The guilds are listed in Tables B-1.1b-1 through B-1.1b-5, which summarize the general habitat parameters of each species by life stage. A change in one or a combination of these parameters could result in an impact on the species at one or more of its developmental stages.

2. PHYSICAL PARAMETERS

Dissolved Oxygen

Oxygen enters the water by photosynthetic activity of aquatic biota and by the transfer of oxygen across the air-water interface (Lerman 1986). The amount of dissolved oxygen (DO) that can be held by water depends on several factors including temperature and salinity. DO concentrations increase with a decrease in water temperature (cold water holds more oxygen than warm). DO concentrations increase as salinity decreases (freshwater holds more oxygen than saltwater) (Smith 1990). Once absorbed, oxygen is either incorporated throughout the water column (via currents and turbulence) or lost from the system (through increase in temperature or biotic respiration) (Lerman 1986, Water SHEDDS 1999). Quite often, DO concentrations decrease with depth because of a lack of mixing, and because benthic biota use available oxygen before it can be replaced.

LMS conducted a study from 1998-1999 (for USACE-NY District) which included measurements of DO throughout the New York/New Jersey Harbor area. A summary of these data is shown in a table in Section 5.3, Physical Resources.

Salinity

Coastal waters often exhibit large variations in salinity. The affect of these variations on marine organisms depends on the organism's ability to respond. The internal fluids of most aquatic organisms are in balance with external salinity. These stenohaline organisms are unable to control their internal salt concentration and are subjected to great stress when external salt concentration changes. Consequently, stenohaline organisms tend to be migratory because they must remain in a water mass of constant salinity. Many organisms can regulate their internal salt concentrations and are referred to as euryhaline species (Lerman 1986). Euryhaline organisms are typical inhabitants of estuarine environments.

The Hudson-Raritan estuary is a partially stratified estuary in which salinity at the surface is typically lower than salinity on the bottom. Differences in salinity between the surface and bottom of the water column are usually on the order of 1-3 ppt, however at times of high freshwater input the difference may be nearly 10 ppt.

Salinity data were collected throughout the study area from October 1998 through September 1999 (USACE-NYD 1999). Measurements were taken at surface, mid-water, and bottom depths. The results are summarized in Section 5.3, Physical Resources.

Temperature

Temperature can exert great control over aquatic communities. It often serves as a behavioral cue, and sudden changes can affect important activities such as spawning and predator-prey interactions. For example, some species need temperature minima or maxima to trigger reproductive behavior, an abrupt change in temperature could cue a spawning event at an inappropriate time. As a result, eggs and larvae may experience higher levels of predation than if spawning had taken place under normal conditions (USEPA 1987).

Water temperature data were collected from October 1998 through September 1999 throughout the study area. The results are summarized in Section 5.3, Physical Resources.

3. PROJECT-RELATED CHANGES

The degree of impact related to changes in physical parameters greatly depends on the species under consideration. Mobile species such as fish and crabs are generally capable of avoiding an area with degraded conditions. Planktonic larvae and egg masses can be carried out of degraded areas by tides and currents. However, sedentary or sessile species, such as mussels, are not able to move away from degraded conditions. Instead, they must rely on physiological responses to

cope with environmental changes. Unfortunately, the duration of physiological responses is not always sufficient to survive the environmental change.

The following is a discussion of the potential impacts of project-related changes in DO, salinity, and temperature on representative species from each guild described above.

Dissolved Oxygen

There are several sites within the project area where DO values are naturally low and fall below New York and New Jersey water quality criterion (See Section 5.3, Physical Resources). These lows are part of seasonal variation in DO that occurs throughout the Harbor, and is dependent on factors such as temperature and riverine input. Typically, low DO values that result from natural processes are temporary and do not pose a significant risk to aquatic organisms. Long-term exposure to low DO concentrations would have an indirect impact on aquatic organisms. These conditions would not directly kill an organism, but could increase its susceptibility to other environmental stresses (Gower 1980).

Project-related changes to DO under low flow and high flow conditions are provided in the Modeling Report.

Guild Analysis

Shallow-Water Demersal Species

Dissolved oxygen-sensitive species identified in this group include juvenile winter flounder, adult northern quahog, juvenile and adult blue crabs, and juvenile Atlantic surf clam.

Winter Flounder. Project-related changes to DO would not affect juvenile winter flounder. Although Dissolved oxygen levels are naturally low in some areas of the Harbor during summer months, the values do not fall below the lower limit of 2.2 mg/l and project-related changes would not depress DO values to this level.

Northern Quahog. Ambient DO does not fall below the lower limit of the adult northern quahog (1.0 mg/l). Project-related changes would be insignificant, so would not depress DO to such and extreme.

Blue Crab. Dissolved oxygen values are naturally below the lower limit for juvenile and adult blue crabs (< 3.0 mg/l) in areas of the Upper Bay during the summer. Project-related changes to DO would serve to depress these values further, but not to a significant extent. Project-related changes in DO would not adversely affect these life-stages of blue crab because reductions in DO occur in summer months when crabs are capable of avoidance behavior (i.e., moving out of a degraded area).

Atlantic Surf Clam. Atlantic surf clams have not been collected in the waters of the Upper Bay, Kill Van Kull, Newark Bay, or Arthur Kill. In the Lower Bay, ambient DO levels would not be reduced to the lower limit of the juvenile Atlantic surf clam (≤ 2 mg/l). Therefore no impact due to project-related changes is expected.

Shallow-Water Pelagic Species

Dissolved oxygen-sensitive species identified in this group include the Atlantic silverside (juveniles and adults), bay anchovy (eggs and larvae), and northern quahog (eggs and larvae).

Atlantic Silverside. Ambient DO levels throughout the Harbor do not fall below the lower limits of juvenile or adult Atlantic silversides (2.6 and 3.0 mg/l, respectively), and would not be depressed to these levels by project-related changes.

Bay Anchovy. Ambient DO levels throughout the Harbor area typically remain above the lower DO limit for bay anchovy eggs and larvae (2.8 or 2.5 mg/l, respectively). Project-related changes would not serve to lower DO values to this extreme level.

Northern Quahog. Ambient DO levels throughout the Harbor are well above the lower limit for northern quahog eggs (< 0.2 mg/l). The negligible change in DO induced by the proposed project would not affect this life-stage. Ambient DO levels in the Upper Bay and the Arthur Kill could be reduced by project-related changes to concentrations below the lower limit for larvae (< 4.2 mg/l). It should be noted, however, that this is based on measurements taken in August 1999 after a regional drought and heat wave, and may not remain constant from year to year. Ambient DO levels are above the lower limit for northern quahog larvae the remainder of the year and would not be depressed significantly by project-related changes. Northern quahog larvae are moved through the water column by currents and turbulence. Therefore it is likely that the larvae would be transported out of the degraded areas in that manner.

Deep-Water Demersal Species

Members of this guild considered sensitive to changes in DO include the northern quahog (adults), blue crab (juveniles and adults), American lobster (juveniles and adults), and the Atlantic surf clam (juveniles and adults).

Northern Quahog. As discussed above, ambient DO levels do not fall below the lower of the adult northern quahog (1.0 mg/l). Project-related changes would be insignificant, so would not depress DO to such an extreme.

Blue Crab. As discussed above, project-related changes in DO would not in themselves result in DO concentrations below the lower limit for blue crab juveniles and adults.

American Lobster. Juvenile and adult American lobsters have extreme lower DO limits of 0.2 and 1.7 mg/l, respectively (depending on temperature and salinity). During the October 1998 through September 1999 biological survey, lobsters were found only in the Lower Bay. Ambient dissolved oxygen concentrations in the Lower Bay such low levels, even in summer, and would not be decreased to these levels even by project-related changes.

Atlantic Surf Clam. As discussed above, DO concentrations would not be decreased to levels below the lower limit for juvenile or adult Atlantic surf clams.

Deep-Water Pelagic Species

Species in this guild considered sensitive to DO concentrations include juvenile American shad, and northern quahog eggs and larvae.

American Shad. The lower dissolved oxygen limit for juvenile American shad is extremely low (< 1.92 mg/l). Ambient DO concentrations throughout the Harbor area are well above this level, and would not be reduced significantly by project-related changes.

Northern Quahog. As discussed above, project-related changes in DO will not result in a reduction of concentrations to levels below the lower limit for northern quahog eggs (< 0.2 mg/l). In certain areas of the Upper Bay and the Arthur Kill, dissolved oxygen levels may be reduced below the lower limits for northern quahog larvae. However, this would only be true if DO concentrations are extremely low during summer months, as observed in August 1999.

Salinity

Estuarine organisms are generally tolerant of fluctuating salinity levels. Under natural conditions, estuarine water can fluctuate between fresh and brackish, depending on riverine input. Aquatic organisms tend to inhabit zones in the estuary according to preferred salinity levels. As in many estuarine systems, salinity in the New York/New Jersey Harbor can vary greatly as freshwater flow varies throughout the year.

Project-related changes to salinity during low-flow and high-flow conditions are presented in the Modeling Report. The changes associated with both conditions would be negligible.

Guild Analysis

Shallow-Water Demersal

Members of this guild that are sensitive to changes in salinity include adult opossum shrimp and adult Atlantic surf clams. Salinity values within the project area are naturally within the ranges of both of these species. Project-related changes would not result in salinity values outside the limits of either species.

Shallow-Water Pelagic

Salinity-sensitive species within this guild include the Atlantic surf clam (larvae), northern quahog (eggs), and blue crabs (larvae).

Atlantic Surf Clam. Atlantic surf clams have only been collected in the waters of the Lower Bay. Salinity there is naturally higher than the lower limit for the larval stage of this species. Project-related changes would result in a negligible increase salinity.

Northern Quahog. Salinity in the Harbor area falls below the lower limit for northern quahog eggs on a seasonal basis. The maximum change projected would increase these salinity values, but only marginally. The upper limit was exceeded in the Upper Bay during August, but this may be an isolated event. The remainder of the year salinities do not exceed the upper limit, and would not exceed the upper limit as a result of project-related changes.

The period when salinity is naturally low does not coincide with periods of heavy spawning in this species. Eggs present in the water column when salinity approaches or exceeds the upper limit would be conducted away from the area by currents and tidal exchange.

Blue Crab. Blue crab larvae are dispersed into ocean waters where salinity is naturally high, therefore they are not normally collected in the waters of the Upper Bay, Kill Van Kull, Newark Bay, and Arthur Kill. Instead larvae would be found in the waters of the Lower Bay. Here, salinity fell below the lower limit of 20 ppt in April, a period that does not coincide with spawning activity in the Harbor area. Project-related changes in salinity would not change these values substantially, and therefore would not affect blue crab larvae.

Deep-Water Demersal

Juvenile and adult American lobster and adult Atlantic surf clam are representatives of this guild that are salinity-sensitive.

American Lobster. American lobsters were found only in the waters of the Lower Bay during the 1998-1999 Biological survey conducted by LMS (for USACE-NYD). Salinity values there do not fall below the lower limits of juvenile or adult lobsters ($\leq$ 16.4 ppt) and would be increased slightly by project-related changes.

Atlantic Surf Clam. During the 1998-1999 Biological Survey, Atlantic surf clams were found only in the waters of the Lower Bay. Salinity values in the Lower Bay do not fall below the lower limit for adults, and would be increased slightly by project-related changes.

Deep-Water Pelagic Species

Salinity-sensitive species included in this guild salinity include the northern quahog (eggs), Atlantic surf clam (larvae), blue crab (larvae) and American lobster (larvae).

Northern Quahog. Northern quahog eggs have a lower salinity limit of ≤ 20 ppt. As discussed above, salinities in most areas of the Harbor fall below this limit only during the winter and early spring. In the Upper Bay salinities occasionally fall below the lower limit during other times of the year. Project-related changes would not substantially change these values, so would not affect this species. Salinity exceeded the upper limit (≥ 32) in the Upper Bay during August. Again, project-related changes would not substantially change these values.

Atlantic Surf Clam. As described above, salinity in Lower Bay waters (where this species is found) is naturally higher than the lower limit for this species. Project-related changes would not be substantial.

American Lobster. American lobster larvae are dispersed into Lower Bay and ocean waters, and are not normally found in estuaries. In the Lower Bay, salinity values do not fall below the lower limit for lobster larvae, and would not be depressed by project-related changes, instead salinity values would experience a negligible increase.

Blue Crab. Like American lobster larvae, blue crab larvae are dispersed into the waters of the Lower Bay and open ocean. They are not usually found in the upper estuary. In the Lower Bay, salinity values were observed to fall below the lower limit for blue crab larvae (< 21 ppt) during the month of April 1999. Project-related changes would not alter these values substantially.

Temperature

As with salinity, water temperature in the Harbor varies seasonally. Water temperatures change gradually and pose no physiological threat to resident species. Under natural conditions, resident species acclimate to the new temperature. Itinerant species aren't typically found where temperatures fall outside their lethal limits. Instead they migrate with water masses of the appropriate temperature.

Results from the harborwide survey were compared with the modeling results presented in the Modeling Report. Their potential effect on the guild species is discussed in the following paragraphs.

Guild Analysis:

Shallow-Water Demersal

Juvenile and adult scup are the temperature-sensitive species in this group. Winter flounder, blue mussels, northern quahog, blue crab, and Atlantic surf clams are discussed below as well.

Scup. Juvenile and adult scup have a lower temperature limit of 7.3°C. During the 1998-1999 biological survey (USACE-NYD 1999), scup were found only in the waters of the Upper Bay. Temperatures in this area are well above the lower limit throughout most of the year. Only during the months of January through March were temperatures considerably below the limit. Project-related changes to temperature would be negligible, and would not serve to depress temperatures below the lower limit during the remainder of the year.

Winter Flounder. Spawning adults and larval winter flounder tend to prefer temperatures below 15°C. Ambient water temperatures fall below 15°C from November through May. Project-related changes would be negligible and would not increase temperatures above 15°C during that period.

Summer Flounder. Larval summer flounder prefer temperatures below 15°C. Ambient water temperatures fall below 15°C from November through May. Project-related changes would be negligible and would not increase temperatures above 15°C during that period.

Blue Crab. Juvenile and adult blue crabs have a lower temperature limit of ≤ 5.5°C. Ambient temperatures within the project area fall below this temperature from January through March. Temperatures do not fall below this lower limit during the remainder of the year, and would not be depressed below this lmit by project-related changes. Upper limits for juvenile and adult blue crabs are in the 30's. At no location in the project area do temperatures reach this level under natural conditions. Project-related increases in temperature are negligible and would not cause temperatures to such an extreme temperature.

Shallow-Water Pelagic Species

Northern quahog and blue mussel larvae are the temperature-sensitive members of this guild.

Northern quahog. Although northern quahog larvae have a rather wide preferred temperature range, the lower temperature limit is rather high. Northern quahog larvae are typically affected when temperatures fall below 15°C. Temperatures within the project area fall below this lower limit from November through April. During the remainder of the year ambient temperatures are above the 15°C limit and would not fall below this limit as a result of project-related changes.

Blue Mussel. Blue mussel larvae have a narrow preferred temperature range (15°C to 20°C). Water temperatures within the project area fall within this range from May through October.

Project-related changes would not increase or decrease these ambient temperatures to a significant extent. Therefore water temperatures in the project area would not exceed the preferred range for this species as a result of the proposed project.

Deep-Water Demersal

Adult red hake, juvenile black sea bass and juvenile and adult scup are the temperature-sensitive species within this guild.

Red Hake. During the 1998-1999 biological survey, red hake were found in the Upper Bay only. Adult red hake have a very narrow preferred temperature range of 10°C to 12°C. Ambient temperatures in the Upper Bay fall within the red hake's narrow temperature range during the month of November. Water temperatures are well outside the range during the remainder of the year. A comparison of the red hake's narrow preferred temperature range with the ambient water temperature of the project area suggests that red hake are capable of surviving in a wider range of temperatures than recorded, or that they are transient visitors to the project area. Project-related changes to water temperature would be negligible and would not affect this species.

Juvenile Black Sea Bass. Juvenile black sea bass prefer temperatures above 6°C, and have a lower limit of < 4°C. Water temperatures in the project area fall below the lower limit during the middle to late winter (January – February). Temperatures are well above the lower limit during the remainder of the year and would not experience a significant change as a result of the proposed project.

Scup. As discussed above, juvenile and adult scup have a lower temperature limit of 7.3°C. Temperatures in the Upper Bay, where scup are typically found, are well above the lower limit throughout most of the year. Only during the months of January through March were temperatures considerably below the limit. Project-related changes to temperature would be negligible, and would not serve to depress temperatures below the lower limit during the remainder of the year.

Deep-Water Pelagic Species.

Temperature-sensitive members of this guild include larval alewife, juvenile American shad, larval blueback herring, and the larval stages of northern quahog, ocean quahog and American lobster.

Alewife. Larval alewife have a rather wide preferred temperature range (15 - 24°C), however the lower temperature limit for this species is very near the lowest temperature of its preferred range. Larval alewife have a lower temperature limit of 8°C. Ambient water temperatures in the project area typically fall below this limit during the months of January through April, a period when larval alewife are most likely not present. During the remainder of the year, temperatures

are well above the lower limit, and would not be significantly reduced by project-related changes.

American Shad. American shad larvae have a lower temperature limit of 4 to 6°C. As is the case for larval alewife, ambient temperatures in the project area fall below this limit during winter through early spring. During the remainder of the year, temperatures remain above the lower limit, and would not be significantly reduced by project-related changes.

Blueback Herring. Larval blueback herring have a relatively high lower temperature limit (14°C). It is unlikely that the larval stage of this species is present when ambient temperatures fall below this temperature criterion (November through April). During the remainder of the year, temperatures are typically greater than 14°C, and would not significantly reduced by project-related changes.

Northern Quahog. Although northern quahog larvae have a wide preferred temperature range (17.5 - 30°C), the lower limit for this species is relatively high (≤ 15°C). Temperatures within the project area typically fall below this lower limit from November through April. During the remainder of the year ambient temperatures are above the 15°C limit and would not fall below this limit as a result of project-related changes.

Ocean Quahog. Ocean quahogs are found in the waters of the Lower Bay. The larvae of this species have a narrow preferred temperature range of 14 to 18°C. Temperatures in the Lower Bay typically fall below this range from November through April, during which time ocean quahog larvae are most likely absent. During the remaining portion of the year, temperatures are above the lower limit, and would not be significantly lowered by project-related changes.

American Lobster. American lobsters are typically found in the waters of the Lower Bay. American lobster larvae have a narrow preferred temperature range of 15 to 20°C. Temperatures fall below the preferred range during the months of November through April. In addition, American lobster larvae have a lower temperature limit of 5°C. Temperatures fall below the lower limit from January through April. It is unlikely that lobster larvae are present during these periods. For the remainder of the year, water temperatures are within or above the preferred range, and will not be significantly affected by project-related changes.

4. SUMMARY

Water quality parameters in the Harbor are naturally variable and sometimes exceed the biological threshold of these species. The guild analysis shows that project-related changes would not significantly augment the natural variability in water quality parameters, so would not have a significant impact on the aquatic species in the Harbor.

Species that are found in the Harbor tend to be highly adaptable or are itinerant species which move through the area on a seasonal basis. The degree of project-related changes is negligible,

and would not come about as a sudden change. Instead any change that occurred would be phased in gradually with the incremental development of the project. In addition, the potential changes (such as in temperature) are not of a magnitude that they would trigger sensitive activities, such as spawning, during inappropriate periods.

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TABLE B-1.1b-1
Harbor Modeling Evaluation – Biological Thresholds/Guild Analysis
Summary of General Habitat Parameters for Shallow-water (< 10 ft) Marsh Species

Species	Life Stage/ Stage to Maturity	General Habitat Parameters									
		Water Temp (°C)			Salinity (‰)			Dissolved Oxygen (mg/l)			
		Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Seasonal Occurrence
Mummichog	Eggs		18			19 – 20			< 4		
	Larvae										
	Juveniles										
	Adults		3 – 45			5 – 20			< 4		
Banded killifish	Eggs										
	Larvae										
	Juveniles										
	Adults					0 – 5					
Striped killifish	Eggs										
	Larvae										
	Juveniles		20			1 – 37					
	Adults					1 – 37					
Fourspine stickleback	Eggs		21								
	Larvae										
	Juveniles										
	Adults										

TABLE B-1.1b-2 (Page 1 of 2)
Harbor Modeling Evaluation – Biological Thresholds/Guild Analysis
Summary of General Habitat Parameters for Shallow-water (< 10 ft) Demersal Species

Species	Life Stage/ Stage to Maturity	General Habitat Parameters									
		Water Temp (°C)			Salinity (‰)			Dissolved Oxygen (mg/l)			
		Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Seasonal Occurrence
Winter flounder	Eggs		<10			10 – 30					Nov – Apr
	Larvae		<15			4 – 30					Nov – May
	Young-of -the-year		<28			5 – 33					
	Juveniles		<25			10 – 30		2.2			Jan – Dec
	Adults		<25			15 – 33					Jan – Dec
	Spawning adults		<15			5.5 – 36					Oct – Apr
Summer flounder	Eggs					15 – 30					
	Larvae		<15			0 >25					Sep – May
	Juveniles		>3			10 – 30					Mar – Dec
	Adults		0 – 25			10 – 30					Mar - Dec
Scup	Eggs		13 – 23			>15					May – Aug
	Larvae		13 – 23			>15					May – Sep
	Juveniles	7.3	>7.3			>15					May – Oct
	Adults		>7.3			≥25					
Blue mussel	Eggs		18								
	Adults		5 – 20	≥27		5 – 34			>60%sat.		Year-round
Northern Quahog (hard clam)	Eggs		7.2 – 12.5		<20	28	>32	<0.2	≥0.2		
	Juveniles					>20					
	Adults	<1	8 – 31	>34		15 – 35		<5	≥5		Year-round

TABLE B-1.1b-2 (Page 2 of 2)
Harbor Modeling Evaluation – Biological Thresholds/Guild Analysis
Summary of General Habitat Parameters for Shallow-water (< 10 ft) Demersal Species

Species	Life Stage/ Stage to Maturity	General Habitat Parameters									
		Water Temp (°C)			Salinity (‰)			Dissolved Oxygen (mg/l)			
		Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Seasonal Occurrence
Opossum shrimp	Larvae		4 - 15								
	Juveniles	≤4	25			>4					
	Adults		0 – 25		<2	15 - 20	≥34				Year-round
Blue crab	Eggs		19 – 29			23 – 33					
	Juveniles	≤5.5	15 – 30[1]	33		>2		<3	≥3		
	Adults	≤5.5	15 – 35[1]			0 – 34		<3	≥3		Year-round
Atlantic surf clam	Eggs		18.3 –24.9[2]								
	Juveniles	≤4	3 ≥ 29					≤2	>3		
	Adults		3 – 29	≥30	<12.5	14 -52		≤2	>3		Year-round

[1] Depending on salinity
[2] Laboratory conditions

TABLE B-1.1b-3 (Page 1 of 2)
Harbor Modeling Evaluation – Biological Thresholds/Guild Analysis
Summary of General Habitat Parameters for Shallow-water (< 10 ft) Pelagic Species

Species	Life Stage/ Stage to Maturity	General Habitat Parameters									
		Water Temp (°C)			Salinity (‰)			Dissolved Oxygen (mg/l)			
		Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Seasonal Occurrence
Atlantic silverside	Eggs		22-29								
	Larvae		12 – 30			1 – 14					
	Juveniles		4 – 32			2 – 35		2.6			
	Adults		4 – 32	32		2 – 35		3.0			May – Jul
Bay anchovy	Eggs	9	13 – 30	31	0	4 – 20	32	2.8			
	Larvae	7	15 – 30	31	0	0 – 15	31	2.5			
	Juveniles	6	10 – 30	34	0	9 – 30	30				
	Adults	2.2	5 – 30	34	0	9 – 30	30				
Butterfish	Eggs										
	Larvae		8.9 – 18.9			0.5 – 25					August
	Juveniles		3 – 28			0.5 – 25					Mar – Nov
	Adults		3 – 28			0.5 – 25					Mar – Nov
Weakfish	Eggs		17 – 26.5			12.1 – 31.3					
	Larvae		17 – 26.5			12.1 – 31.3					
	Juveniles										
	Adults										
White mullet	Eggs										
	Larvae										
	Juveniles					10 – 15					Apr – Nov
	Adults										

TABLE B-1.1b-3 (Page 2 of 2)
Harbor Modeling Evaluation – Biological Thresholds/Guild Analysis
Summary of General Habitat Parameters for Shallow-water (< 10 ft) Pelagic Species

Species	Life Stage/ Stage to Maturity	General Habitat Parameters									
		Water Temp (°C)			Salinity (‰)			Dissolved Oxygen (mg/l)			Seasonal Occurrence
		Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	
Atlantic surf clam	Larvae		14 – 30		<16	≥16					
Northern quahog (hard clam)	Larvae	≤15	17.5 – 30[1]	≥33		20 – 27		<4.2	≥4.2		
Blue mussel	Larvae		15 – 20			15 – 35[2]					
Blue crab	Larvae		<21		<20	≥20					

[1] Depends on salinity
[2] Depends on temperature

TABLE B-1.1b-4 (Page 1 of 3)
Harbor Modeling Evaluation – Biological Thresholds/Guild Analysis
Summary of General Habitat Parameters for Deep-water (> 10 ft) Demersal Species

Species	Life Stage/ Stage to Maturity	General Habitat Parameters									
		Water Temp (°C)			Salinity (‰)			Dissolved Oxygen (mg/l)			
		Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Seasonal Occurrence
Atlantic tomcod	Eggs										
	Larvae					4.5 – 8.7					
	Juveniles			>13		4.5 – 8.7					
	Adults										
Red hake	Eggs										
	Larvae		<19			>0.5					
	Juveniles		4 – 16			0.5 – 33					
	Adults		10 - 12			33 – 34					
Windowpane flounder	Eggs		<20			0.5 - 25					Feb – Nov
	Larvae		<20			0.5 – 25					Feb – Nov
	Juveniles		<25			5.5 – 36					Jan – Dec
	Adults		<26.8			5.5 - 36					Jan – Dec
	Spawning adults		<21			5.5 – 36					Feb – Nov
Black sea bass	Eggs										
	Larvae										
	Juveniles	<4	>6			>18					
	Adults		6 - 28			0.5 ≥ 25					May – Oct

TABLE B-1.1b-4 (Page 2 of 3)
Harbor Modeling Evaluation – Biological Thresholds/Guild Analysis
Summary of General Habitat Parameters for Deep-water (> 10 ft) Demersal Species

Species	Life Stage/ Stage to Maturity	General Habitat Parameters									
		Water Temp (°C)			Salinity (‰)			Dissolved Oxygen (mg/l)			
		Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Seasonal Occurrence
Seaboard goby	Eggs										
	Larvae		15 – 33								
	Juveniles		15 – 33								
	Adults		15 – 33								
Scup	Eggs		13 – 23			>15					May – Aug
	Larvae		13 – 23			>15					May – Sep
	Juveniles	7.3	>7.3			>15					May – Oct
	Adults					>25					May – Oct
Northern quahog (hard clam)	Eggs		7.2 – 12.5		<20	28	>32	<0.2	≥0.2		
	Juveniles					>20					
	Adults	<1	8 – 31	>34		15 – 35		<5	≥5		Year-round
Opossum shrimp	Larvae		4 - 15								
	Juveniles	≤4	25			>4					
	Adults		0 – 25		<2	15 - 20	≥34				Year-round
Blue crab	Eggs		19 – 29			23 – 33					
	Juveniles	≤5.5	15 - 30[1]	33		>2		<3	≥3		
	Adults	≤5.5	15 - 35[1]			0 – 34		<3	≥3		Year-round

TABLE B-1.1b-4 (Page 3 of 3)
Harbor Modeling Evaluation – Biological Thresholds/Guild Analysis
Summary of General Habitat Parameters for Deep-water (> 10 ft) Demersal Species

Species	Life Stage/ Stage to Maturity	General Habitat Parameters									
		Water Temp (°C)			Salinity (‰)			Dissolved Oxygen (mg/l)			Seasonal Occurrence
		Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	
American lobster	Eggs		15								
	Juveniles	<5	5 – 31		≤16.4	>16.4[2]		0.2, 1.7[3]	>1.7		
	Adults	<5	5 – 31		≤16.4	>16.4[2]		0.2, 1.7[3]	>1.7		
Atlantic surf clam	Eggs		18.3 –24.9[2]								
	Juveniles	≤4	3 ≥ 29					≤2	>3		
	Adults		3 – 29	≥30	<12.5	14 -52		≤2	>3		Year-round
Ocean quahog	Eggs		13.5								
	Juveniles		<20			>22			>2		
	Adults		7 - 19			>22			>2		Year-round
Long-fin squid	Eggs		10 - 23			30 - 32					

[1] Depends on salinity
[2] Depends on temperature and D.O.
[3] Depends on temperature and salinity
[4] Laboratory conditions

TABLE B-1.1b-5 (Page 1 of 3)
Harbor Modeling Evaluation – Biological Thresholds/Guild Analysis
Summary of General Habitat Parameters for Deep-water (> 10 ft) Pelagic Species

Species	Life Stage/ Stage to Maturity	General Habitat Parameters									
		Water Temp (°C)			Salinity (‰)			Dissolved Oxygen (mg/l)			
		Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Seasonal Occurrence
Alewife	Eggs	12	16 – 21	29.7		0-2			> 5.0		
	Larvae	8	15 – 24			N/A			> 5.0		
	Juveniles		17 – 24			0 - 5			> 3.6		
	Adults		21.3			0 - 5			> 3.6		
American shad	Eggs		13 – 26			0 – 15			> 5.0		
	Larvae		15.5 – 26.1			N/A			> 5.0		
	Juveniles	4 - 6	15.6 – 23.9			0 – 30		< 1.92	> 5.0		
	Adults		10 - 30	30		0 – 30					
Atlantic herring	Eggs										
	Larvae		>16			~32					Mar – May
	Juveniles		>10			26 – 32					Jan – May
	Adults		>10			>28					Jan – May
Blueback herring	Eggs	14	20 – 24			0 – 2			N/A		
	Larvae	14	14 – 26			0 - 22			> 5.0		
	Juveniles		20 - 28			0 - 5			> 4.0		
	Adults					0 - 5			> 4.0		
Bluefish	Eggs										
	Larvae										
	Juveniles					> 15					Apr – Oct
	Adults		11.9 – 29.2			>25					Apr - Oct

TABLE B-1.1b-5 (Page 2 of 3)
Harbor Modeling Evaluation – Biological Thresholds/Guild Analysis
Summary of General Habitat Parameters for Deep-water (> 10 ft) Pelagic Species

Species	Life Stage/ Stage to Maturity	General Habitat Parameters									
		Water Temp (°C)			Salinity (‰)			Dissolved Oxygen (mg/l)			
		Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Seasonal Occurrence
Butterfish	Eggs										
	Larvae		8.9 – 18.9			0.5 – 25					August
	Juveniles		3 – 28			0.5 – 25					Mar – Nov
	Adults		3 – 28			0.5 – 25					Mar – Nov
Red hake	Eggs										
	Larvae		<19			>0.5					May – Dec
	Juveniles										
	Adults										
Weakfish	Eggs		17 – 26.5			12.1 – 31.3					
	Larvae		17 – 26.5			12.1 – 31.3					
	Juveniles										
	Adults										
Windowpane flounder	Eggs										
	Larvae		<20			0.5 – 25					Feb – Nov
	Juveniles										
	Adults										
Atlantic mackerel	Eggs										
	Larvae										
	Juveniles		4 – 22			≥25					Apr – Dec
	Adults		4 - 16			≥25					Apr-Jun, Sep-Dec

TABLE B-1.1b-5 (Page 3 of 3)
Harbor Modeling Evaluation – Biological Thresholds/Guild Analysis
Summary of General Habitat Parameters for Deep-water (> 10 ft) Pelagic Species

Species	Life Stage/ Stage to Maturity	General Habitat Parameters									
		Water Temp (°C)			Salinity (‰)			Dissolved Oxygen (mg/l)			
		Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Lower Limit	Preferred Range	Upper Limit	Seasonal Occurrence
Long-fin squid	Larvae		10 - 26			31.5 – 34					
	Juveniles		8 - 26			31.5 – 34					
	Adults		9 – 21[1] 8 – 16[2]								Apr – Sep
Short-fin squid	Eggs		13 - 26								
	Larvae		5 – 20								
	Juveniles		2 – 23			34 – 37					summer, autumn
	Adults		4 - 19			30 – 36.5					summer
Northern quahog (hard clam)	Larvae	≤15	17.5 – 30[3]	≥33		20 – 27		<4.2	≥4.2		
Atlantic surf clam	Larvae		14 – 30		<16	≥16					
Ocean quahog	Larvae		14 – 18								May, Jul-Nov
American lobster	Larvae	5	15 – 20		<17	>21.4					
Blue crab	Larvae		<21		<20	≥20					

[1] Surface
[2] Bottom
[3] Depends on salinity

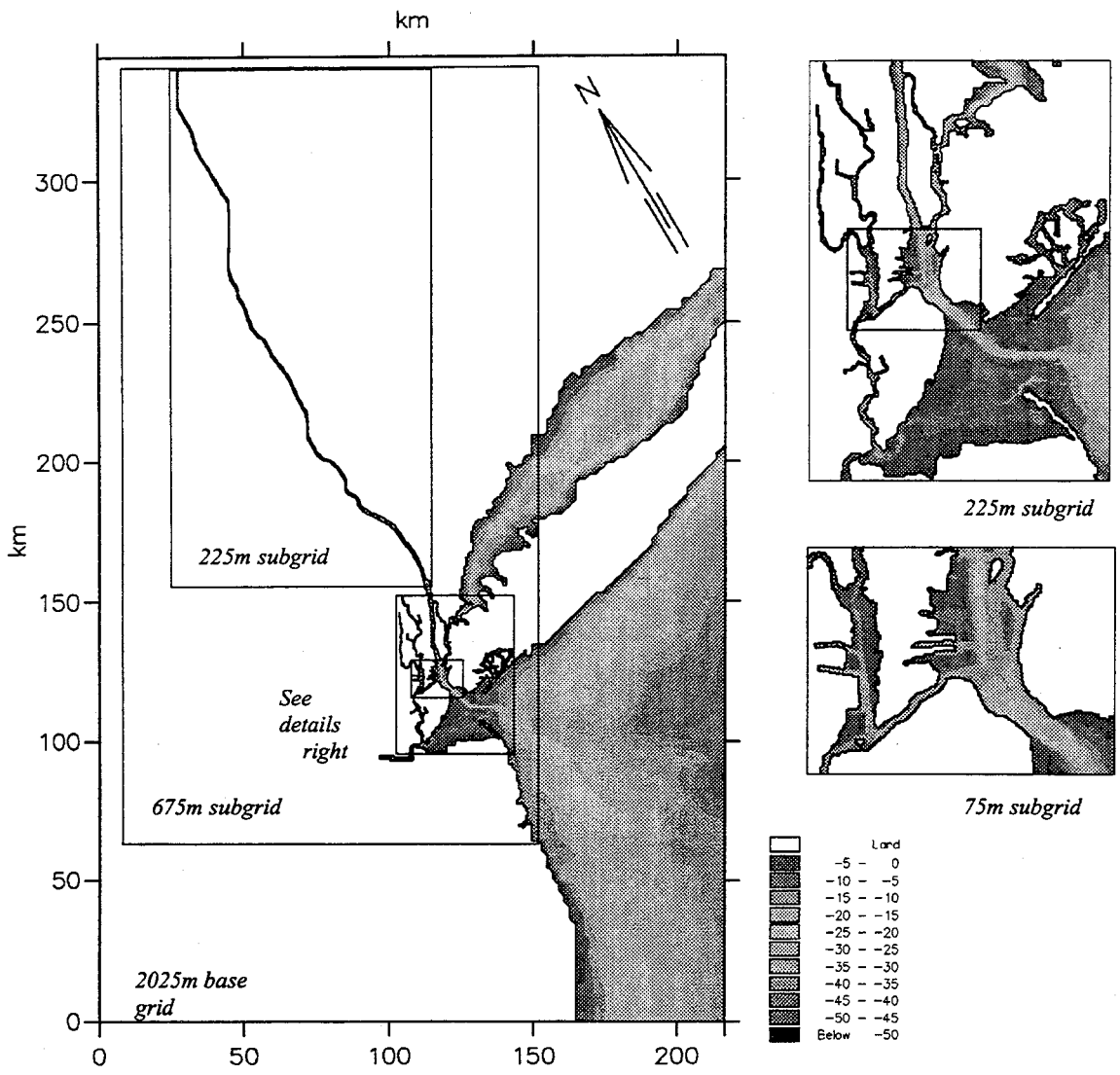

Figure B-1.1-1 Model Grids and Bathymetry (m).

LEGEND

New York
- **BA** NY Battery
- **BB** Brooklyn Bridge
- **CI** Coney Island
- **CP** College Point
- **FH** Fort Hamilton
- **GB** Gowanus Bay
- **HP** Hunts Point
- **HR** Harlem River
- **NA** The Narrows
- **NR** New Rochelle
- **WP** Willets Point

New Jersey
- **BE** Belmar
- **BP** Bergen Point
- **GW** G. Washington Bridge
- **HH** Howland Hook
- **PN** Port Newark
- **RB** Raritan Bay
- **SA** South Amboy
- **SH** Sandy Hook
- **TP** Tufts Point
- **WE** Weehawken

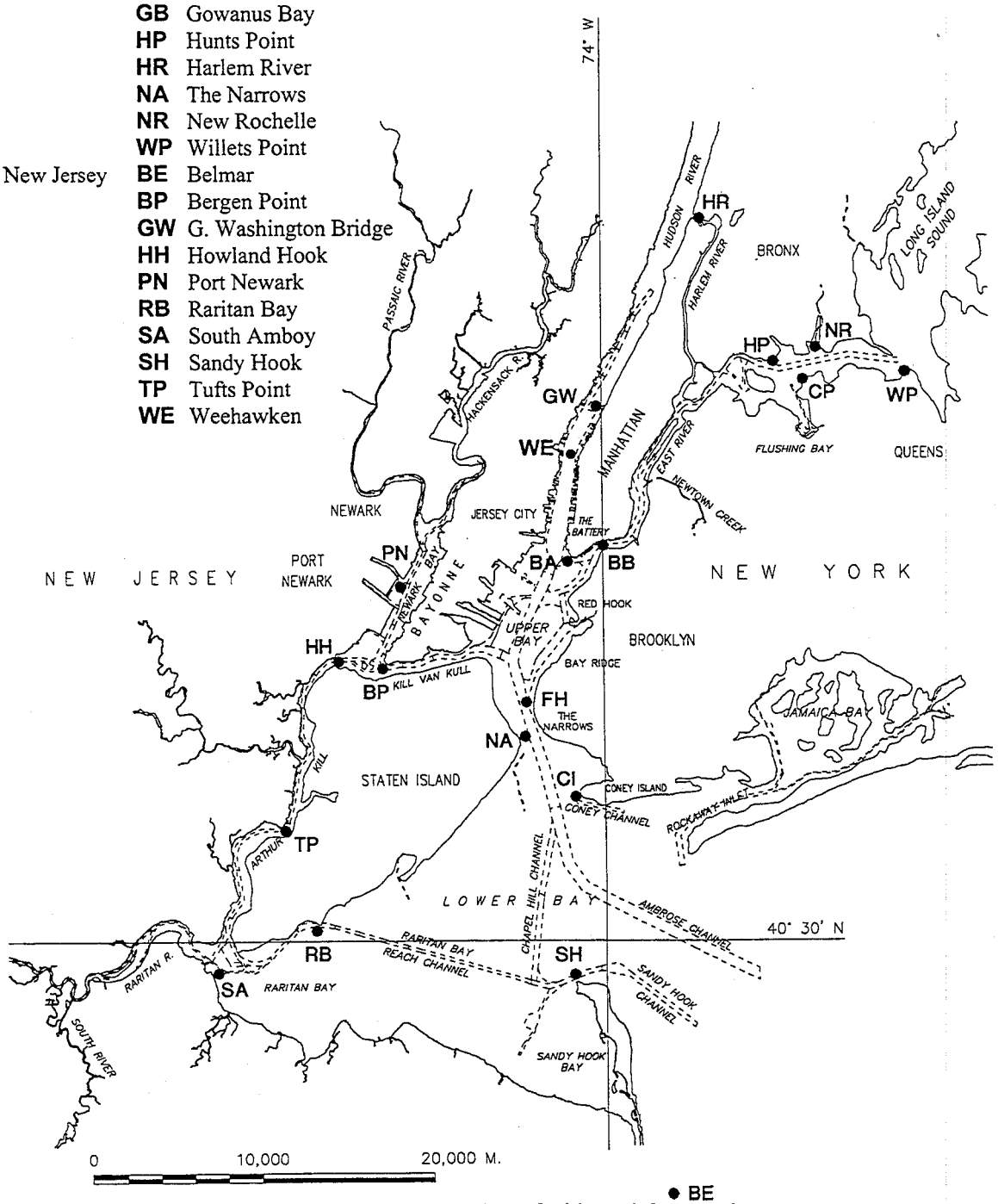

Figure B-1.1-2 Location of Tide and Current Status.

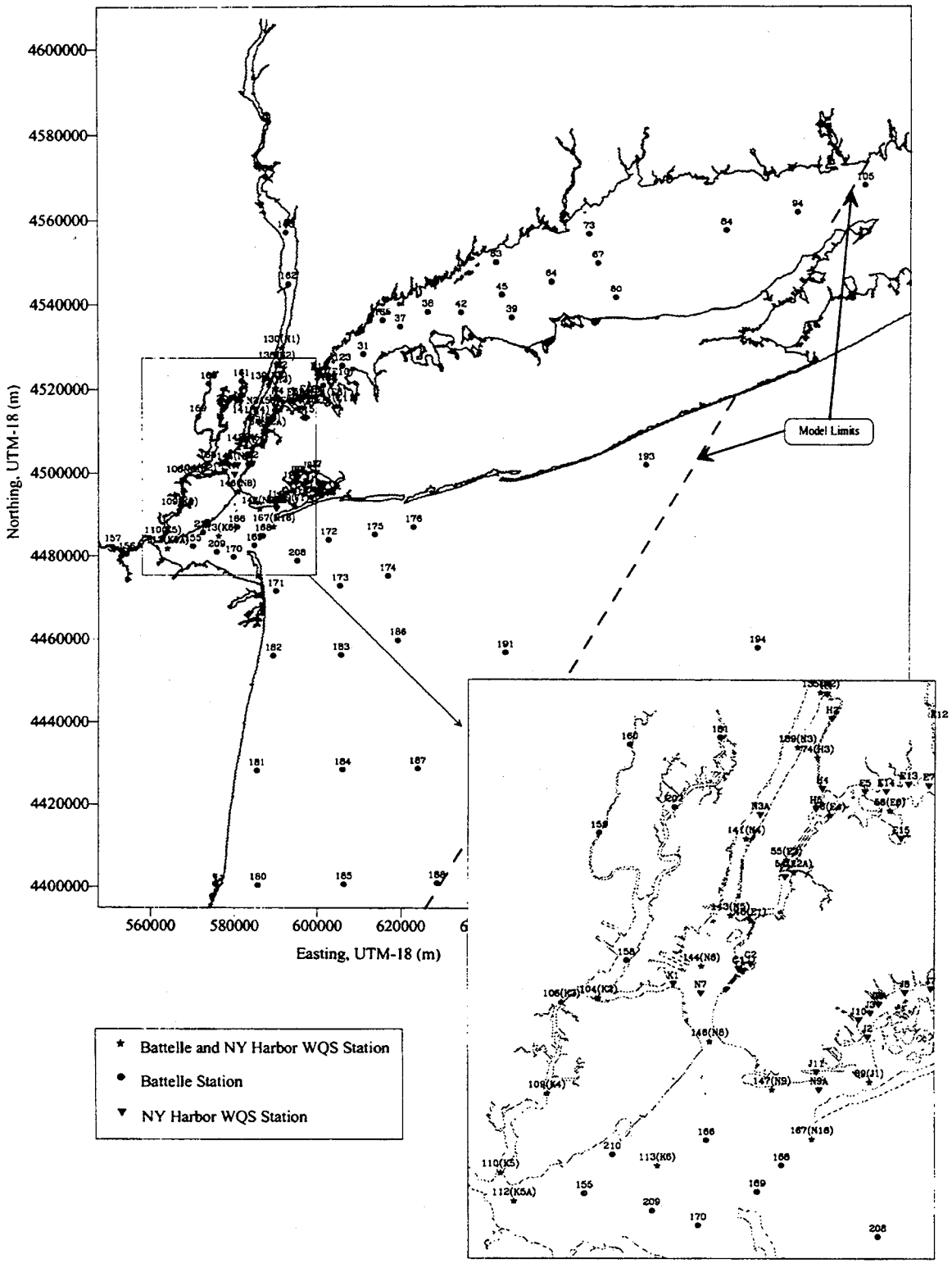

Figure B-1.1-3 Water quality sampling station locations for the Battelle and New York Harbor Surveys of 1995.

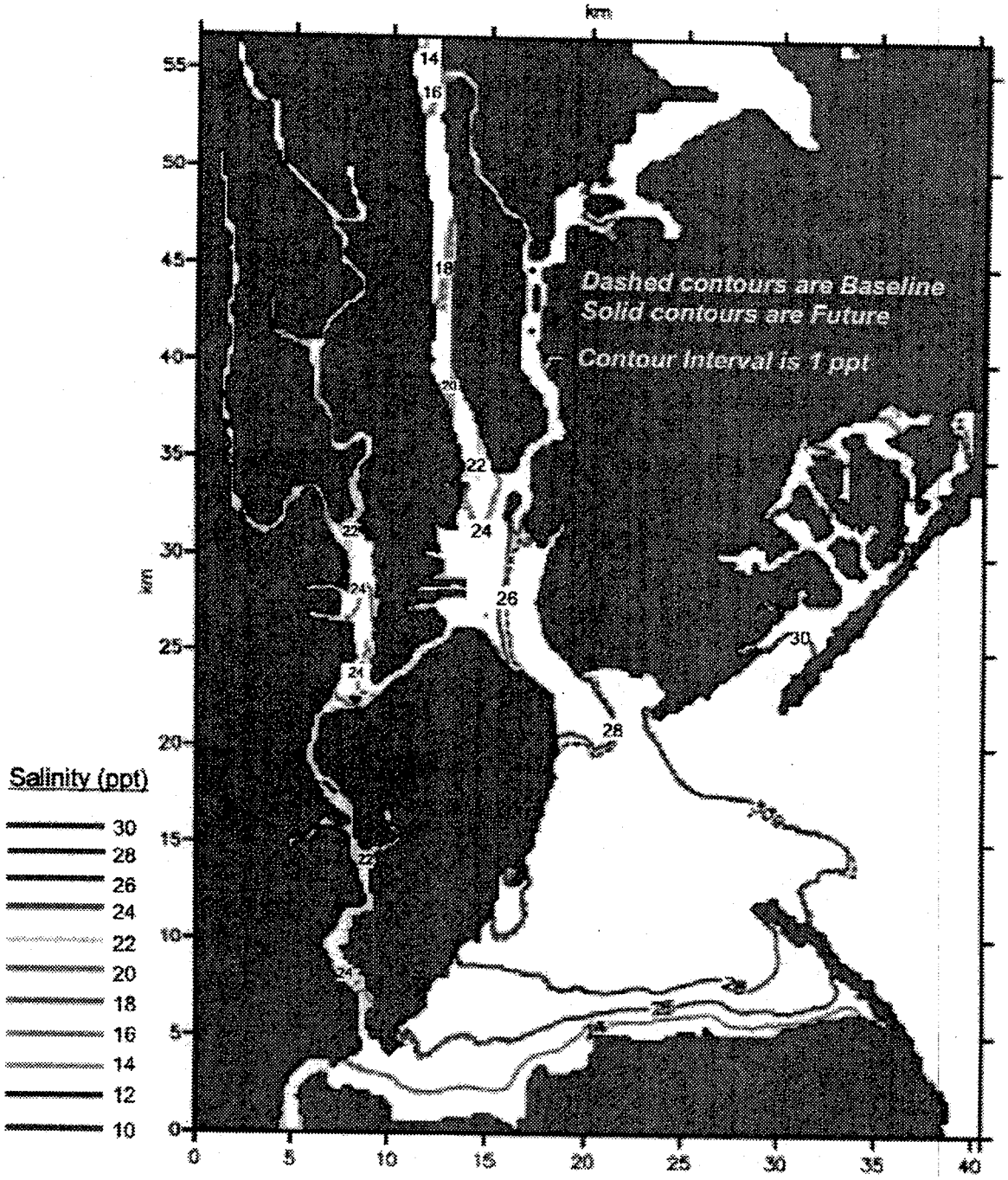

Figure B-1.1-4 Baseline/future comparison: salinity (ppt) top layer, low summertime flow Port of New York and New Jersey

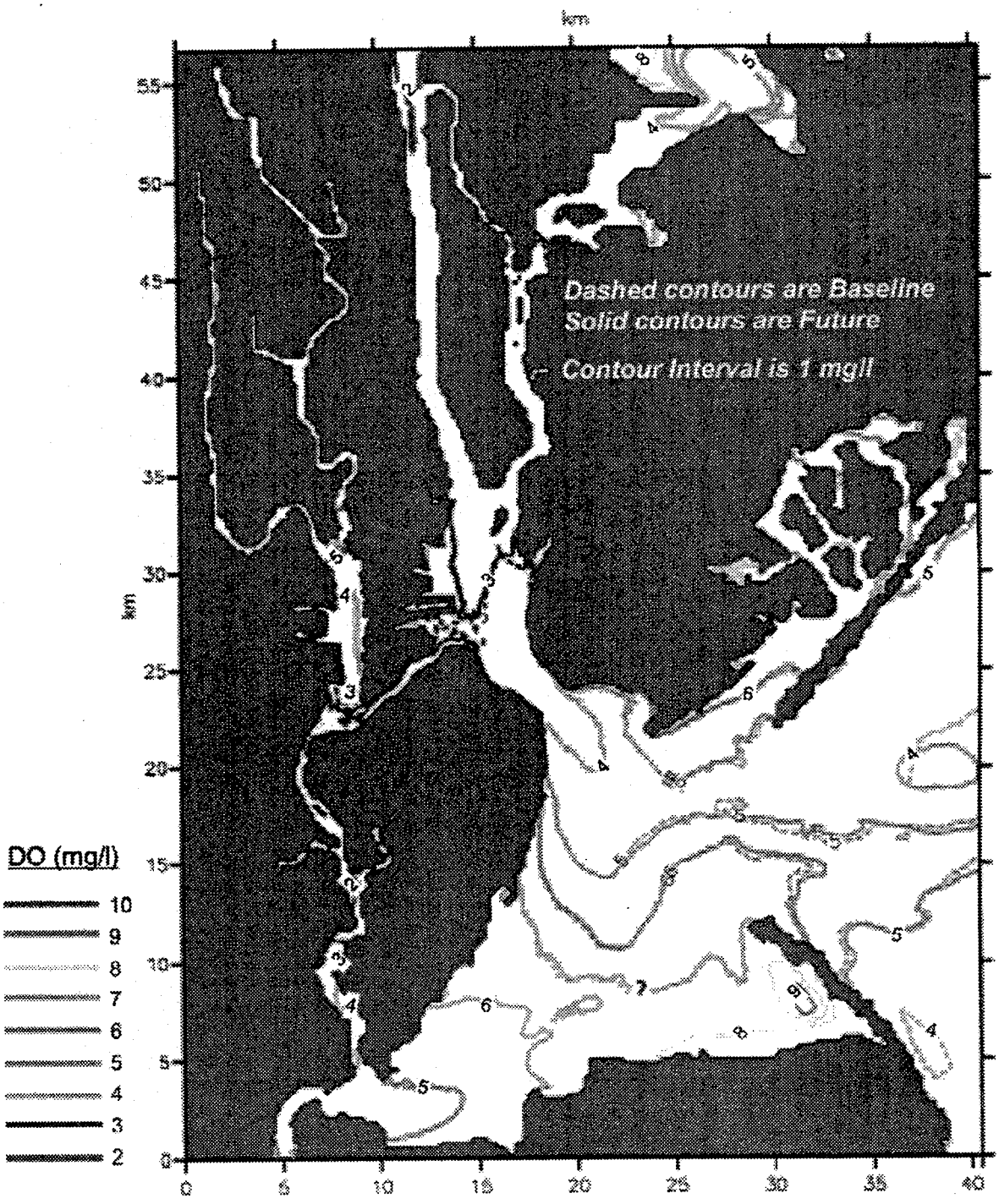

Figure B-1.1-5 Baseline/future comparison: DO (mg/l) top layer, low summertime flow Port of New York and New Jersey

FEIS APPENDIX B-1.2

BASELINE BIOLOGICAL MONITORING REPORT

NEW YORK AND NEW JERSEY HARBOR NAVIGATION STUDY

BIOLOGICAL MONITORING PROGRAM
1998-1999

VOLUME I of II

DECEMBER 1999

U.S. Army Corps Of Engineers – New York District
Planning Division
Jacob K. Javits Federal Building
26 Federal Plaza
New York, New York 10965

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CHAPTER 1

1.0 INTRODUCTION

1.1 BACKGROUND

The U.S. Army Corps of Engineers-New York District (USACE-NYD) was authorized by Congress in the 1996 Water Resources Development Act (WRDA) to conduct a comprehensive study on the navigation needs of the Port of New York and New Jersey. The study includes the evaluation of the deepening of existing channels to depths of 50 ft or greater and upgrading existing select Port facilities, including anchorages and berthing areas.

Potential environmental impacts associated with navigational channel improvements will be evaluated in a Feasibility Report and a National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS) prepared by the USACE-NYD. Biological information on finfish, shellfish and macroinvertebrate species distribution, community structure, and seasonal use patterns is important in identifying potential environmental impacts and evaluating project alternatives in the EIS.

1.2 PURPOSE

A comprehensive review of literature concerning biological resources in the New York and New Jersey Harbor indicated there have been few comprehensive synoptic harbor wide studies that could be used to evaluate the relative importance of aquatic habitats, including navigation channels, among the water bodies comprising the Harbor (USACE-NYD 1998). Results of previous biological sampling programs conducted in the study area are summarized and discussed in Chapter 2.

Information on the seasonal distribution of resident and migrant finfish species, shellfish and benthic macroinvertebrates specific to project alternative areas was supplemented through a biological sampling program. The year-long sampling program was initiated in October 1998 and continued through September 1999 (USACE-NYD 1999). The program was designed to obtain information on the seasonal use and distribution patterns of aquatic populations in the project area navigation channels, shoals, and berthing areas. The program includes seasonal sampling of finfish, ichthyoplankton, and benthic macroinvertebrates at fixed sampling stations within the project area.

The biological program consists of two separate surveys, a harborwide survey and a site-specific survey. Harborwide sampling was conducted to obtain information on seasonal use of the Harbor's navigation channels by aquatic populations. Site-specific sampling was conducted to collect information on the seasonal use and distribution of resident and migrant fish and other aquatic organisms in specific channel, shoal and marine terminal areas representative of Harbor facilities and shoal areas. Survey stations are located in navigation channels (i.e., Harborwide stations) or near harbor berthing areas and marine

terminals (i.e., site-specific stations). Survey sampling methodologies, station locations, and survey schedule information is provided in Chapter 3.0

Results of the harborwide survey and the site-specific survey are discussed in Chapter 4. Data tables and figures for the harborwide survey and the site-specific survey are provided in report Appendices A through G (Volume II, separate submission).

CHAPTER 2

2.0 PREVIOUS BIOLOGICAL SAMPLING PROGRAMS

Several biological investigations have characterized the seasonal distribution and composition of the fish, shellfish and macroinvertebrate community in various habitats and areas of the New York and New Jersey Harbor estuary. Biological sampling programs conducted within the study area are summarized and discussed here to provide a background and comparison to the more recent USACE-NYD sponsored program results.

2.1 Fish Sampling Programs

Fish sampling was conducted in the Arthur Kill, Kill Van Kull, and Newark Bay in 1984-1985 (USACE 1987) and from April 1995 to March 1996 (LMS 1996). Sampling specific to Newark Bay was conducted in 1987-1988 (Will and Houston 1992) and from May 1993 to April 1994 (NMFS 1994). From March 1994 to February 1995, sampling was conducted in the Arthur Kill in the vicinity of the Goethals Bridge (USCG 1995). An extensive sampling program was conducted including both channel and shoal areas of Raritan, Lower New York Bay and Sandy Hook Bay between January 1992 and December 1997 (Wilk et al. 1998). These studies have also been used to characterize the abundance and seasonal occurrence of blue crabs and other shellfish.

The fish sampling programs presented above provide an inventory of fish species that may occur in the project area (Table 2-1). The combined list includes the results of the recent USACE-NYD sponsored program and shows the occurrence of 92 species representing 45 families. Most species listed are seasonal residents in the project area, however the list includes some freshwater and marine species that represent unique or uncharacteristic catches. A limited number of species dominate the fish community, with the vast majority of species occurring in very low numbers. Many of the marine species are semitropical, moving north along the Atlantic coast during summer.

Twenty fish species were collected in combined samples of shoal and channel areas during the 1994-1995 studies conducted in the vicinity of Goethals Bridge (USCG 1995). The species assemblage included common species that have historically occurred in the Arthur Kill on a frequent basis (EA 1989a,b). Most of the species found in the Arthur Kill occur in very low numbers and generally only for a short time on a seasonal basis. The greatest abundance of fishes were collected during December and January. Winter flounder dominated these catches, making up 81% and 76% of the December and January catches, respectively. Overall, winter flounder accounted for 60% of the total fish collected during the study, followed by striped bass (8.9%), Atlantic tomcod (6.4%), and grubby (5.9%).

In order to describe the species composition and relative abundance of fishes in shoal areas of Newark Bay, trawl samples were collected there from April 1995 to March 1996

(LMS 1996). Four shoal areas in Newark Bay and two channel stations near the Bayonne and Goethals bridges were sampled to provide information on the fish community in shoal and deep water. The Goethals Bridge station was the same station used during the 1994-1995 studies (USCG 1995).

Twenty-seven species of fish were collected in 1995-1996 in the combined shoal and deepwater stations (Table 2-2 and 2-3). Five species – butterfish, grubby, scup, spot, and cunner - were collected only in the channel stations. Grubby was the dominate species, comprising over 30% of all fish collected during all months at each station. Most species occurred infrequently, and in very low numbers during the 12-month long study.

Fish collected at shoal stations were dominated by relatively few species, with bay anchovy, striped bass, winter flounder and Atlantic silverside the most abundant species collected. Bay anchovy dominated the overall catch of the 12-month study, accounting for over 80% of all fish collected at shoal stations. Bay anchovy were present at shoal stations from May through December, with abundance highest during September. Striped bass and Atlantic silverside were the second and third most abundant species collected, accounting for 5.6 and 4.2% of all fish collected at shoal stations, respectively. Winter flounder were collected during all months except January and February. Most species occurred infrequently, and in very low numbers during the 12-month long study.

There was a consistent seasonal pattern for fishes among the shoal stations. Fish were relatively abundant from April through October but much less abundant from November through March. During the period when fish were most abundant only four species - striped bass, winter flounder, summer flounder, and bay anchovy - occurred during each month.

NMFS undertook a major fish sampling program in Newark Bay as part of an evaluation of a flood control project for the Passaic River Basin (NMFS 1994). This study provides additional information on habitat preference of species, namely, channel versus shoal areas. Monthly fish sampling was conducted from May 1993 through April 1994. Juvenile and adult fish were sampled with bottom trawls and gill nets. Larval fish were sampled with two different mesh sizes of plankton nets.

Twenty-eight species of fish were collected with a bottom trawl from seven shoal stations on the east side (relative to main channel) of Newark Bay in 1993-1994 (Table 2-4). Six species (striped bass, winter flounder, bay anchovy, Atlantic herring, Atlantic tomcod, and Atlantic silverside) accounted for 1% or more of the total number collected at the shoal stations combined. Two of these species, Atlantic herring and Atlantic tomcod, were collected only in May and June. Combined, both species accounted for over 80% of the catch in June.

Bay anchovy was the overall dominant species collected, occurring at shoal stations from April through September and again in December. Bay anchovy abundance was highest during September, with over 750 individuals collected at all seven stations combined.

Winter flounder and striped bass were the fourth and fifth most abundant species, respectively. Both species were relatively common in trawl samples collected at Newark Bay shoal stations in 1993-1994, occurring during most months sampled. Winter flounder was collected from April though January, with abundance highest during late-spring and early summer (i.e., May through July). Striped bass was present from May through December and accounted for almost 5% of all fish collected.

Forty-three species of fish were collected at the 10 Newark Bay channel stations in 1993-1994 (Table 2-5). Twelve species made up at least 1% of the catch for all channel stations combined: alewife, gizzard shad, bay anchovy, rainbow smelt, Atlantic tomcod, spotted hake, grubby, white perch, striped bass, weakfish, summer flounder, and winter flounder. Among the major species, striped bass, white perch, Atlantic tomcod, weakfish, and winter flounder were the most abundant. Among the species that accounted for less than 1% of the annual combined catch, only windowpane flounder occurred in all months. The other less abundant species occurred infrequently.

There was a distinct difference in the seasonal occurrence of fish between channel and shoal stations. Unlike shoal stations, striped bass was the overall dominant species collected at channel stations, accounting for almost 32% of all fish collected. Striped bass was most abundant from November through April. White perch abundance followed a similar pattern. Atlantic tomcod was the second most abundant species collected. Unlike shoal stations, Atlantic tomcod was present at channel stations throughout the 12-month study. Abundance was highest during June and July. With the exception of winter flounder and grubby, the seasonal abundance of the 10 most abundant species at the channel stations is shown below.

Seasonal Abundance at Channel Stations in Newark Bay 1993 – 1994

Species	Season	Species	Season
Alewife	Fall	Spotted hake	Late spring and early summer
Gizzard shad	Fall and Winter	White perch	Late Fall and Winter
Bay anchovy	Summer	Striped bass	Late Fall to early Spring
Rainbow smelt	Winter	Weakfish	Summer through Fall
Atlantic tomcod	Summer	Summer flounder	Summer

Fish were abundant in every month at the channel stations, while they were nearly absent from the shoals from November through April. Striped bass and white perch were particularly abundant at channel stations during the winter months. Similar to shoal stations, winter flounder was present at channel stations throughout the 12-month study. Winter flounder were abundant during July and August and again from October through December.

2.2 Shellfish Sampling Programs

In addition to finfish, blue crabs and other invertebrates collected in bottom trawl sampling gear used during the NMFS Passaic River Basin study (NMFS 1994) were reported. Blue crab was the overwhelmingly dominate species collected at both shoal and channel stations, accounting for over 98% of the megainvertebrates collected in both areas. Male blue crabs outnumbered females in channel stations by 1.25 to 1, while females outnumbered males in shoal areas by 2 to 1. Males and females were collected in greatest abundance from June through October at both shoal and channel stations. Other invertebrate species collected and reported include rock crab, spider crab, horseshoe crab, longfin squid, mantis shrimp and eastern oyster. The eastern oyster was collected only at shoal stations and was the only other invertebrate species reported there.

A recent survey of macroinvertebrates and shellfish was conducted in Newark Bay, Kill Van Kull, and Arthur Kill (LMS 1996). Data from this survey showed at least 19 species of macroinvertebrates in these three areas (Table 2-6). The most abundant species in the Newark Bay area were the dwarf surfclam (*Mulinia lateralis*) (66.95% of total) and softshell clam (*Mya arenaria*) (33.36% of total). The three other taxa present in appreciable numbers were the tellinids (*Tellina* sp.), gammarid amphipods (*Gammarus* spp.), and the sea grape (*Molgula manhattensis*). These three taxa accounted for 5.29%, 4.35%, and 1.79% of the individuals collected, respectively.

When considered separately, the Kill Van Kull had the highest diversity (16 species), followed by Newark Bay (11 species) and the Arthur Kill (7 species) (Table 2-7 through 2-9). Patterns of abundance were similar to the overall Bay area, with the exception of sea grape abundance in the Kill Van Kull and gammarid amphipod abundance in Newark Bay. In the Kill Van Kull, the common slipper shell (*Crepidula fornicata*) replaced the sea grape as the fifth most abundant species, while in Newark Bay, the solitary paper shell (*Haminoea solitaria*) replaced gammarid amphipods as the fourth most abundant species.

2.3 Benthic Macroinvertebrate Sampling Programs

The benthic fauna of Newark Bay was surveyed during 1985, with samples collected at 30 stations throughout the western and southern half (the northern limit was Port Newark) and the Kill Van Kull in the vicinity of Shooters Island (USACE-NYD 1987). Benthic sampling was conducted during the spring (Cerrato 1985) and summer (Chezik 1985) months, and included an equal number of sampling stations from shallow-water (7-18 ft) and deeper-water (33-40 ft) stations. A listing of benthic fauna by sampling month identified in the Newark Bay samples, along with the dominant species designated, is presented in Table 2-10. In general, greater numbers of organisms and species were recorded during the summer sampling program, with a significant difference (α= 0.5) noted for the shallow-water-depth stations.

Overall benthic organism abundance in Newark Bay was classified as moderate. The Newark Bay benthic community was dominated by polychaete worms, which are habitat generalists and exhibit high tolerance to environmentally stressful conditions such as low DO levels. Two polychaete worms, *Streblospio benedicti* and *Sabellaria vulgaris*, as well as softshell clam were dominant during both the spring and summer periods. Three polychaete worm species, *Scolecolepides viridis, Nereis succinea*, and *Polydora ligni*, were dominant in the spring, being replaced by *Spio setosa* (polychaete), *Balanus improvisus* (barnacle), and *Molgula manhattensis* (tunicate) during the summer. There was a high degree of variability in individual species abundance levels between the shallow- and deep-water stations; however, no significant difference was detected in abundance or species representation between the two habitat types. Physical and chemical parameters measured during these studies included water temperature, salinity, and DO. All three parameters were similar at the shallow- and deep-water stations, and it was concluded that none of the three was limiting to the development of the benthic community. Stations characterized by finer-grained sediments in the center of the Bay exhibited lower species numbers and lower overall abundance. The moderate organism abundance and generally low species diversity in the benthos suggest that Newark Bay is a stressed environment that restricts the development of the benthic community (USACE-NYD 1987).

Twenty-five stations (18 channel stations and seven shallow-water stations) located in the northern and central sections of Newark Bay were sampled for benthic macroinvertebrates during 1993 and 1994 (NOAA 1994). Bottom sediments at the northern end of the Bay in the vicinity of the mouth of the Passaic River consisted primarily of soft, black, silty clay; north of the two bridges the bottom sediments were soft, with varying amounts of gravel, shell, sand, silt, and clay. South of the bridges the bottom sediments in both the channel and shoal stations were light, soft silt and clay, with some shell fragments. Channel stations located opposite Elizabeth Marine terminal usually contained lumps of thick, hard, red clay. Benthic fauna collected, including designation of dominant species, is presented in Table 2-11. As noted for the benthic study conducted during 1985, the benthos at both shallow-water and channel stations were similar in species composition (dominated by polychaete worms) and exhibited similar seasonal abundance patterns. It was determined that the Newark Bay benthic community had lower overall abundance and lower species diversity when compared to the benthos of Upper New York Bay.

Lawler, Matusky & Skelly Engineers LLP (LMS) conducted a Newark Bay benthic sampling program for PANYNJ from April 1995 through March 1996 (LMS 1996). Seven stations were sampled: five of the stations were in Newark Bay and included stations in the immediate vicinity of the proposed Newark Bay Combined Disposal Facility (NBCDF) site. Two of the stations were outside Newark Bay, one near the Bayonne Bridge (Kill Van Kill) and the other near the Goethals Bridge (Arthur Kill). Total abundance by species for the five Newark Bay stations is presented in Table 2-12, and monthly abundance by species for all stations combined over the 12-month study period is presented in Table 2-13.

Polychaetes dominated the benthos collected at the Newark Bay stations. Six species of polychaete worms were among the ten most abundant benthic invertebrate species identified in the Bay samples. The dominant species collected was the polychaete worm *Scoloplos* sp., which accounted for 28.5% of the total. The five other polychaetes found in the most abundant 10 benthic invertebrate species were *S. benedicti* (rank = 2, 23.7% of the total), the family Paraonidae (rank = 4, 7.0% of the total), the family Phyllodocidae (rank = 8, 1.7% of the total), *Glycera* sp. (rank = 9, 1.7% of the total), and *P. ligni* (rank = 10, 1.6% of the total). The other species rounding out the top 10 benthic invertebrate species by abundance included two bivalves, *Mulinia lateralis* (rank = 3, 15.4% of the total), and *M. arenaria* (rank = 6, 4.4% of the total); the estuarine isopod *Cyathura polita* (rank = 5, 5.8% of the total); and the cumacean *Oxyurostylis smithii* (rank = 7, 1.9% of the total). Species composition and abundance patterns were similar among the five Newark Bay stations (LMS 1996).

Similar trends were observed in the benthic samples from the Arthur Kill and Kill Van Kull stations (Table 2-14 and 2-15, respectively). Of the ten taxa that were numerically abundant at the Arthur Kill site, six were polychaetes. The polychaete *S. benedicti* accounted for 79% of the total number of organisms collected. The other five abundant polychaetes were Phyllodocidae (rank = 2, 4.77% of total), *Scoloplos* sp. (rank = 3, 3.62% of total), Paraonidae (rank = 5, 1.99% of total), Oligochaeta (rank = 6, 1.64% of total) and *P. ligni* (rank = 7, 1.09% total). The other benthic species in the top ten in abundance at the Arthur Kill site included two bivalve mollusks, *M. arenaria* (rank = 4, 2.08% of total) and *M. lateralis* (rank = 8, 0.84% of total), the cumacean *Leucon americanus* (rank = 9, 0.78% of total), and the isopod *Edotea triloba* (rank = 10, 0.68% of total) (LMS 1996).

At the Kill Van Kull site, seven of the ten most abundant taxa were polychaetes. Of these polychaetes, *S. benedicti* accounted for 49.14% of the total number of organisms collected. The remaining six were *S. vulgaris* (rank = 2, 29.47% of total), Paraonidae (rank = 3, 5.56% of total), *Scoloplos* sp. (rank = 5, 1.71% of total), Phyllodocidae (rank = 7, 1.57% of total), Oligochaeta (rank = 9, 1.10% of total), and *N. succinea* (rank = 10, 0.73% of total). The remaining benthic species that were among the ten most abundant taxa at the Kill Van Kull site included two bivalve mollusks, *M. lateralis* (rank = 4, 1.82% of total) and *M. arenaria* (rank = 6, 1.67% of total), and the amphipod Aoridae (rank = 8, 1.42% of total) (LMS 1996).

As noted for the Newark Bay sampling programs, where water depths and sediment types are similar, polychaete worms dominated this Arthur Kill benthic community. Among the more abundant polychaete taxa were *S. benedicti*, *Scoloplos* sp., and *Phyllodoce arenae* (USCG 1995). Oligochaete worms were found to be the second most abundant group, followed by burrowing cumacean shrimp. In Old Place Creek, polychaetes were also the dominant group and oligochaetes were found in most samples. However, more bivalves and isopods were found, as the sediments are firmer with more sand, bits of brick-like material, and clay. The benthic invertebrate taxa collected are presented in

Table 2-16. The shallow-water benthic community in the soft sediments near the Goethals Bridge was similar to Newark Bay in terms of species types and seasonal abundance patterns. Temporal and spatial variability, primarily related to reproduction patterns, was noted in the seasonal collections. However, a stable community dominated by detritivores was found throughout the sampling area.

Intricate flow patterns between the Hudson River estuary, the East River, Kill Van Kull, and the Atlantic Ocean through The Narrows complicate the sediment patterns of Upper New York Bay (Coch 1986). Coarse-grained facies, such as gravelly silty sand, silty gravelly sand, clayey silty sand, and silty sandy gravel, underlie the central part of the northern portion of the Upper Bay. The intense bottom currents indicative of this area cause this complex pattern. In contrast, sandy clayey silts underlie the shallower and calmer areas along the New Jersey, Queens, and Brooklyn shorelines. Clayey silty sand was found on the bottom of the central portion of Upper New York Bay and into the mouth of the Kill Van Kull. These sediments grade into a sand facies toward The Narrows and are bordered in The Narrows by silty sands on the east and west sides. Gravelly sands bordered on the west by sandy clayey silts and on the east by clayey silty sands underlie the channel south of The Narrows. These facies grade into the coarse-grained sands of the northern portion of the Lower Bay.

Benthos samples were collected from August 1975 to June 1976 in the vicinity of Liberty State Park in the Upper New York Bay Harbor (TI 1976). The polychaete worm *S. benedicti* strongly dominated the benthos by representing 57.0% of the annual mean total number of organisms per square meter collected, while other polychaetes accounted for 5.7%. Tubificid worms made up an additional 31.3% of the benthos, leaving a mere 6.0% of the community to be made up by other taxa. There was a distinct variation in the structure of the benthic community in relation to the distance from sewer outfalls, waterfowl concentrations, and a nutrient-rich *Spartina* marsh. The areas around sewer outfalls exhibited very low benthic abundance in the summer, but showed an increase in numbers with the buildup of DO concentrations during the winter. Fecal contamination from waterfowl seemed to have a similar effect on the benthos, but to a lesser degree. The increased availability of nutrients from the marsh created an increase in the numbers of benthic organisms near the marsh shoreline.

Coch (1986) noted that Lower New York Bay contained three distinct regions of sediments separated by narrow gradational facies. The three regions were the apex of the New York Bight in the north and northeast, Sandy Hook Bay in the south, and Raritan Bay in the west. Sands with aprons of gravelly sands and patches of sandy gravel covered most of the bottom of the northern portion of Lower New York Bay. These facies graded into the sands covering the apex of the New York Bight to the east and southeast. Silty sands underlay Sandy Hook Bay and graded into sands along the shoreline of New Jersey and Sandy Hook. Sandy clayey silt covered Raritan Bay and extended into the Raritan River estuary to the west and into the Arthur Kill to the northwest. These sediments graded into the sands of the northern Lower New York Bay to the northeast and the sands along the New Jersey coast to the southeast.

A regional study of the benthos in Lower New York Bay was done seasonally in 1986-87 (Cerrato, et al. 1989). Eighty-four sites were sampled extending from Raritan Bay across to Sandy Hook, up to Rockaway Point, and across to the Verrazano Narrows. The sediments were variable, ranging from 100% sand and gravel to silty clay. The amphipod *Ampelisca abdita* accounted for 55.8% of the total number of organisms collected, and the blue mussel ranked second at 18.6%. Other abundant species included the polychaetes *Asabellides oculata* and *Heteromastus filiformis*, the softshell clam, the slipper shell *Crepidula fornicata* and the amphipods *Corophium tuberculatum* and *Elasmopus levis.*

Benthic studies of lower New York Bay/Raritan Bay area were carried out in 1989 as part of an environmental study related to expanding and deepening the Raritan Bay anchorages (USACE-NYD 1994a; 1994b). Anchorage sites in the study area are composed of 65% silt with varying amounts of sand and clay. The average sand:silt:clay ratio is 16:65:19. A diverse benthic community was found to be present in Raritan Bay/Lower New York Bay. The benthos was dominated by *A. abdita*, a tube-dwelling amphipod (55.8% of all individuals collected). Polychaete worms ranked fourth in overall abundance.

TABLE 2-1 (page 1 of 6)

Inventory of Fish Species Collected from Various Sampling Programs Conducted in the Project Area

Family Genus Species	Common Name	A 1988	B 1991	C 1991-1992	D 1993-1994	E 1994	F 1995-1996	G 1992-1997	H 1998-1999
Carcharhinidae	**Requiem Sharks**								
Mustelus canis	Smooth dogfish		X						
Rajidae	**Skates**								
Raja eglanteria	Clearnose skate							X	
Raja erinacea	Little skate			X	X			X	X
Raja ocellata	Winter skate							X	
Acipenseridae	**Sturgeons**								
Acipenser oxyrhyncus	Atlantic sturgeon		X		X				
Anguillidae	**Freshwater Eels**								
Anguilla rostrata	American eel	X	X	X	X	X			X
Ophichthidae	**Snake eels**								
Myrophis punctatus	Speckled worm eel			X					
Congridae	**Conger Eels**								
Conger oceanicus	Conger eel			X	X				X
Clupeidae	**Herrings**								
Alosa aestivalis	Blueback herring		X	X	X		X	X	X
Alosa pseudoharengus	Alewife	X	X	X	X	X	X	X	X
Alosa sapidissima	American shad	X	X	X	X	X	X		X
Alosa mediocris	Hickory shad		X	X		X			X
Brevoortia tyrannus	Atlantic menhaden		X	X	X				X
Clupea harengus	Atlantic herring		X		X		X	X	X
Dorosoma epedianum	Gizzard shad		X	X	X		X		X
Engraulidae	**Anchovies**								
Anchoa mitchilli	Bay anchovy	X	X	X	X	X	X	X	X
Anchoa hepsetus	Striped anchovy		X				X		X
Osmeridae	**Smelts**								
Osmerus mordax	Rainbow smelt				X				X
Synodontidae	**Lizardfishes**								
Synodus foetens	Inshore lizardfish		X	X					X

TABLE 2-1 (page 2 of 6)

Inventory of Fish Species Collected from Various Sampling Programs Conducted in the Project Area

Family Genus Species	Common Name	A 1988	B 1991	C 1991-1992	D 1993-1994	E 1994	F 1995-1996	G 1992-1997	H 1998-1999
Gadidae	**Cods**								
Merluccius bilinearis	Silver hake		X	X		X		X	X
Microgadus tomcod	Atlantic tomcod	X	X	X	X		X		X
Urophycis chuss	Red hake	X	X	X	X	X		X	X
Urophycis regia	Spotted hake	X	X		X		X	X	X
Urophycis tenuis	White hake	X	X						
Gadus morhua	Atlantic cod	X							
Enchelyopus cimbrius	Fourbeard rockling			X					
Pollachius virens	Pollock		X	X					X
Ophidiidae	**Cusk-eels**								
Lepophidium cervinum	Fawn cusk-eel		X						
Ophidion marginatum	Striped cusk-eel			X					X
Batrarchoididae	**Toadfishes**								
Opsanus tau	Oyster toadfish		X	X					X
Belonidae	**Needlefishes**								
Strongylura marina	Atlantic needlefish			X					
Cyprinodontidae	**Killifishes**								
Fundulus heteroclitus	Mummichog	X		X		X			
Fundulus majalis	Striped killifish	X		X	X	X			
Fundulus diaphanus	Banded killifish			X					
Atherinidae	**Silversides**								
Menidia beryllina	Inland silverside		X						
Menidia peninsulae	Tidewater silverside			X					
Menidia menidia	Atlantic silverside		X		X		X		X
Gasterosteidae	**Sticklebacks**								
Gasterosteus aculeatus	Threespine stickleback			X	X				
Apeltes quadracus	Fourspine stickleback		X	X					
Syngnathidae	**Pipefishes**								
Hippocampus erectus	Lined seahorse		X	X	X				X
Syngnathus fuscus	Northern pipefish	X	X	X		X	X		X

TABLE 2-1 (page 3 of 6)

Inventory of Fish Species Collected from Various Sampling Programs Conducted in the Project Area

Family Genus Species	Common Name	A 1988	B 1991	C 1991-1992	D 1993-1994	E 1994	F 1995-1996	G 1992-1997	H 1998-1999
Triglidae	**Searobins**								
Prionotus carolinus	Northern searobin		X	X				X	X
Prionotus evolanis	Striped searobin	X	X	X				X	X
Cottidae	**Sculpins**								
Myoxocephalus octodecemspinosus	Longhorn sculpin		X						
Myoxocephalus aenaeus	Grubby		X	X		X	X		X
Percichthyidae	**Temperate Basses**								
Morone americana	White perch			X	X	X	X		X
Morone saxatilis	Striped bass		X	X	X	X	X	X	X
Serranidae	**Sea Basses**								
Centropristis striata	Black sea bass		X	X				X	X
Centrarchidae	**Sunfishes**								
Pomoxis nigromaculatus	Black crappie			X					
Lepomis macrochirus	Bluegill		X						
Micropterus salmoides	Largemouth bass			X					
Pomoxis annularis	White crappie			X					
Pomatomidae	**Bluefishes**								
Pomatomus saltatrix	Bluefish	X	X	X		X	X	X	X
Carangidae	**Jacks**								
Caranx hippos	Crevalle jack		X		X		X		X
Trachurus lathami	Rough scad		X						
Selene vomer	Lookdown		X	X					X
Selene setapinnis	Atlantic moonfish		X	X					X
Lutjanidae	**Snappers**								
Lutjanus griseus	Grey snapper		X						
Sparidae	**Porgies**								
Stenotomus chrysops	Scup		X	X	X		X	X	X
Sciaenidae	**Drums**								
Cynoscion regalis	Weakfish	X	X	X	X	X	X	X	X
Leiostomus xanthurus	Spot	X	X	X	X	X	X	X	X

TABLE 2-1 (page 4 of 6)

Inventory of Fish Species Collected from Various Sampling Programs Conducted in the Project Area

Family Genus Species	Common Name	A 1988	B 1991	C 1991-1992	D 1993-1994	E 1994	F 1995-1996	G 1992-1997	H 1998-1999
Sciaenidae (cont.)	**Drums**								
Menticirrhus saxatilis	Northern kingfish		X	X	X		X		X
Bairdiella chryosura	Silver perch			X	X				
Micropogon undulatas	Atlantic croaker						X		
Chaetodontidae	**Butterflyfishes**								
Chaetodon ocellatus	Spotfin butterflyfish		X	X					
Mugilidae	**Mullets**								
Mugil cephalus	Striped mullet		X	X					
Labridae	**Wrasses**								
Tautoga onitis	Tautog		X	X	X	X			X
Tautogolabrus adspersus	Cunner		X	X	X	X	X		X
Pholidae	**Gunnels**								
Pholis gunnellus	Rock gunnel		X	X	X				X
Uranoscopidae	**Stargazers**								
Astroscopus guttatus	Northern stargazer		X	X					X
Blenniidae	**Combtooth Blennies**								
Hypsoblennius hentz	Feather blenny			X					X
Ammodytidae	**Sand Lances**								
Ammodytes americanus	American sand lance		X	X		X			X
Gobiidae	**Gobies**								
Gobiosoma bosc	Naked goby		X	X					X
Gobiosoma ginsburgi	Seaboard goby		X	X					
Scombridae	**Mackerels**								
Scomberomorus maculatus	Spanish mackerel			X					
Scomber japonicus	Chub mackerel				X				
Scomber scombrus	Atlantic mackerel		X						X
Stromateidae	**Butterfishes**								
Peprilus triacanthus	Butterfish		X		X		X	X	X

TABLE 2-1 (page 5 of 6)

Inventory of Fish Species Collected from Various Sampling Programs Conducted in the Project Area

Family Genus Species	Common Name	A 1988	B 1991	C 1991-1992	D 1993-1994	E 1994	F 1995-1996	G 1992-1997	H 1998-1999
Bothidae	**Lefteye Flounder**								
Etropus microstomus	Smallmouth flounder		X	X	X				X
Paralichthys dentatus	Summer flounder		X	X	X		X	X	X
Scopthalmus aquosus	Windowpane		X	X				X	X
Paralicthys oblongus	Fourspot flounder		X		X				X
Pleuronectidae	**Righteye Flounders**								
Hippoglossoides platessoides	American plaice			X		X			
Pleuronectes americanus	Winter flounder		X		X		X	X	X
Soleidae	**Soles**								
Trinectes maculatus	Hogchoker		X	X	X				
Symphurus plagiusa	Blackcheek tonguefish			X					
Balistidae	**Leatherjackets**								
Cantherhines pullus	Orangespotted filefish			X					
Monacanthus hispidus	Planehead filefish				X				
Ostraciidae	**Boxfishes**								
Lactophrys quadricornis	Scrawled cowfish			X					
Tetraodontidae	**Puffers**								
Sphoeroides maculatus	Northern puffer		X	X					X
Chilomycterus schoepfi	Striped burrfish			X					
Mullidae	**Goatfishes**								
Pseudupeneus maculatus	Spotted goatfish								X

TABLE 2-1 (page 6 of 6)

Inventory of Fish Species Collected from Various Sampling Programs Conducted in the Project Area

Source	Study Location	Reference
A	Arthur Kill and Old Place Creek	Louis Berger & Associates, Inc. (LBA). 1992. Staten Island Bridges Program Environmental Report. Submittal to the Port Authority of New York/New Jersey.
B	Raritan Bay and Sandy Hook Bay Trawls	Woodhead, P.M.J. 1991. *Inventory and Assessment of Habitat and Fish Resources and Assessment of Information on Toxic Effects in the New York/New Jersey Harbor Estuary.* New York/New Jersey Harbor Estuary Program. Marine Sciences Research Center, State University of New York, Stony Brook, New York.
C	Arthur Kill Generating Station	Lawler, Matusky & Skelly Engineers (LMS). 1993. Arthur Kill Impingement and Entrainment Report, September 1991-September 1992. Report to Consolidated Edison Company of New York, Inc.
D	Newark Bay	National Marine Fisheries Service. Undated. Results of a Biological and Hydrological Characterization of Newark Bay, New Jersey, May 1993-April 1994.
E	Arthur Kill and Old Place Creek	U.S. Coast Guard (USCG). 1995. Draft Environmental Impact Statement/Draft Section 4(f) Statement. Staten Island Bridges Program, Modernization and Capacity Enhancement Project.
F	Newark Bay	Lawler, Matusky & Skelly Engineers LLP (LMS). 1996. Newark Bay Biological Monitoring Program April 1995-March 1996. Report prepared for the Port Authority of NY/NJ.
G	Hudson-Raritan Estuary	Wilk, S.J.; Pikanowski, R.A.; McMillan, D.G.; MacHaffie, E.M. 1998. Seasonal Distribution and Abundance of 26 Species of Fish and Megainvertebrates Collected in the Hudson-Raritan Estuary, January 1992- December 1997. *Northeast Fish. Sci. Cent. Ref. Doc.* 98-10; 145 p.
H	New York Harbor, Arthur Kill, Kill van Kull, and Newark Bay	U.S. Army Corps of Engineers (USACE). 1999. New York New Jersey Harbor Navigation Study – Biological Monitoring Program. USACE New York District.

TABLE 2-2

Newark Bay Aquatic Sampling Program 1995 – 1996
Shoal Station Catch Per Ten Minutes of 30-ft Bottom Trawl Effort

	NEWARK BAY (4 stations combined)													
Species Collected	1995 APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1996 JAN	FEB	MAR	TOTAL	% COMP.
Alewife							1.00						1.00	0.03
American shad			1.00			9.00	3.00						13.00	0.40
Atlantic croaker					1.00				1.00				2.00	0.06
Atlantic herring		4.00											4.00	0.12
Atlantic silverside						78.00	50.00	7.00					135.00	4.18
Atlantic tomcod		2.00											2.00	0.06
Bay anchovy		4.00	23.50	147.00	787.00	1703.00	10.00	2.00					2676.50	82.97
Blueback herring			2.00	1.00									3.00	0.09
Bluefish					5.00	33.00	7.00						45.00	1.39
Butterfish														
Crevalle jack						4.00							4.00	0.12
Cunner														
Gizzard shad										1.00			1.00	0.03
Grubby														
Northern Puffer					1.00								1.00	0.03
Northern kingfish						15.00							15.00	0.46
Northern pipefish		3.00	1.00	4.00									8.00	0.25
Scup														
Spot														
Spotted hake		7.00											7.00	0.22
Striped anchovy							1.00						1.00	0.03
Striped bass	63.50	69.00	17.00	13.00		1.00	15.00				2.00		180.50	5.60
Summer flounder		5.00	7.25	7.00	8.00	2.00							29.25	0.91
Weakfish		1.00		5.00		1.00							7.00	0.22
White perch	1.00	1.00				5.00		1.00	1.00				9.00	0.28
Windowpane				1.00									1.00	0.03
Winter flounder	9.75	15.00	8.00	7.00	2.00	15.00	9.00	8.00			3.00	4.00	80.75	2.50

SOURCE: LMS 1996

TABLE 2-3

Newark Bay Aquatic Sampling Program 1995 – 1996
Channel Station Catch Per Ten Minutes of 30-ft Bottom Trawl Effort

	NEWARK BAY (2 stations combined)													
Species Collected	1995 APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1996 JAN	FEB	MAR	TOTAL	% COMP.
Alewife														
American shad														
Atlantic croaker														
Atlantic herring														
Atlantic silverside														
Atlantic tomcod		2.5		48.3					2.5				53.3	11.5
Bay anchovy					20.0		3.3						23.3	5.0
Blueback herring														
Bluefish														
Butterfish					2.5								2.5	0.5
Crevalle jack														
Cunner						2.5	2.5						5.0	1.1
Gizzard shad														
Grubby		12.5	3.3	16.7					17.5	32.5		5.0	87.5	18.8
Northern puffer														
Northern kingfish														
Northern pipefish														
Scup		5.0											5.0	1.1
Spot			3.3				2.5						5.8	1.3
Spotted hake		45.0						2.9					47.9	10.3
Striped anchovy														
Striped bass						3.3			20.0	13.3	3.3	10.0	50.0	10.7
Summer flounder														
Weakfish						3.3	7.5						10.8	2.3
White perch		2.5				3.3			9.2	6.7		10.0	31.7	6.8
Windowpane				3.3						3.3			6.7	1.4
Winter flounder		2.5	46.7	40.0	13.3	6.7		3.3	6.7	13.3		3.3	135.8	29.2

SOURCE: LMS 1996

TABLE 2-4

Number of Fish and Megainvertebrates Collected with an 4.9-M Otter Trawl at Shoal Stations in Newark Bay, May 1993 – April 1994

Common Name	Scientific Name	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Species Total	% Comp.
Blueback herring	*Alosa aestivalis*	-	-	-	-	-	-	2	7	-	-	-	-	9	0.32
Alewife	*Alosa pseudoharengus*	2	-	-	1	-	-	-	2	-	-	-	-	5	0.18
American shad	*Alosa sapidissima*	1	-	-	3	2	-	-	2	-	-	-	-	8	0.29
Atlantic herring	*Clupea harengus*	50	616	-	-	-	-	-	-	-	-	-	-	666	23.88
Bay anchovy	*Anchoa mitichilli*	1	79	171	398	750	-	-	8	-	-	-	1	1408	50.48
Rainbow smelt	*Osmerus Mordax*	-	-	-	-	-	-	-	-	-	-	1	-	1	0.04
Altantic tomcod	*Microgadus tomcod*	48	246	-	-	-	-	-	-	-	-	-	-	294	10.54
Spotted hake	*Urophycis regia*	-	2	-	-	-	-	-	-	-	-	-	-	2	0.07
Atlantic silverside	*Menidia menidia*	-	-	-	-	-	30	3	8	1	-	2	-	44	1.58
Threespine stickleback	*Gasterosteus aculeatus*	-	-	-	-	-	-	-	-	-	-	2	-	2	0.07
Lined seahorse	*Hippocampus erectus*	-	1	-	-	-	-	-	-	-	-	-	-	1	0.04
Northern pipefish	*Syngnathus fuscus*	1	3	4	1	1	-	-	-	-	-	-	-	10	0.36
Northern searobin	*Prionotus carolinus*	1	-	-	-	-	-	-	-	-	-	-	-	1	0.04
Striped searobin	*Prionitus evolans*	-	-	-	2	1	-	-	-	-	-	-	-	3	0.11
Grubby	*Myoxocephalus aenaeus*	-	-	-	-	-	-	1	-	-	-	-	-	1	0.04
White perch	*Morone americana*	-	-	-	-	-	-	-	8	-	-	2	-	10	0.36
Striped bass	*Morone saxatilis*	6	1	8	23	33	37	1	23	-	-	-	-	132	4.73
Bluefish	*Pomatomus saltatrix*	-	-	2	4	9	-	-	-	-	-	-	-	15	0.54
Weakfish	*Cynoscion regalis*	-	-	-	3	-	3	-	-	-	-	-	-	6	0.22
Spot	*Leiostomus xanthurus*	-	-	-	1	-	-	-	-	-	-	-	-	1	0.04
Northern kingfish	*Menticirrhus saxatilis*	-	-	-	2	-	-	-	-	-	-	-	-	2	0.07
Goby	*Gobiidae sp.*	-	1	-	-	-	-	-	-	-	-	-	-	1	0.04
Butterfish	*Peprilus triacanthus*	-	-	-	-	-	1	-	-	-	-	-	-	1	0.04
Smallmouth flounder	*Etropus microstomus*	-	-	-	-	2	-	1	-	-	-	-	-	3	0.11
Summer flounder	*Paralichthys dentatus*	1	5	9	6	-	-	-	-	-	-	-	-	21	0.75
Windowpane	*Scophthalmus aquosus*	-	-	4	-	-	-	-	-	-	-	-	-	4	0.14
Winter flounder	*Pleuronectes americanus*	25	53	21	14	1	8	6	5	1	-	-	3	137	4.91
Northern puffer	*Sphoeroides maculatus*	-	-	-	-	1	-	-	-	-	-	-	-	1	0.04
Easter oyster	*Crassostrea virginica*	-	1	-	-	-	-	-	-	-	-	-	-	1	
Blue crab (M)	*Callinectes sapidus*	2	13	51	27	13	17	-	-	-	3	11	-	137	
Blue crab (F)	*Callinectes sapidus*	-	4	41	6	5	8	1	1	-	-	1	1	68	
Blue crab (U)	*Callinectes sapidus*	-	1	-	-	-	-	-	-	-	-	-	-	1	

NOTES: A dash (-) indicates no catch, U = unclassified to sex, M=Male, and F=Female.
SOURCE: NMFS 1994.

TABLE 2-5 (page 1 of 2)

Number of Fish and Megainvertebrates Collected with an 8.5-M Otter Trawl at Channel Stations in Newark Bay, May 1993 – April 1994

Common Name	Scientific Name	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Species Total	% Comp.
Little skate	*Raja erinacea*	-	-	-	-	-	-	1	-	-	-	-	1	2	0.01
Altantic sturgeon	*Acipenser oxyrhynchus*	-	1	-	-	-	-	-	-	-	-	-	-	1	0.00
American eel	*Anguilla rostrata*	1	1	-	1	-	-	2	1	2	1	-	1	10	0.05
Conger eel	*Congridae sp.*	-	-	-	-	-	-	-	-	1	-	-	-	1	0.00
Blueback herring	*Alosa aestivalis*	-	-	-	-	-	-	-	1	-	-	-	1	2	0.01
Alewife	*Alosa pseudoharengus*	1	2	31	3	3	31	161	2	9	-	-	9	252	1.25
American shad	*Alosa sapidissima*	-	1	-	-	-	-	5	-	-	-	-	2	8	0.04
Altantic menhaden	*Brevoortia tyrannus*	2	8	68	7	2	2	2	-	-	-	-	-	91	0.45
Atlantic herring	*Clupea harengus*	-	3	-	-	-	-	2	-	-	-	1	1	7	0.03
Gizzard shad	*Dorosoma cepedianum*	-	-	-	2	-	13	196	18	47	1	-	-	277	1.37
Bay anchovy	*Anchoa mitichilli*	-	16	282	11	8	2	5	1	-	-	-	-	325	1.61
Rainbow smelt	*Osmerus Mordax*	1	-	-	-	-	-	-	5	313	25	27	2	373	1.85
Altantic tomcod	*Microgadus tomcod*	167	852	1226	684	15	91	276	110	9	8	7	102	3547	17.60
Red hake	*Urophycis chuss*	45	33	1	-	-	-	-	13	3	-	1	3	99	0.49
Spotted hake	*Urophycis regia*	288	450	31	-	-	17	20	15	-	-	-	26	847	4.20
Striped killfish	*Fundulus majalis*	-	-	-	-	-	-	-	-	1	1	-	-	2	0.01
Threespine stickleback	*Gasterosteus aculeatus*	-	-	-	-	-	-	-	-	1	6	11	-	18	0.09
Northern pipefish	*Syngnathus fuscus*	-	-	-	-	1	-	-	-	-	-	-	1	2	0.01
Northern searobin	*Prionotus carolinus*	-	9	7	10	-	2	-	-	-	-	-	-	28	0.14
Striped searobin	*Prionitus evolans*	2	5	3	7	44	25	7	-	-	-	-	-	93	0.46
Grubby	*Myoxocephalus aenaeus*	13	28	13	8	-	4	5	23	66	44	54	13	271	1.34
White perch	*Morone americana*	3	1	-	-	-	1	507	264	244	737	666	354	2777	13.78
Striped bass	*Morone saxatilis*	22	22	323	23	-	41	1742	181	215	1021	1844	1006	6440	31.95
Bluefish	*Pomatomus saltatrix*	-	-	-	1	2	2	-	-	-	-	-	-	5	0.02
Crevalle jack	*Caranx hippos*	-	-	-	-	1	-	-	-	-	-	-	-	1	0.00
Scup	*Stenotomus chrysops*	1	1	-	-	-	1	-	-	-	-	-	-	3	0.01
Silver perch	*Bairdiella chrysoura*	-	-		-	-	8	13	-	-	-	-	-	21	0.10
Weakfish	*Cynoscion regalis*	5	14	9	804	1128	735	104	4	-	-	-	-	2803	13.91
Spot	*Leiostomus xanthurus*	-	-	-	2	2	1	-	-	-	-	-	-	5	0.02
Northern kingfish	*Menticirrhus saxatilis*	-	-	-	1	-	-	-	-	-	-	-	-	1	0.00
Atlantic croaker	*Micropogonias undulatus*	-	-	-	7	3	4	5	3	-	-	-	-	22	0.11
Tautog	*Tautoga onitis*	-	-	-	1	-	-	3	1	-	-	-	1	6	0.03
Cunner	*Tautogolabrus adspersus*	-	1	-	-	-	-	-	-	1	-	2	2	6	0.03

TABLE 2-5 (page 2 of 2)

Number of Fish and Megainvertebrates Collected with an 8.5-M Otter Trawl at Channel Stations in Newark Bay, May 1993 – April 1994

Common Name	Scientific Name	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Species Total	% Comp.
Rock gunnel	*Pholis gunnellus*	-	-	-	-	-	-	-	-	-	-	-	1	1	0.00
Butterfish	*Peprilus triacanthus*	-	-	-	42	18	19	1	-	-	-	-	-	80	0.40
Smallmouth flounder	*Etropus microstomus*	-	-	-	-	-	-	2	2	-	-	-	1	5	0.02
Summer flounder	*Paralichthys dentatus*	28	52	80	40	10	1	-	-	-	-	-	8	219	1.09
Fourspots flounder	*Paralichthys oblongus*	-	1	-	-	-	-	-	-	-	-	-	-	1	0.00
Windowpane	*Scophthalmus aquosus*	1	2	9	4	2	19	19	5	1	2	4	10	78	0.39
Winter flounder	*Pleuronectes americanus*	17	59	161	271	53	108	365	164	51	33	57	69	1408	6.99
Hogchoker	*Trinectes maculatus*	1	2	1	2	7	-	-	2	-	-	1	1	17	0.08
Planehead filefish	*Monacanthus hispidus*	-	-	-	-	-	1	-	-	-	-	-	-	1	0.00
Northern puffer	*Sphoeroides maculatus*	-	-	-	1	-	-	-	-	-	-	-	-	1	0.00
Soft clam	*Mya arenaria*	-	-	-	-	-	-	4	-	2	5	5	29	45	0.78
Longfin sqiud	*Loligo pealei*	-	-	1	-	-	-	-	-	-	-	-	-	1	0.02
Horseshoe crab (U)	*Limulus polyphemus*	1	1	-	1	-	1	-	-	2	1	-	1	8	0.14
Mantis shrimp	*Squilla empusa*	-	-	-	-	2	11	2	-	6	-	-	-	21	0.36
Spider crab (U)	*Libina emarginata*	-	-	-	-	-	-	-	-	-	1	1	-	2	0.03
Atlantic rock crab (U)	*Cancer irroratus*	-	-	-	-	-	-	-	1	-	-	-	-	1	0.02
Atlantic rock crab (M)	*Cancer irroratus*	-	1	-	-	-	-	-	-	3	-	1	-	5	0.09
Lady crab (F)	*Ovalipes acellatus*	-	-	-	-	-	-	-	1	-	-	-	-	1	0.02
Blue crab (M)	*Callinectes sapidus*	336	876	894	163	171	368	100	69	30	54	75	23	3159	54.75
Blue crab (F)	*Callinectes sapidus*	228	647	1093	147	199	62	64	32	13	9	17	16	2527	43.80

NOTES: A dash (-) indicates no catch, U = unclassified to sex, M=Male, and F=Female.
SOURCE: NMFS 1994.

TABLE 2-6

Macroinvertebrate Taxa Collected From Newark Bay, Arthur Kill, and Kill Van Kull, 1995– 1996 (Number/ 0.56 Square Feet)

Monthly Total For All Stations (5 Newark Bay Sites; 2 Channel Sites)														
Species	1995 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1996 Jan	Feb	Mar	Total	%
Bivalvia														
Mercenaria mercenaria		1											1	0.08
Mya arenaria	91	180	55	6	6	2	1		3	3	13	69	429	33.36
Mulinia lateralis	10	14	1	1	39	137	96	51	122	152	151	87	861	66.95
Tellina sp.	7	17	18	11			1	11				3	68	5.29
Lyonsia hyalina	1												1	0.08
Mytilus edulis	1	1											2	0.16
Macoma sp.												2	2	0.16
Gastropoda														
Crepidula fornicata						2	1				1		4	0.31
Crepidula plana						9	1			1	1		12	0.93
Retusa sp.		1											1	0.08
Haminoea solitaria		1	1			4	1	3	5				15	1.17
Epitonium sp.											1		1	0.08
Arthropoda														
Gammaridae	2	4	5		1					1	3	40	56	4.35
Crangon septemspinosus		2						2		1	2		7	0.54
Callinectes sapidus									1			2	3	0.23
Rhithropanopeus harrisii		2				1			1			1	5	0.39
Neopanope texana sayi												1	1	0.08
Eurypanopeus depressus											1		1	0.08
Chordata														
Molgula manhattensis	15				1	3			1		1	2	23	1.79
Total	127	223	80	18	47	158	101	67	133	158	174	207	1286	100.00

Source: LMS 1996.

TABLE 2-7

Macroinvertebrate Taxa Collected From Kill Van Kull, 1995 – 1996
(Number /0.05 Square Meter)

Station	BBN													
Approx. Depth at MLW	42-44'													
Species	1995 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1996 Jan	Feb	Mar	Total	%
Bivalvia														
Mercenaria mercenaria		1											1	0.28
Mya arenaria	21	8	14		6	2	1		1	2	2	69	126	35.80
Mulinia lateralis	7		1		31	2	24	14	9	34	8	7	137	38.92
Tellina sp.		3	3					8					14	3.98
Mytilus edulis	1	1											2	0.57
Macoma sp.												2	2	0.57
Gastropoda														
Crepidula fornicata						2	1				1		4	1.14
Crepidula plana						9	1			1	1		12	3.41
Epitonium sp.											1		1	0.28
Arthropoda														
Gammaridae			1									40	41	11.65
Crangon septemspinosus								2					2	0.57
Callinectes sapidus												1	1	0.28
Rhithropanopeus harrisii						1						1	2	0.57
Neopanope texana sayi												1	1	0.28
Eurypanopeus depressus											1		1	0.28
Chordata														
Molgula manhattensis						3					1	1	5	1.42
Total	29	13	19	0	37	19	27	24	10	37	15	122	352	100.0

Source: LMS 1996.

TABLE 2-8

Macroinvertebrate Taxa Collected From Newark Bay, 1995 – 1996
(Number/0.05 Square Meter)

	Total (April 1995-March 1996)						
Station Approx. Depth at MLW	NBSW (N) 1-2'	NBSW (S) 1-2'	NBSW (W) 1-4'	NBSW (E) 1-3'	NBSW (E) 1-2'	All NBS Total	%
Species							
Bivalvia							
Mya arenaria	55	66	63	4	8	196	20.23
Mulinia lateralis	7	8	50	85	531	681	70.28
Tellina sp.	6	21	4	10	10	51	5.26
Lyonsia hyalina		1				1	0.10
Gastropoda							
Retusa sp.				1		1	0.10
Haminoea solitaria		2	10	1	1	14	1.44
Arthropoda							
Gammaridae	1	1	2	6		10	1.03
Crangon septemspinosus		2			1	3	0.31
Callinectes sapidus			2			2	0.21
Rhithropanopeus harrisii					3	3	0.31
Chordata							
Molgula manhattensis			5	1	1	7	0.72
Total	69	101	136	108	555	969	100.00

Source: LMS 1996.

TABLE 2-9

Macroinvertebrate Taxa Collected From Arthur Kill, 1995 – 1996
(Number/0.05 Square Meter)

Station	GWB													
Approx. Depth at MLW	38-40'													
Species	1995 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1996 Jan	Feb	Mar	Total	%
Bivalvia														
Mercenaria mercenaria											1		107	62.21
Mya arenaria	20	84		2										
Mulinia lateralis	3	13				8	1	8	3	3	3	1	43	25.00
Tellina sp.	1	1						1					3	1.74
Gastropoda														
Haminoea solitaria								1					1	0.58
Arthropoda														
Gammaridae		3	2										5	2.91
Crangon septemspinosus		2											2	1.16
Chordata														
Molgula manhattensis	10											1	11	6.40
Total	34	103	2	2	0	8	1	10	3	3	4	2	172	100.0

Source: LMS 1996.

TABLE 2-10 (page 1 of 3)

Newark Bay / Kill Van Kull Benthos Survey – 1985

TAXONOMIC LISTING	MAY	AUGUST
CNIDARIA		
ANTHOZOA		
METRIDIIDAE		
Metridium senile	X	X
HYDROZOA		
HYDRACTINIIDAE		
Hydractinia sp.		X
TUBULARIIDAE		
Tubularia sp.		X
ASCHELMINTHES		
Nematoda sp.	X	X
RHYNCHOCOELA		
Nemertea sp.	X	
ANNELIDA		
OLIGOCHAETA		
Oligochaeta sp.		X
POLYCHAETA		
AMPHARETIDAE		
Asabellides oculata	X	
CAPITELLIDAE		
Capitella capitata		X
Capitellidae sp.	X	X
CIRRATULIDAE		
Tharyx acutus	X	X
GLYCERIDAE		
Glycera americana		X
Glycera capitata	X	
Glycera dibranchiata	X	X
Glycera sp.	X	X
MAGELONIDAE		
Magelona rioja	X	
MALDANIDAE		
Clymenella sp.	X	X
Maldanidae sp.	X	X
NEPHTYIDAE		
Nephtys incisa		X
Nephtys sp.		X
NEREIDAE		
*Nereis succinea**	X	X
Nereis sp.		X
PECTINARIIDAE		
Pectinaria gouldii	X	X
PHYLLODOCIDAE		
Eteone heteropoda	X	X

TABLE 2-10 (page 2 of 3)

Newark Bay / Kill Van Kull Benthos Survey – 1985

TAXONOMIC LISTING	MAY	AUGUST
POLYNOIDAE		
Harmothoe extenuata	X	
Lepidonotus squamatus	X	X
Polynoidae sp.		X
SABELLARIIDAE		
*Sabellaria vulgaris**	X	X
SABELLIDAE		
Fabricia sabella		X
SERPULIDAE		
Hydroides dianthus		X
SPIONIDAE		
*Polydora ligni**	X	X
Scolelepis squamata	X	
*Scolecolepides viridis**	X	X
*Spio setosa**		X
*Streblospio benedicti**	X	X
ARTHROPODA		
CRUSTACEA		
CIRRIPEDIA		
BALANIDAE		
*Balanus improvisus**		X
Balanus sp.	X	X
CAPRELLIDEA		
CAPRELLIDAE		
Caprella sp.		X
CUMACEA		
Oxyurostylis smithi	X	X
AMPHIPODA		
AORIDAE		
Lembos smithi	X	
Unciola irrorata	X	
CHOROPHIIDAE		
Corophium acherusicum	X	X
Corophium sp.		X
Erichthonius brasiliensis	X	
MELITIDAE		
Melita nitida	X	X
Melitidae sp.	X	X
ISOPODA		
ANTHURIDAE		
Cyathura polita	X	X
IDOTEIDAE		
Edotea montosa	X	X
MYSIDACEA		
MYSIDAE		
Neomysis americana		X

TABLE 2-10 (page 3 of 3)

Newark Bay / Kill Van Kull Benthos Survey – 1985

TAXONOMIC LISTING	MAY	AUGUST
DECAPODA		
CRANGONIDAE		
Crangon septemspinosa		X
XANTHIDAE		
Rhithropanopeus harrisii	X	X
MOLLUSCA		
GASTROPODA		
CALYPTRAEIDAE		
Crepidula plana		X
NASSARIIDAE		
Ilyanassa obsoleta		X
Nassarius trivittata	X	
BIVALVIA		
MACTRIDAE		
Mulinia lateralis	X	X
Spisula solidissima		X
MYIDAE		
*Mya arenaria**	X	X
MYTILIDAE		
Mytilus edulis	X	X
OSTREIDAE		
Crassostrea virginica		X
SOLENIDAE		
Ensis directus		X
TELLINIDAE		
Tellina agilis	X	X
ECTOPROCTA		
GYMNOLAEMATA		
CHEILOSTOMATA		
CALLOPORIDAE		
Callopora sp.		X
ELECTRIDAE		
Electra sp.		X
MEMBRANIPORIDAE		
Conopeum reticulum	X	X
Membranipora tenuis		X
CTENOSTOMATA		
VESICULARIDAE		
Bowerbankia sp.		X
CHORDATA		
ASCIDIACEA		
PLEUROGONA		
MOLGULIDAE		
*Molgula manhattensis**	X	X

Note: * Indicates dominant species. Source USACE-NYD (1987)

TABLE 2-11

Benthic Fauna Identified In Newark Bay in 1993-1994

CNIDARIA
- *Anthozoa*

RHYNCHOCOELA
- *Rhynchocoela*

POLYCHAETA
- *Lepidonotus squamatus*
- *Lepidonotus sublevis*
- *Hypereteone heteropoda*
- *Hypereteone foliosa*
- *Paranaitis speciosa*
- *Eumida sanguinea*
- *Podarkeopsis levifuscina*
- *Microphthalmus sczelkowii*
- *Proceraea cornuta*
- *Streptosyllis pettiboneae*
- Nereidae
- *Neanthes succinea*
- *Nephtys incisa*
- *Glycera spp.*
- *Glycera americana*
- *Leitoscoloplos* sp.
- *Leitoscoloplos robustus**
- *Polydora spp.*
- *Polydora cornuta**
- *Spio setosa*
- *Pygospio elegans*
- *Streblospio benedicti**
- *Marenzelleria viridis*
- *Tharyx sp. A**
- *Heteromastus filiformis*
- *Mediomastus ambiseta**
- *Sabellaria vulgaris**
- *Pectinaria gouldii*
- Ampharetidae
- *Asabellides oculata*
- Sabellidae
- *Polychaete fragments*

OLIGOCHAETA
- Oligochaeta*

MOLLUSCA
- Gastropoda
- *Epitonium sp.*
- *Odostomia* sp.*
- *Rictaxis punctostriatus*
- *Cylichnella bidentata*
- *Doradella obscura*
- *Mytilus edulis*
- *Mulinia lateralis**
- *Ensis directus*
- *Macoma balthica*
- *Tellina agilis*
- *Mya arenaria**
- *Barnea truncata*
- Bivalve siphons

CRUSTACEA
- *Balanus improvisus*
- *Neomysis americana*
- *Leucon americanus**
- *Oxyurostylis smithi*
- *Cyathura polita*
- *Sphaeroma quadridentata*
- *Edotea triloba*
- *Ampelisca* spp.
- *Ampelisca abdita*
- *Microdeutopus* spp.
- *Microdeutopus gryllotalpa*
- *Corophium* spp.
- *Corophium acutum*
- *Unciola serrata*
- *Elasmopus laevis*
- *Melita nitida*
- *Monoculodes* sp. I
- *Parapleustes aestuarius*
- *Paracaprella tenuis*
- *Crangon septemspinosa*
- *Cancer irroratus*
- Xanthidae
- *Rhithropanopeus harrisii*

INSECTA
- Chironomidae

ECHINODERMATA
- Asteroidea
- Echinoidea

ASCIDIACEA
- *Molgula manhattensis*

Note: Asterisk (*) indicates dominate species.
Source: NMFS 1994.

TABLE 2-12 (page 1 of 2)

Benthic Invertebrate Taxa Collected From Newark Bay, 1995 – 1996
(Number/0.05 Square Meter)

Station Approx. Depth at MLW	Total (April 1995-March 1996)						
	NBSW (N) 1-2'	NBSW (S) 1-2'	NBNW 1-4'	NBSE 1-3'	NBNE 1-2'	TOTAL	%
Taxa							
Rhynchocoela							
Nemertea	15	7	5	8	21	56	1.30
Annelida							
Oligochaeta	6	1			3	10	0.23
Polychaeta							
Phyllodocidae	12	13	28	9	15	77	1.78
Glycera sp.	24	11	9	20	9	73	1.69
Glycera dibranchiata	1	2	1		1	5	0.12
Goniadidae	3	1	1			5	0.12
Pectinaria gouldii	2	2	5	9	8	26	0.60
Nereis succinea	8	14	15	3	13	53	1.23
Opheliidae	12					12	0.28
Paraonidae	45	38	156	38	31	308	7.13
Scolecolepidis viridis		1	1		1	3	0.07
Streblospio benedicti	105	268	442	161	73	1049	24.27
Polydora ligni	17	5	8	36	3	69	1.60
Scoloplos sp.	297	464	196	157	147	1261	29.18
Capitella capitata	1					1	0.02
Ampharetidae				2		2	0.05
Sabella sp.					1	1	0.02
Cirratulidae					2	2	0.05
Mollusca							
Bivalves							
Mya arenaria	55	66	63	4	8	196	4.53
Mulinia lateralis	7	8	50	85	531	681	15.76
Tellina sp.	6	21	4	10	10	51	1.18
Lyonsia hyalina		1				1	0.02

TABLE 2-12 (page 2 of 2)

Benthic Invertebrate Taxa Collected From Newark Bay, 1995 – 1996
(Number/0.05 Square Meter)

Station Approx. Depth at MLW	Total (April 1995-March 1996)					TOTAL	%
	NBSW (N) 1-2'	NBSW (S) 1-2'	NBNW 1-4'	NBSE 1-3'	NBNE 1-2'		
Taxa							
Gastropods							
Retusa sp.				1		1	0.02
Haminoea solitaria		2	10	1	1	14	0.32
Arthropoda							
Isopods							
Cyathura polita	45	73	30	50	56	254	5.88
Edotea triloba			2		2	4	0.09
Cumacids							
Leucon americanus	13		24	10	1	48	1.11
Amphipoda	1				3	4	0.09
Ampelisca sp.	2		1	2		5	0.12
Ampelisca abdita	2	4		15	1	22	0.51
Gammarus sp.	1	1	2	4		8	0.19
Gammarus mucronatus				2		2	0.05
Unciola dissimilis					1	1	0.02
Balanus sp.					2	2	0.05
Crangon septemspinosa		2			1	3	0.07
Callinectes sapidus			2			2	0.05
Rhithropanopeus harrisii					3	3	0.07
Chordata							
Molgula manhattensis			5	1	1	7	0.16
Total	680	1005	1060	628	949	4322	100.00

Source: LMS 1996.

TABLE 2-13 (page 1 of 4)

Benthic Invertebrate Taxa Collected From Newark Bay, Arthur Kill, and Kill Van Kull, 1995 – 1996
(Number/0.05 Square Meter)

Taxa	Monthly Total For All Stations (5 Newark Bay; 2-Channel Site)												Total	%
	1995 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1996 Jan	Feb	Mar		
Rhynchocoela														
Nemertea	4	33	6	1		3	1	3		2	1	6	60	0.35
Annelida														
Oligochaeta	18	31		32			2	14	6		25	49	177	1.04
Polychaeta														
Phyllodocidae	161	164	2	3		9	3	8	13	5	13	59	440	2.59
Phyllodoce mucosa	1												1	0.01
Glyceridae												5	5	0.03
Glycera sp.		16	18	8		13	25	21	19	13			133	0.78
Glycera dibranchiata	2				3								5	0.03
Goniadidae	12	2			2	9	1						26	0.15
Pectinaria gouldii	1				1	16	6	2	9	1	5	10	51	0.30
Nereis succinea	15	31	13	1		15	4		9	4	4	35	131	0.77
Opheliidae		17		12									29	0.17
Paraonidae	88	141	61	91	4	55	37	17	37	12	133	153	829	4.88
Spionidae		1											1	0.01
Scolecolepidis viridis	5	35	3			1					1		45	0.26
Streblospio benedicti	2298	3614	88	102		46	77	186	476	168	648	1104	8807	51.83
Polydora ligni	20	36	9	4		34	5	2	19	12	8	13	162	0.95
Spiophanes bombyx	1												1	0.01
Scoloplos sp.	244	336	174	206	31	97	50	46	88	119	93	92	1576	9.28

TABLE 2-13 (page 2 of 4)

Benthic Invertebrate Taxa Collected From Newark Bay, Arthur Kill, and Kill Van Kull, 1995 – 1996
(Number/0.05 Square Meter)

Taxa	Monthly Total For All Stations (5 Newark Bay; 2-Channel Site)												Total	%
	1995 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1996 Jan	Feb	Mar		
Sabellaria vulgaris						417	18			44	26	1721	2226	13.10
Diopatra cuprea									10	9	1	3	23	0.14
Eunice norvegica					2	10	6		1				19	0.11
Nephtys sp.								1					1	0.01
Capitella capitata						7							7	0.04
Ampharetidae						2						12	14	0.08
Hypaniola grayi									1				1	0.01
Sabella sp.						7			1				8	0.05
Sabella micropthalma												3	3	0.02
Cirratulidae									2				2	0.01
Podarke sp.						2							2	0.01
Lepidonotus squamatus							1				1		2	0.01
Mollusca														
Bivalves														
Mercenaria mercenaria		1											1	0.01
Mya arenaria	91	180	55	6	6	2	1		3	3	13	69	429	2.52
Mulinia lateralis	10	14	1	1	39	137	96	51	122	152	151	87	861	5.07
Tellina sp.	7	17	18	11			1	11				3	68	0.40
Lyonsia hyalina	1												1	0.01

TABLE 2-13 (page 3 of 4)

Benthic Invertebrate Taxa Collected From Newark Bay, Arthur Kill, and Kill Van Kull, 1995 – 1996
(Number/0.05 Square Meter)

Taxa	Monthly Total For All Stations (5 Newark Bay; 2-Channel Site)												Total	%
	1995 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1996 Jan	Feb	Mar		
Mytilus edulis	1	1											2	0.01
Macoma sp.												2	2	0.01
Gastropods														
Crepidula fornicata						2	1				1		4	0.02
Crepidula plana						9	1			1	1		12	0.07
Retusa sp.		1											1	0.01
Haminoea solitaria		1	1			4	1	3	5				15	0.09
Epitonium sp.											1		1	0.01
Arthropoda														
Isopods														
Cyathura polita	51	83	25	25	11	8	18	7	9	8	11	7	263	1.55
Edotea triloba	22	16				2	4	3	12	1	4	4	68	0.40
Limnoria lignorum						1					1	1	3	0.02
Cumacids														
Leucon americanus	48	18	1				1	6	2		20	7	103	0.61
Oxyurostylis smithii	2	2											4	0.02
Amphipoda	6	47											53	0.31
Ampeliscidae												3	3	0.02
Ampelisca sp.								3	2				5	0.03

TABLE 2-13 (page 4 of 4)

Benthic Invertebrate Taxa Collected From Newark Bay, Arthur Kill, and Kill Van Kull, 1995 – 1996
(Number/0.05 Square Meter)

Taxa	Monthly Total For All Stations (5 Newark Bay; 2-Channel Site)												Total	%
	1995 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1996 Jan	Feb	Mar		
Ampelisca *abdita*	13	7	1					1		6	9	1	38	0.22
Corophiidae				6									6	0.04
Corophium sp.		1							17	1	4		23	0.14
Gammaridae		3										40	43	0.25
Gammarus sp.		1	5		1					1	3		11	0.06
Gammarus m*ucronatus*	2												2	0.01
Aoridae	0	107											107	0.63
Unciola dissimilis	1												1	0.01
Melita sp.							4						4	0.02
Melita nitida						10	2		3				15	0.09
Balanus sp.									2		9		11	0.06
Crangon septemspinosa		2						2		1	2		7	0.04
Callinectes sapidus									1			2	3	0.02
Xanthidae												4	4	0.02
Rhithropanopeus harrisii		2				1			1			1	5	0.03
Neopanope texana sayi												1	1	0.01
Eurypanopeus depressus											1		1	0.01
Chordata														
Molgula manhattensis	15				1	3			1		1	2	23	0.14
Total	3140	4961	481	509	101	922	366	387	871	563	1191	3499	16991	100.00

Source: LMS 1996.

TABLE 2-14 (page 1 of 2)

Benthic Invertebrate Taxa Collected from the Arthur Kill, 1995 – 1996
(Number/0.05 Square Meter)

Station	GBW													
Approx. Depth at MLW	38-40'													
Taxa	1995 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1996 Jan	Feb	Mar	Total	%
Annelida														
Oligochaeta	5	4		27			1	14			21	12	84	1.64
Polychaeta														
Phyllodocidae	105	126						5		2	5	2	245	4.77
Phyllodoce mucosa	1												1	0.02
Glycera sp.		4	4	4		2	1	1	2				18	0.35
Pectinaria gouldii	1					2	1		6	1			11	0.21
Nereis succinea	1	9		1		4	1			4	3		23	0.45
Opheliidae		17											17	0.33
Paraonidae	2	5	4	80			1	3	3		2	2	102	1.99
Scolecolepidis viridis		13	1								1		15	0.29
Streblospio benedicti	1249	1987	6	100		2	32	142	3	95	266	173	4055	79.00
Polydora ligni	12	31		4						3	4	2	56	1.09
Scoloplos sp.	45	19	17		9	6	1	23		4	26	36	186	3.62
Sabellaria vulgaris											1	4	5	0.10
Diopatra cuprea										9	1	3	13	0.25
Eunice norvegica					2	10	6		1				19	0.37
Mollusca														
Mya arenaria	20	84		2							1		107	2.08
Mulinia lateralis	3	13				8	1	8	3	3	3	1	43	0.84
Tellina sp.	1	1						1					3	0.06
Haminoea solitaria								1					1	0.02
Arthropoda														
Cyathura polita	1	1								1			3	0.06
Edotea triloba	15	7					4	3		1	2	3	35	0.68
Limnoria lignorum											1		1	0.02

TABLE 2-14 (page 2 of 2)

Benthic Invertebrate Taxa Collected from the Arthur Kill, 1995 – 1996
(Number/0.05 Square Meter)

Station Approx. Depth at MLW	GBW 38-40'													
Taxa	1995 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1996 Jan	Feb	Mar	Total	%
Leucon americanus	25						1	6			6	2	40	0.78
Oxyurostylis smithi	2	2											4	0.08
Ampelisca abdita	4	5	1					1					11	0.21
Corophiidae				6									6	0.12
Corophium sp.										1			1	0.02
Gammaridae		3											3	0.06
Gammarus sp.			2										2	0.04
Melita nitida							2						2	0.04
Balanus sp.											8		8	0.16
Crangon septemspinosa		2											2	0.04
Chordata														
Molgula manhattensis	10											1	11	0.21
Total	1502	2333	35	224	11	34	52	208	18	124	351	241	5133	100.00

Source: LMS 1996.

TABLE 2-15 (page 1 of 3)

Benthic Invertebrate Taxa Collected From Kill Van Kull Area, 1995 – 1996
(Number/0.05 Square Meter)

Station	BBN													
Approx. Depth at MLW	42-44'													
Taxa	1995 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1996 Jan	Feb	Mar	Total	%
Rhynchocoela														
Nemertea												4	4	0.05
Annelida														
Oligochaeta	12	27					1		4		3	36	83	1.10
Polychaeta														
Phyllodocidae	16	18		2		8	3		10	1	4	56	118	1.57
Glyceridae												5	5	0.07
Glycera sp.		10	8	2			9	7	3	3			42	0.56
Goniadidae	10				2	9							21	0.28
Pectinaria gouldii					1	3	4	1	1		3	1	14	0.19
Nereis succinea	1	2				9	1		7		1	34	55	0.73
Paraonidae	64	104	39			33	18	5	2	4	9	141	419	5.56
Spionidae		1											1	0.01
Scolecolepidis viridis	5	21				1							27	0.36
Streblospio benedicti	729	1524	79	1		36	21	3	445	7	58	800	3703	49.14
Polydora ligni	7	4	9				1		11			5	37	0.49
Spiophanes bombyx	1												1	0.01
Scoloplos sp.	15	9	33	26	3		3	7	17		2	14	129	1.71
Sabellaria vulgaris						417	18			44	25	1717	2221	29.47
Diopatra cuprea									10				10	0.13
Nephtys sp.								1					1	0.01
Capitella capitata						6							6	0.08
Ampharetidae												12	12	0.16
Hypaniola grayi									1				1	0.01
Sabella sp.						7							7	0.09

TABLE 2-15 (page 2 of 3)

Benthic Invertebrate Taxa Collected from the Kill Van Kull , 1995 – 1996
(Number/0.05 Square Meter)

Station	BBN													
Approx. Depth at MLW	42-44'													
Taxa	1995 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1996 Jan	Feb	Mar	Total	%
Sabella micropthalma												3	3	0.04
Podarke sp.						2							2	0.03
Lepidonotus squamatus							1				1		2	0.03
Mollusca														
Bivalves														
Mercenaria mercenaria		1											1	0.01
Mya arenaria	21	8	14		6	2	1		1	2	2	69	126	1.67
Mulinia lateralis	7		1		31	2	24	14	9	34	8	7	137	1.82
Tellina sp.		3	3					8					14	0.19
Mytilus edulis	1	1											2	0.03
Macoma sp.												2	2	0.03
Gastropods														
Crepidula fornicata						2	1				1		4	0.05
Crepidula plana						9	1			1	1		12	0.16
Epitonium sp.											1		1	0.01
Arthropoda														
Isopods														
Cyathura polita	4											2	6	0.08
Edotea triloba	6	7				2			11		2	1	29	0.38
Limnoria lignorum						1						1	2	0.03
Cumacids														
Leucon americanus	15												15	0.20
Amphipoda	2	47											49	0.65
Ampeliscidae												3	3	0.04
Ampelisca abdita	3	2											5	0.07

TABLE 2-15 (page 3 of 3)

Benthic Invertebrate Taxa Collected from the Kill Van Kull , 1995 – 1996
(Number/0.05 Square Meter)

Station	BBN													
Appx. Depth at MLW	42-44'													
Taxa	1995 Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	1996 Jan	Feb	Mar	Total	%
Corophium sp.		1							17		4		22	0.29
Gammaridae												40	40	0.53
Gammarus sp.			1										1	0.01
Aoridae		107											107	1.42
Melita sp.							4						4	0.05
Melita nitida						10			3				13	0.17
Balanus sp.											1		1	0.01
Crangon septemspinosa								2					2	0.03
Callinectes sapidus												1	1	0.01
Xanthidae												4	4	0.05
Rhithropanopeus harrisii						1						1	2	0.03
Neopanope texana sayi												1	1	0.01
Eurypanopeus depressus											1		1	0.01
Chordata														
Molgula manhattensis						3					1	1	5	0.07
Total	919	1897	187	31	43	563	111	48	552	96	128	2961	7536	100.00

TABLE 2-16 (page 1 of 4)

Benthic Invertebrate Taxa Collected From the Goethals Bridge and Old Place Creek Study Area, 1994

PHYLUM **Class** **Order** **Family** ***Genus species***	**Common Name**
RHYNCHOCOELA (NEMERTEA)	Nematodes
ANNELIDA	Segmented worms
Oligochaeta	Aquatic earthworms
Polychaeta	Bristle worms
Phyllodocida	
Phyllodocidae	Paddle worms
Eteone lactea	
Phyllodoce arenae	
Glyceridae	Blood worms
Glycera dibranchiata	
Goniadidae	Chevron worms
Terebellida	
Pectinariidae	
Pectinaria gouldii	Trumpet worms
Ampharetidae	Ampharetid worms
Nereidae	
Nereis sp.	Clam worms
Nereis succinea	Common clam worms
Capitellida	
Capitellidae	
Capitella capitata	Capitellid thread worms
Spionida	
Paraonidae	Paraonid worms
Aricidea sp.	
Sabellaridae	
Sabellaria vulgaris	Sand-builder worms
Spionidae	
Scolecolepides viridis	Red-gilled mud worms

TABLE 2-16 (page 2 of 4)

Benthic Invertebrate Taxa Collected From the Goethals Bridge and Old Place Creek Study Area, 1994

PHYLUM Class Order Family *Genus species*	Common Name
Streblospio benedicti	Barred-gilled mud worms
Polydora ligni	Whip mud worms
Spiophanes bombyx	Mud worms
Ariciida	
Orbiniidae	Orbiniid worms
Scoloplos sp.	
Eunicida	
Onuphidae	
Diopatra cuprea	Plumed worms
MOLLUSCA	
Bivalvia	
Heterodonta	
Veneridae	
Mercenaria mercenaria	Hard-shelled clams
Gemma gemma	Gem venus clams
Myidae	
Mya arenaria	Soft-shelled clams
Mactridae	
Mulinia lateralis	Little surf clams
Tellinidae	
Tellina sp.	Tellins
Eudesmodontida	
Lyonsidae	
Lyonsia hyalina	Glassy lyonsia
Gastropoda	Snails and slugs
Cephalaspidea	
Atyidae	
Haminoea solitaria	Solitary glassy bubbles
Mesogastropoda	
Hydrobiidae	
Hydrobia minuta	Swamp hydrobia

TABLE 2-16 (page 3 of 4) Benthic Invertebrate Taxa Collected From the Goethals Bridge and Old Place Creek Study Area, 1994	
PHYLUM **Class** **Order** **Family** ***Genus species***	**Common Name**
ARTHROPODA	
Crustacea	Crustaceans
Subclass Pterygota	
Diptera	Flies
Subclass Ostracoda	
Subclass Cirrepedia	
Thoracia	
Balanidae	
Subclass Malacostraca	
Isopoda	Isopods
Anthuridae	
Cyathura polita	Slender isopods
Idoteidae	
Edotea triloba	Mounded-back isopods
Cumacea	Cumacean shrimp
Leuconidae	
Leucon americanus	
Diastylidae	
Oxyurostylis smithi	Sharp-tailed cumacean
Amphipoda	
Ampeliscida	
Ampelisca abdita	Four-eyed amphipods
Corophiidae	
Corophium sp.	Slender tubemakers
Gammaridae	Scuds
Gammarus sp.	
Gammarus mucronatus	Spine-backed scuds
Gammarus daiberi	
Melita nitida	

TABLE 2-16 (page 4 of 4)

Benthic Invertebrate Taxa Collected From the Goethals Bridge and Old Place Creek Study Area, 1994

PHYLUM **Class** **Order** **Family** ***Genus species***	**Common Name**
Pleustidae	
Stenopleustes sp.	
Decapoda	Decapods
Infraorder Caridea	Caridean shrimp
Crangonidae	
Crangon septemspinosa	Sand shrimp
Infraorder Brachyura	True crabs
Xanthidae	Mud crabs
Rhithropanopeus harrisii	White-fingered mud crabs
Portunidae	Swimming crabs
Callinectes sapidus	Blue crabs
CHORDATA	
Infraorder Ascidiacea	
Pleurogona	
Molgulidae	
Molgula manhattensis	Sea grapes

Source: USCG (1995)

CHAPTER 3

3.0 MATERIALS AND METHODOLOGY

The primary purpose of the biological monitoring program was to obtain information on seasonal use patterns and distribution trends of the Harbor's navigation channels, berthing areas, marine terminals and adjacent habitats by aquatic populations. Sampling gear-types and seasonal surveys reflect the focus of the biological monitoring program on two specific aquatic communities, demersal (i.e., bottom orientated) fish and benthic macroinvertebrates. Both communities were considered the primary receptors of potential aquatic impacts associated with proposed channel deepening alternatives.

A summary of the biological monitoring program methodology and materials is provided below. Additional details on sampling procedures, analysis and quality assurance/quality control (QA/QC) procedures are provided in the standard operating procedures (SOP) (USACE 1999).

3.1 FISHERIES SURVEYS

Seasonal use patterns and distribution trends of fisheries populations in the project area were sampled using several gear types, including: bottom trawls; epibenthic sled mounted ichthyoplankton nets; and a hydroacoustic echo sounder.

3.1.1 Bottom Trawl and Hydroacoustic Survey

Bottom trawl surveys were conducted to evaluate the seasonal use of demersal fishes within navigation channels, shoals and interpier areas. Bottom trawl surveys were conducted using a 30-foot (9.1 m) otter trawl, typical of previous biological monitoring programs conducted in the New York/ New Jersey Harbor area. Bottom trawl surveys were conducted against the prevailing current at an adjusted speed over the bottom of 4.9 ft/sec (150 cm/sec) for ten minutes. Tow velocities and duration were adjusted accordingly to account for obstructions, limited distances, and commercial traffic. A minimum 5:1 tow cable length to maximum station depth ratio was maintained to ensure trawl contact with the bottom. All samples were collected during daylight hours. Bottom trawl specifications are shown in Table 3-1.

Bottom trawl samples were analyzed for all fish collected. Fish analysis included species identification, enumeration, and fish length. The total length of up to 100 specimens was measured for each species for each bottom trawl sample. Numbers of fish collected were adjusted for tow duration and reported as catch-per-unit-effort (CPUE) for a 10-minute tow.

Hydroacoustic surveys were conducted to obtain information on fish population in the water column above the navigation channel bottom. Hydroacoustic surveys were conducted simultaneously with bottom trawl surveys using an HTI Model 241

hydroacoustic system. A 200 MHz 15° beam width transducer was mounted in a towfin and towed off the side of the boat. Hydroacoustic system specifications are shown in Table 3-1.

Results of each hydroacoustic survey (i.e., station track or tow) were recorded in discrete database files along with station sampling information. Station bottom depth (m), tracked target (i.e., acoustic echo) strengths (dB), and tracked target depths (m) were recorded during each survey.

3.1.2 Ichthyoplankton Survey

A seasonal ichthyoplankton survey was conducted to obtain distribution information on demersal egg and larval stages of fish populations in the project area. Ichthyoplankton surveys were conducted using an epibenthic sled mounted 0.5-m plankton net towed against the prevailing current at an adjusted speed over the bottom of 3.3 ft/sec (100 cm/sec). Tow duration was ten minutes. Tow velocities and duration were adjusted accordingly to account for obstructions, limited distances, and commercial traffic. A minimum 5:1 tow cable length to maximum station depth ratio was maintained to ensure sled contact with the bottom. A General Oceanics Model 2030R digital flowmeter mounted in the mouth of the sled-mounted plankton net was used to calculate sample volume. All samples were collected during daylight hours. The epibenthic sled and 0.5-m plankton net specifications are shown in Table 3-1.

Ichthyoplankton samples were transferred to sample containers filled with 5% buffered formalin and the vital stain rose bengal. Sample containers were returned to the laboratory for analysis. All fish larvae and eggs collected were identified to the lowest practical taxonomic level, assigned a life stage (egg, yolk sac larvae, post-yolk sac larvae, or juvenile) based on morphometric characteristics and enumerated. Samples containing large numbers of fish eggs or larvae were split prior to analysis using a Folsom plankton splitter. Actual egg and larval counts were adjusted for subsampling (i.e., splitting) and reported as egg or larval densities (no./ 1000 cubic meters) based on sample volume.

3.2 BENTHIC MACROINVERTEBRATE SURVEYS

Benthic macroinvertebrate surveys were conducted to evaluate seasonal use patterns and distribution trends of shellfish (primarily blue crab) and benthic invertebrate populations in navigation channels, shoals and interpier regions of the project area. Benthic macroinvertebrate surveys were conducted using both a commercial style crab dredge and a Smith-McIntrye sediment grab sampler.

3.2.1 Benthic Macroinvertebrate Survey

A Smith-McIntrye sediment sampler (mouth area of 0.1 square meters) was used to collect quantitative benthic macroinvertebrate samples. Replicate grab samples were

collected at each sample station. The Smith-McIntrye sediment sampler specifications are shown in Table 3-1.

Sediment grab samples were rinsed using a 1000μ sieve and transferred to sample containers filled with 5% buffered formalin and the vital stain phloxine B. Sample containers were returned to the laboratory for analysis. Samples containing excessive sand and detritus, or organisms in significant number, were split using a Caton Macroinvertebrate Subsampler. Following sorting and subsampling, organisms were identified to the lowest practical taxonomic level and enumerated. Organism counts were adjusted to sample size (i.e., area) and recorded as macroinvertebrate densities (no./0.1 square meter). Replicate grab samples were averaged and reported for each station.

3.2.2 Crab Dredge Survey

A seasonal crab dredge survey was conducted to evaluate the use of navigation channels, shoals and interpier regions as overwintering areas for crabs (primarily blue crabs) and other large macroinvertebrates. Crab dredge surveys were conducted using a commercial style 48-in steel knife edge crab dredge towed at an adjusted speed over the bottom of 5.0 ft/sec (152 cm/sec). Tow duration varied between a minimum of 2 minutes and a maximum of 5 minutes due to obstructions, limited distances, and commercial traffic. Crab dredge specifications are provided in Table 3-1.

All blue crabs collected were enumerated. The presence of other crab species (e.g., green crab, rock crab) were noted. The sex and carapice width (spine-tip to spine-tip) of each blue crab collected was recorded. Blue crab counts were adjusted for tow duration and reported as CPUE for a 5-minute tow.

3.3 HARBORWIDE SAMPLING PROGRAM

The primary purpose of the harborwide sampling program was to determine the seasonal use of the Harbor's navigation channels by demersal fish and benthic macroinvertebrate populations. Sampling locations and sampling frequency for both fisheries and macroinvertebrate surveys are described below.

3.3.1 Sampling Locations

Harborwide sampling locations were selected to distribute sampling effort evenly among several navigation channels and different water bodies within the project area. The original sampling methodology specified eight fixed sampling stations to be sampled seasonally (depending on gear type) beginning in October 1998. One station was located in each of the following areas: Lower Harbor (HW-1); Red Hook (HW-3); Kill Van Kull (HW-5); and Newark Bay (HW-8). Two stations were located in the Upper Harbor (HW-2 and HW-4), as well as in the Arthur Kill (HW-6 and HW-7). All stations were located within navigation channels (Figure 3-1).

In March 1999, two additional sampling stations were added to the harborwide sampling program. Both stations were located in the Newark Bay area, one located in the south reach of the Newark Bay channel (HW-9) and one located near the confluence of the Newark Bay and Port Elizabeth channels (HW-10) (Figure 3-1). Both stations were added to provide additional sampling coverage of the Newark Bay area.

Sampling stations were located using Global Positioning System (GPS) coordinates as well as aids to navigation, soundings, bottom type, and landmarks. Starting points for bottom trawl, ichthyoplankton, and crab dredge surveys were located at either end of a station transect, depending on current and tide patterns. Benthic macroinvertebrate grab samples were located at the approximate mid-point of each station transect. Station locations (GPS coordinates) and nominal depths are listed in Table 3-2.

3.3.2 Sampling Frequency

The harborwide sampling program was conducted over a 12-month period, beginning in October 1998 and continuing through September 1999. Sampling surveys were conducted bi-monthly, quarterly or seasonally, depending on gear type (Table 3-3).

3.3.2.1 ***Bottom Trawl and Hydroacoustic Survey.*** Beginning in October 1998, bottom trawl surveys were conducted bi-monthly (i.e., every other month) at stations HW-1 through HW-8. Hydroacoustic surveys, conducted simultaneously with bottom trawl surveys, began in December 1998 and continued through September 1999. One bottom trawl sample (i.e., one tow) was collected at each station.

Stations HW-9 and HW-10 were added to the harborwide sampling program in March 1999. Bottom trawl and hydroacoustic surveys were conducted at HW-9 and HW-10 during March, April, June and August 1999. An additional bottom trawl and hydroacoustic survey was also conducted at station HW-8, located at Newark Bay Middle Reach, during April 1999 to compliment the additional sampling effort in Newark Bay.

Additional bottom trawl and hydroacoustic surveys were also conducted at station HW-5, located in the Kill Van Kull. Bottom trawl surveys were conducted every other month beginning in October 1998 through February 1999. Hydroacoustic surveys were conducted simultaneously with bottom trawl surveys beginning in December 1998. Monthly sampling, with the exception of May 1999, was conducted from March through September 1999.

3.3.2.2 ***Ichthyoplankton Survey.*** Seasonal ichthyoplankton surveys were conducted monthly at harborwide sampling stations HW-1 through HW-8 beginning in February 1999. Monthly surveys continued through June 1999 (Table 3-3). Ichthyoplankton surveys commenced at stations HW-9 and HW-10 in March 1999 and continued through June 1999.

3.3.2.3 ***Benthic Macroinvertebrate Survey.*** Benthic macroinvertebrate surveys were conducted every three months (i.e., quarterly) at harborwide sampling stations HW-1 through HW-8 beginning in November 1998 (Table 3-3). Stations HW-9 and HW-10 were not added to the harborwide sampling program until March 1999. Benthic macroinvertebrate surveys were conducted at HW-9 and HW-10 during May and August 1999.

3.3.2.4 ***Crab Dredge Survey.*** Seasonal crab dredge surveys were conducted monthly at harborwide sampling stations HW-1 through HW-8 from February through April 1999 (Table 3-3). Crab dredge surveys began in March 1999 at stations HW-9 and HW-10 and continued through April 1999.

3.4 SITE-SPECIFIC SAMPLING PROGRAM

The primary purpose of the site-specific sampling program was to obtain information on the relative distribution and seasonal use of the Harbor's berthing areas and marine terminals by demersal fish and benthic macroinvertebrate populations. Two facilities, Port Jersey and South Brooklyn, were selected as representative areas for site-specific evaluation. Aquatic habitat and biological conditions at Port Jersey were considered characteristic of the areas surrounding the Port Newark/Elizabeth Marine Terminal and Howland Hook Marine Terminal. South Brooklyn was considered characteristic of the Red Hook and Brooklyn Marine Terminals. Sampling locations and sampling frequency for both fisheries and macroinvertebrate surveys are described below.

3.4.1 Sampling Locations

Site-specific sampling locations were selected to distribute sampling effort evenly among the two representative marine terminal facilities within the project area. The original sampling methodology specified nine fixed sampling stations to be sampled seasonally (depending on gear type) beginning in October 1998. Sampling locations included interpier areas, approach channels, and flats or shoals in the immediate vicinity of each facility.

Four stations were located at South Brooklyn. Three stations were located in interpier areas within Gowanus Bay (SB-1, SB-2 and SB-3) and one station was located in the approach channel (i.e., Bay Ridge Channel) (SB-4) (Figure 3-1).

Five fixed sampling stations were located at Port Jersey. Two stations were located on nearshore flats, one adjacent to Constable Hook (PJ-3) and one on the Jersey Flats (PJ-1) (Figure 3-1). Interpier stations were located within the Port Jersey Channel (PJ-4) and adjacent to the Global Marine Terminal (PJ-5). One station was located in the approach channel (PJ-2). In February 1999, one additional sampling station was added to the site-specific sampling program at Port Jersey. This station was located within the Claremont Terminal Channel (PJ-6) (Figure 3-1).

Sampling stations were located using Global Positioning System (GPS) coordinates as well as aids to navigation, soundings, bottom type, and landmarks. Station locations (GPS coordinates) and nominal depths are listed in Table 3-4. Starting points for bottom trawl, ichthyoplankton, and crab dredge surveys were located at either end of a station transect, depending on current and tide patterns. Benthic macroinvertebrate grab samples were located at the approximate mid-point of each station transect.

3.4.2 Sampling Frequency

The site-specific sampling program was conducted over a 12-month period, beginning in October 1998 and continuing through September 1999. Sampling surveys were conducted bi-monthly, quarterly or seasonally, depending on gear type (Table 3-5).

3.4.2.1 ***Bottom Trawl and Hydroacoustic Survey.*** Beginning in October 1998, bottom trawl surveys were conducted monthly at stations SB-1 through SB-4 and PJ-1 through PJ-5. Hydroacoustic surveys, conducted simultaneously with bottom trawl surveys, began in December 1998 and continued through September 1999. One bottom trawl sample (i.e., one tow) was collected at each station.

Station PJ-6 was added to the site-specific sampling program in February 1999. Bottom trawl and hydroacoustic surveys were conducted at PJ-6 monthly through September 1999.

3.4.2.2 ***Ichthyoplankton Survey.*** Seasonal ichthyoplankton surveys were conducted monthly at all site-specific stations beginning in February 1999. Monthly surveys continued through June 1999 (Table 3-5).

3.4.2.3 ***Benthic Macroinvertebrate Survey.*** Benthic macroinvertebrate surveys were conducted every three months (i.e., quarterly) at stations SB-1 through SB-4 and PJ-1 through PJ-5 beginning in November 1998 (Table 3-5). Station PJ-6 was not added to the site-specific sampling program until February 1999. Benthic macroinvertebrate surveys were conducted at PJ-6 during February, May and August 1999.

3.4.2.4 ***Crab Dredge Survey.*** Seasonal crab dredge surveys were conducted monthly at all site-specific stations from February through April 1999 (Table 3-5).

TABLE 3-1

Biological Monitoring Program Gear Specifications

Survey	Gear Specifications	
Bottom Trawl	Headrope	25.9 ft. (7.9 m)
30-ft Otter trawl (9.1 m)	Footrope	27.9 ft. (8.5 m)
	Wing height	3.6 ft. (1.1 m)
	Total length	35.1 ft. (10.7)
	Wing mesh (square)	2.0 in. (5.1 cm)
	Body mesh (square)	2.0 in. (5.1 cm)
	Cod end mesh (square)	0.75 in. (1.9 cm)
	Cod end liner mesh (square)	0.25 in. (0.6 cm)
	Trawl doors	32.0 x 17.0 x 0.75 in. (79.2 x 39.6 x 3.1 cm)
	Tow line length	5 times maximum station water depth
Hydroacoustic survey	HTI Model 241-2 Split beam digital echo sounder	
Digital echo sounder	HTI Model 5445-200 Split beam transducer 200 kHz 15°	
	Model 624 towfin	
	Digital audio tape recorder	
	Dual channel oscilloscope (20 Mhz)	
Ichthyoplankton tow	Mouth diameter	0.5 m
Epibenthic sled mounted	Overal length	3.0 m
0.5-m plankton net	Mesh size	0.5 mm
	Cod end diameter	10.1 cm
	Code end mesh	0.5 mm (PVC cod end bucket)
	Epibenthic sled	Constructed of PVC pipe
Benthic	Smith-McIntyre sediment sampler	
macroinvertebrate grab	Grab (jaw) sample area	0.1 square meter
Crab dredge	Mouth opening	2.0 in. (6.1 cm) x 48 in. (121.5 cm)
	Mesh	2.0 in (5.1 cm) nylon/steel
	Steel knife edge	

Note: Additional gear specifications provided in the standard operating procedures (SOP) (USACE 1999).

TABLE 3-2 (page 1 of 2)

Harborwide Survey Station Locations

Survey	Harbor Area	Station	Location	Depth (Ft)	GPS Coordinates (deg., min., sec.) Start	N W	End	N W
BOTTOM TRAWL	Lower Harbor	HW-1	Ambrose Channel North	51	40 33 54 74 01 55		40 33 20 74 01 43	
	Upper Harbor	HW-2	Anchorage Channel South	50	40 38 49 74 03 16		40 38 14 74 02 58	
	Red Hook	HW-3	Red Hook Channel	43	40 40 38 74 01 20		40 40 10 74 01 16	
	Upper Harbor	HW-4	Anchorage Channel North	51	40 40 57 74 01 52		40 40 29 74 02 08	
	Kill Van Kull	HW-5	Bergen Point East Reach/ Constable Hook Reach	43	40 38 46 74 06 30		40 38 42 74 06 52	
	Arthur Kill	HW-6	North of Shooter Island Reach	40	40 38 48 74 10 29		40 38 47 74 09 55	
	Arthur Kill	HW-7	Elizabeth Reach	38	40 38 22 74 11 31		40 38 35 74 11 16	
	Newark Bay	HW-8	Middle Reach	41	40 40 23 74 07 58		40 40 50 74 07 50	
	Newark Bay	HW-9	Newark Bay South Reach	45	40 39 43 74 08 24		40 39 20 74 08 38	
	Newark Bay	HW-10	Newark Bay/Port Elizabeth	41	40 40 06 74 08 10		40 39 44 74 08 24	
ICHTHYOPLANKTON	Lower Harbor	HW-1	Ambrose Channel North	51	40 33 54 74 01 55		40 33 20 74 01 43	
	Upper Harbor	HW-2	Anchorage Channel South	50	40 38 49 74 03 16		40 38 14 74 02 58	
	Red Hook	HW-3	Red Hook Channel	43	40 40 38 74 01 20		40 40 10 74 01 16	
	Upper Harbor	HW-4	Anchorage Channel North	51	40 40 57 74 01 52		40 40 29 74 02 08	
	Kill Van Kull	HW-5	Bergen Point East Reach/ Constable Hook Reach	43	40 38 46 74 06 30		40 38 42 74 06 52	
	Arthur Kill	HW-6	North of Shooter Island Reach	40	40 38 48 74 10 29		40 38 47 74 09 55	
	Arthur Kill	HW-7	Elizabeth Reach	38	40 38 22 74 11 31		40 38 35 74 11 16	
	Newark Bay	HW-8	Middle Reach	41	40 40 23 74 07 58		40 40 50 74 07 50	
	Newark Bay	HW-9	Newark Bay South Reach	45	40 39 65 74 08 44		40 40 16 74 08 13	
	Newark Bay	HW-10	Newark Bay/Port Elizabeth	41	40 40 06 74 08 19		40 39 75 74 08 40	

TABLE 3-2 (page 2 of 2)

Harborwide Survey Station Locations

Survey	Harbor Area	Station	Location	Depth (Ft)	GPS Coordinates (deg., min., sec.) Start N W	End N W
BENTHIC MACROINVERTEBRATE GRAB	Lower Harbor	HW-1	Ambrose Channel North	51	40 33 51 74 01 50	
	Upper Harbor	HW-2	Anchorage Channel South	50	40 38 20 74 03 03	
	Red Hook	HW-3	Red Hook Channel	43	40 40 12 74 01 23	
	Upper Harbor	HW-4	Anchorage Channel North	51	40 40 44 74 01 47	
	Kill Van Kull	HW-5	Bergen Point East Reach/ Constable Hook Reach	43	40 38 40 74 06 56	
	Arthur Kill	HW-6	North of Shooter Island Reach	40	40 38 48 74 10 04	
	Arthur Kill	HW-7	Elizabeth Reach	38	40 38 18 74 11 25	
	Newark Bay	HW-8	Middle Reach	41	40 40 31 74 07 54	
	Newark Bay	HW-9	Newark Bay South Reach	45	40 39 28 74 08 30	
	Newark Bay	HW-10	Newark Bay/Port Elizabeth	41	40 39 52 74 08 18	
CRAB DREDGE	Lower Harbor	HW-1	Ambrose Channel North	51	40 33 30 74 01 49	40 33 38 74 01 58
	Upper harbor	HW-2	Anchorage Channel South	50	40 38 41 74 03 14	40 38 26 74 03 10
	Red Hook	HW-3	Red Hook Channel	43	40 40 11 74 01 20	40 40 29 74 01 27
	Upper Harbor	HW-4	Anchorage Channel North	51	40 40 36 74 02 13	40 40 25 74 02 19
	Kill Van Kull	HW-5	Bergen Point East Reach/ Constable Hook Reach	43	40 38 41 74 06 59	40 38 45 74 06 45
	Arthur Kill	HW-6	North of Shooter Island Reach	40	40 38 51 74 09 45	40 38 51 74 10 01
	Arthur Kill	HW-7	Elizabeth Reach	38	40 38 29 74 11 25	40 38 23 74 11 30
	Newark Bay	HW-8	Middle Reach	41	40 40 38 74 07 54	40 40 24 74 07 59
	Newark Bay	HW-9	Newark Bay South Reach	45	40 39 39 74 08 27	40 39 32 74 08 32
	Newark Bay	HW-10	Newark Bay/Port Elizabeth	41	40 40 07 74 08 09	40 40 06 74 08 10

Note: Hydroacoustic surveys conducted simultaneously with bottom trawl surveys at same sample locations.
All stations located in navigation channels

TABLE 3-3 (page 1 of 2)

Harborwide Sampling Program Survey Schedule October 1998 – September 1999

Survey	Station	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Bottom trawl	HW-1	X		X		X		X		X		X	
	HW-2	X		X		X		X		X		X	
	HW-3	X		X		X		X		X		X	
	HW-4	X		X		X		X		X		X	
	HW-5	X		X		X	X	X		X	X	X	X
	HW-6	X		X		X		X		X		X	
	HW-7	X		X		X		X		X		X	
	HW-8	X		X		X		X		X		X	
	HW-9						X	X		X		X	
	HW-10						X	X		X		X	
Ichthyoplankton	HW-1					X	X	X	X	X			
	HW-2					X	X	X	X	X			
	HW-3					X	X	X	X	X			
	HW-4					X	X	X	X	X			
	HW-5					X	X	X	X	X			
	HW-6					X	X	X	X	X			
	HW-7					X	X	X	X	X			
	HW-8					X	X	X	X	X			
	HW-9						X	X	X	X			
	HW-10						X	X	X	X			

TABLE 3-3 (page 2 of 2)

Harborwide Sampling Program Survey Sampling Schedule October 1998 – September 1999

Survey	Station	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Benthic grab	HW-1		X			X			X			X	
	HW-2		X			X			X			X	
	HW-3		X			X			X			X	
	HW-4		X			X			X			X	
	HW-5		X			X			X			X	
	HW-6		X			X			X			X	
	HW-7		X			X			X			X	
	HW-8		X			X			X			X	
	HW-9								X			X	
	HW-10								X			X	
Crab dredge	HW-1					X	X	X					
	HW-2					X	X	X					
	HW-3					X	X	X					
	HW-4					X	X	X					
	HW-5					X	X	X					
	HW-6					X	X	X					
	HW-7					X	X	X					
	HW-8					X	X	X					
	HW-9						X	X					
	HW-10						X	X					

Note: Months and stations shaded were not sampled.
Hydroacoustic surveys conducted simultaneously with bottom trawl surveys beginning in December 1998.
Replicate benthic grab samples collected at all stations sampled.

TABLE 3-4 (page 1 of 2)

Site-Specific Survey Station Locations

Survey	Harbor Area	Station	Location	Depth (Ft)	GPS Coordinates (deg., min., sec.) START N	START W	END N	END W
BOTTOM TRAWL	South Brooklyn	SB-1	Gowanus Bay Interpier South	26	40 38 40	74 01 40	40 38 47	74 01 56
	South Brooklyn	SB-2	Gowanus Bay Interpier	24	40 39 05	74 01 25	40 39 35	74 01 06
	South Brooklyn	SB-3	Gowanus Bay Interpier North	29	40 39 37	74 00 28	40 39 44	74 00 41
	South Brooklyn – Channel	SB-4	Bay Ridge Channel	41	40 39 22	74 01 20	40 38 01	74 02 02
	Port Jersey	PJ-1	Jersey Flats	14	40 40 10	74 03 31	40 39 52	74 03 48
	Port Jersey	PJ-2	Pierhead Channel	26	40 40 20	74 03 37	40 39 59	74 0353
	Port Jersey	PJ-3	Constable Hook	9	40 39 47	74 04 47	40 39 33	74 04 37
	Port Jersey – Channel	PJ-4	Port Jersey Channel	42	40 40 26	74 05 19	40 40 08	74 04 43
	Port Jersey	PJ-5	Global Marine Terminal	16	40 40 28	74 04 31	40 40 17	74 03 57
	Port Jersey	PJ-6	Claremont Terminal Channel	29	40 40 38	74 03 50	40 40 28	74 03 34
ICHTHYOPLANKTON	South Brooklyn	SB-1	Gowanus Bay Interpier South	26	40 38 40	74 01 40	40 38 47	74 01 56
	South Brooklyn	SB-2	Gowanus Bay Interpier	24	40 39 05	74 01 25	40 39 35	74 01 06
	South Brooklyn	SB-3	Gowanus Bay Interpier North	29	40 39 37	74 00 28	40 39 44	74 00 41
	South Brooklyn – Channel	SB-4	Bay Ridge Channel	41	40 39 22	74 01 20	40 38 01	74 02 02
	Port Jersey	PJ-1	Jersey Flats	14	40 40 10	74 03 31	40 39 52	74 03 48
	Port Jersey	PJ-2	Pierhead Channel	26	40 40 20	74 03 37	40 39 59	74 0353
	Port Jersey	PJ-3	Constable Hook	9	40 39 47	74 04 47	40 39 33	74 04 37
	Port Jersey – Channel	PJ-4	Port Jersey Channel	42	40 40 26	74 05 19	40 40 08	74 04 43
	Port Jersey	PJ-5	Global Marine Terminal	16	40 40 28	74 04 31	40 40 17	74 03 57
	Port Jersey	PJ-6	Claremont Terminal Channel	29	40 40 38	74 03 48	40 40 31	74 03 35

TABLE 3-4 (page 2 of 2)

Site-Specific Survey Station Locations

Survey	Site	Station	Location	Depth (Ft)	GPS Coordinates (deg., min., sec.) START N W	GPS Coordinates (deg., min., sec.) END N W
BENTHOS	South Brooklyn	SB-1	Gowanus Bay Interpier South	26	40 38 44 74 01 52	
	South Brooklyn	SB-2	Gowanus Bay Interpier	24	40 39 08 74 01 31	
	South Brooklyn	SB-3	Gowanus Bay Interpier North	29	40 39 42 74 00 35	
	South Brooklyn – Channel	SB-4	Bay Ridge Channel	41	40 39 11 74 01 48	
	Port Jersey	PJ-1	Jersey Flats	14	40 39 56 74 03 40	
	Port Jersey	PJ-2	Pierhead Channel	26	40 39 58 74 03 51	
	Port Jersey	PJ-3	Constable Hook	9	40 39 32 74 04 29	
	Port Jersey – Channel	PJ-4	Port Jersey Channel	42	40 40 02 74 04 25	
	Port Jersey	PJ-5	Global Marine Terminal	16	40 40 23 74 04 05	
	Port Jersey	PJ-6	Claremont Terminal Channel	29	40 40 34 74 03 42	
CRAB DREDGE	South Brooklyn	SB-1	Gowanus Bay Interpier South	26	40 38 44 74 01 49	40 38 49 74 01 56
	South Brooklyn	SB-2	Gowanus Bay Interpier	24	40 39 29 74 00 56	40 39 34 74 01 05
	South Brooklyn	SB-3	Gowanus Bay Interpier North	29	40 39 41 74 00 39	40 39 46 74 00 47
	South Brooklyn – Channel	SB-4	Bay Ridge Channel	41	40 39 08 74 01 42	40 39 01 74 01 50
	Port Jersey	PJ-1	Jersey Flats	14	40 39 52 74 03 40	40 40 01 74 03 28
	Port Jersey	PJ-2	Pierhead Channel	26	40 39 59 74 03 53	40 40 04 74 03 47
	Port Jersey	PJ-3	Constable Hook	9	40 39 42 74 04 50	40 39 31 74 04 36
	Port Jersey – Channel	PJ-4	Port Jersey Channel	42	40 40 16 74 04 60	40 40 12 74 04 49
	Port Jersey	PJ-5	Global Marine Terminal	16	40 40 27 74 04 15	40 40 19 74 03 59
	Port Jersey	PJ-6	Claremont Terminal Channel	29	40 40 41 74 03 51	40 40 30 74 03 31

Note: Hydroacoustic surveys conducted simultaneously with bottom trawl surveys at same sample locations.
Station SB-4 and PJ-4 located in marine terminal approach channels.

TABLE 3-5 (page 1 of 2)

Site-specific Sampling Program Survey Schedule October 1998 – September 1999

Survey	Station	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Bottom trawl	SB-1	X	X	X	X	X	X	X	X	X	X	X	X
	SB-2	X	X	X	X	X	X	X	X	X	X	X	X
	SB-3	X	X	X	X	X	X	X	X	X	X	X	X
	SB-4	X	X	X	X	X	X	X	X	X	X	X	X
	PJ-1	X	X	X	X	X	X	X	X	X	X	X	X
	PJ-2	X	X	X	X	X	X	X	X	X	X	X	X
	PJ-3	X	X	X	X	X	X	X	X	X	X	X	X
	PJ-4	X	X	X	X	X	X	X	X	X	X	X	X
	PJ-5	X	X	X	X	X	X	X	X	X	X	X	X
	PJ-6					X	X	X	X	X	X	X	X
Ichthyoplankton	SB-1					X	X	X	X	X			
	SB-2					X	X	X	X	X			
	SB-3					X	X	X	X	X			
	SB-4					X	X	X	X	X			
	PJ-1					X	X	X	X	X			
	PJ-2					X	X	X	X	X			
	PJ-3					X	X	X	X	X			
	PJ-4					X	X	X	X	X			
	PJ-5					X	X	X	X	X			
	PJ-6					X	X	X	X	X			

TABLE 3-5 (page 2 of 2)

Site-specific Sampling Program Survey Sampling Schedule October 1998 – September 1999

Survey	Station	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Benthic grab	SB-1		X			X			X			X	
	SB-2		X			X			X			X	
	SB-3		X			X			X			X	
	SB-4		X			X			X			X	
	PJ-1		X			X			X			X	
	PJ-2		X			X			X			X	
	PJ-3		X			X			X			X	
	PJ-4		X			X			X			X	
	PJ-5		X			X			X			X	
	PJ-6					X			X			X	
Crab dredge	SB-1					X	X	X					
	SB-2					X	X	X					
	SB-3					X	X	X					
	SB-4					X	X	X					
	PJ-1					X	X	X					
	PJ-2					X	X	X					
	PJ-3					X	X	X					
	PJ-4					X	X	X					
	PJ-5					X	X	X					
	PJ-6					X	X	X					

Note: Months and stations shaded were not sampled.
Hydroacoustic surveys conducted simultaneously with bottom trawl surveys beginning in December 1998.
Replicate benthic grab samples collected at all stations sampled.

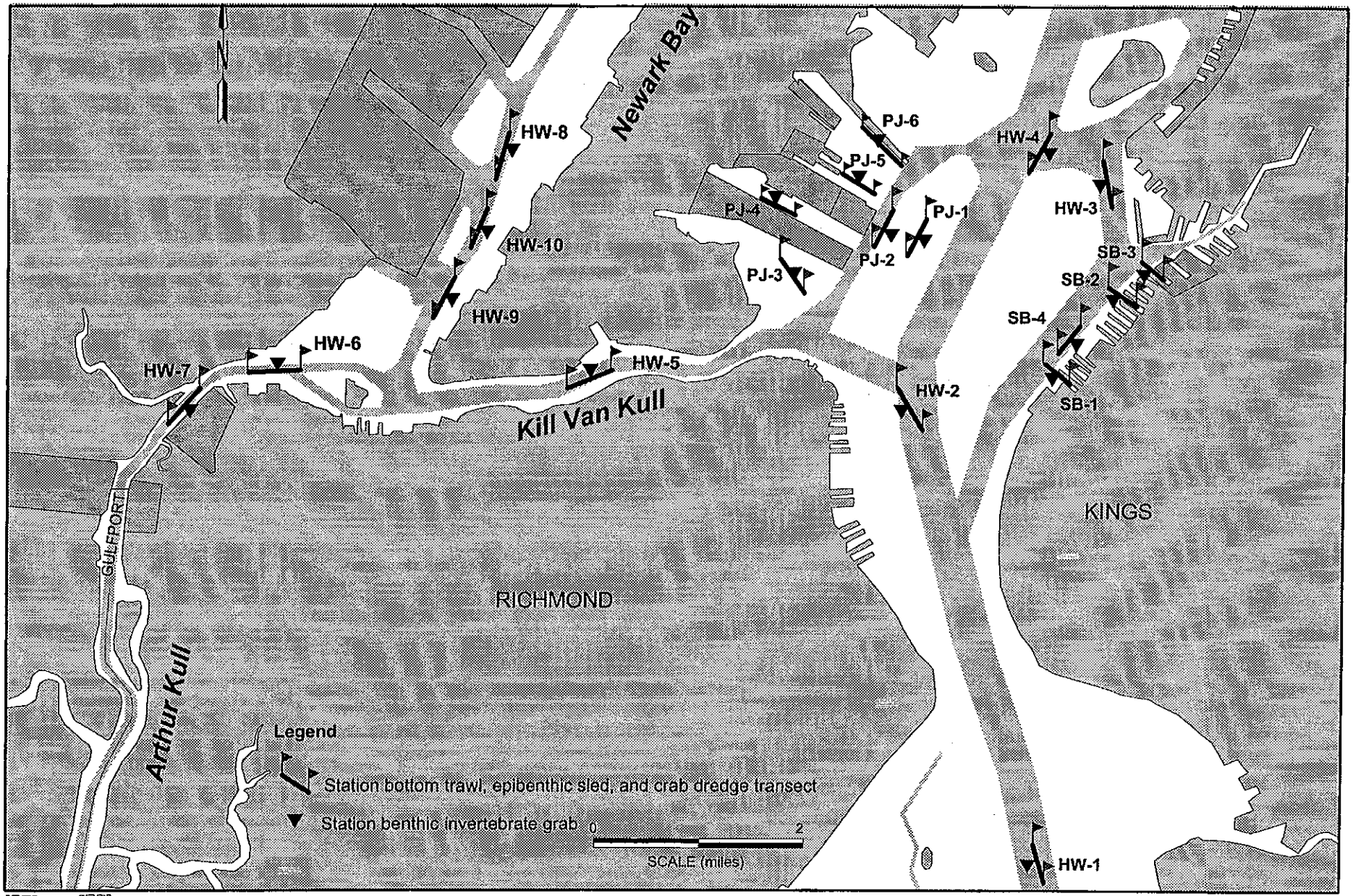


Figure 3-1.
Harborwide and site-specific station locations October 1998 - September 1999

CHAPTER 4

4.0 RESULTS AND DISCUSSION

Results of the biological monitoring program are discussed below. Gear-specific surveys (e.g., bottom trawl) conducted during both the harborwide and site-specific sampling programs are discussed together to provide comparisons among different waterbodies, aquatic habitats and navigation channels in the project area.

Station results were divided among two general aquatic habitats types for discussion and comparison purposes. These aquatic habitats were navigation channels (including site-specific approach channels) and marine terminal interpier / neashore shoal areas. The seasonal distribution and abundance of blue crab and other macroinvertebrates collected in bottom trawl samples is discussed in Section 4.4 with the results of the crab dredge survey.

Data tables and figures are provided in Appendices A through G (Volume II, separate submission). Summary tables and figures are provided at the end of Chapter 4.0.

4.1 BOTTOM TRAWL SURVEY

A combined total of 164 bottom trawl samples were collected during the biological monitoring program. Between October 1998 and September 1999, 54 species of fish were collected at all stations combined. Species composition was similar to previous sampling programs conducted in the project area (see Chapter 2, Table 2-1). Clownfish, a tropical species which had not been collected in previous sampling programs, was collected in October at South Brooklyn. A common aquarium pet, this species was most likely abandoned in the area or may have been an odd itinerant to the project area. This species was not included in catch summaries or statistics.

Bay anchovy, striped bass and weakfish were the dominate species collected during the bottom trawl survey. Average CPUE of bay anchovy was 34.4 among all stations sampled (Table 4-1). Striped bass and weakfish CPUE were similar, averaging 29.8 and 27.5, respectively. Average CPUE was less than 0.2 fish per 10-minture tow for more than half of the species collected.

Overall CPUE (all species combined) declined from October through January (Figure 4-1). CPUE increased steadily beginning in February and peaked in July at approximately 14 fish per 10-minute tow. Species diversity (i.e., number of species collected) followed a similar pattern, with the fewest number of species collected during winter months (January, 6 species) and the largest number collected during summer (August, 32 species) (Table 4-2).

Overall seasonal abundance in the project area varied, with bay anchovy and weakfish accounting for over 80% of the fish collected in October, while November and December

were dominated by relatively large catches of striped bass, white perch and American shad.

Atlantic silverside and Atlantic herring accounted for over 90% of the fish collected in January 1999. White perch dominated bottom trawl catches during December (29.1%), February (52.8%) and March (36.6%), but were not collected in appreciable numbers during any other period.

Distinct changes in species abundance during March and April reflect the seasonal movement of winter flounder, striped bass and spotted hake in the project area. Catch composition of winter flounder rose from 4.8% during February to almost 30% in March. Although CPUE remained relatively high compared to other months, winter flounder were collected in relatively fewer numbers during April, accounting for 11.8% of the fish collected. Striped bass and spotted hake were also dominate in bottom trawl collections during this period. Monthly percent composition of striped bass in bottom trawl samples averaged over 22% during February, March and April. Spotted hake CPUE peaked during April, averaging over 25 fish per 10-minute tow, before declining in May and June (Table 4-3).

Atlantic tomcod, bay anchovy and blueback herring were the dominate species collected during May, accounting for almost 75% of all fish collected. Relatively large catches of alewife and blueback herring during April and May, respectively, reflect the movement of these anadromous herring through the project area to upstream spawning areas.

Bay anchovy dominated overall catch composition from June through September, averaging over 40% of the fish collected each month. Bay anchovy CPUE steadily increased during this period, averaging over 180 fish per 10-minute tow in September. The steady increase in bay anchovy CPUE likely represents young-of-year recruitment to the bottom trawl (i.e., growth to a catchable size). The length frequency distribution of bay anchovy during this period was bimodal (peaks near 40 and 65 mm), representing the abundance of young-of-year and yearling and older fish, respectively (Appendix B). Weakfish, striped bass, Atlantic silverside, alewife and butterfish were also collected in relatively large numbers during this period.

4.1.1 **Navigation Channels**

Species composition in bottom trawl samples collected at channel stations was generally similar to the overall seasonal abundance in the project area. However, some differences in seasonal abundance were evident during several months, most often during those periods when site-specific channel (i.e., approach channel) stations (SB-4 and PJ-5) only were sampled.

Similar to the overall seasonal abundance in the project area, bay anchovy and weakfish dominated species composition of bottom trawl collections in October, accounting for over 80% of fish collected (Table 4-4). The majority of these fish were collected in

Newark Bay and the Arthur Kill (Appendix A, Figure 4-2). Striped bass, however, were noticeably absent at approach-channel stations during October and November. American shad and blueback herring comprised the majority of fish collected in November, accounting for 80% of the fish collected. CPUE of American shad peaked during this period, averaging 31.5 per 10-minute tow during November (Table 4-5).

Although no fish were collected at channel stations sampled during January, bottom trawl catch composition in December, February and March reflects the seasonal abundance of white perch and striped bass in harbor navigation channels during winter months. Striped bass and white perch comprised over 60% of the fish collected each month during this period. The majority of these fish, of both species, were collected in Newark Bay (Appendix A). Previous biological sampling programs conducted in Newark Bay and the Arthur Kill have noted the abundance of striped bass and white perch in deep-water navigation channels during this same period (NMFS 1994, LMS 1996).

Striped bass continued to comprise a large percentage of fish collected at channel stations during April, however, winter flounder, white perch and spotted hake accounted for the majority of fish collected. A clear increase in winter flounder CPUE between February and March reflects the movement of winter flounder into the project area, primarily Newark Bay. CPUE was highest at Newark Bay stations, averaging over 80 fish per 10-minute tow. Sampling was not conducted during March in the Lower Harbor, Upper Harbor, Red Hook and Arthur Kill areas. Average CPUE was less than 2 fish per tow at all other stations sampled. During April, winter flounder were collected in all navigation channel areas except the Port Jersey Channel area (PJ-4); CPUE was highest in Newark Bay (33.3 fish per 10-min tow) and South Brooklyn Channel (33.0 fish per 10-min tow) areas.

Spotted hake was the dominant species collected at navigation channel areas during both April and May. Summer flounder and windowpane replaced winter flounder as other dominant species during May, each accounting for 13.6% of all fish collected. Winter flounder CPUE dropped in May to less than 3 fish per 10-minute tow, but increased in June to over 13 fish per 10-minute tow. Bottom trawl sampling was limited to only the Port Jersey Channel and South Brooklyn Channel areas during May. No bottom trawl sampling was conducted in Newark Bay during this time. Winter flounder were collected in all navigation channel areas except the Lower Harbor area in June, accounting for almost 20% of all fish collected. Previous bottom sampling conducted in Newark Bay navigation channels in 1993-1994 (NMFS 1994) indicated an increase in winter flounder CPUE beginning in June and lasting through August. During the current study, winter flounder CPUE decreased steadily from June through September.

Bay anchovy appeared in bottom trawl samples collected in navigation channel areas in June, comprising 18.8% of the monthly catch. Although bay anchovy was generally common throughout June through September, large catches of weakfish dominated bottom trawl CPUE during this period. Weakfish accounted for over 75% of the fish collected at both approach-channel stations during July, averaging over 290 fish per 10-

minute tow. CPUE was largest in the Kill Van Kull (494 fish per 10-min tow) and Port Jersey Channel (297 fish per 10-min tow), with most fish ranging between 40 and 100 mm in length (Appendix B). Young-of-year weakfish generally range in length from about 4 to 16 cm in early fall (Able and Fahay 1998). Bottom trawl sampling was conducted only in the Kill Van Kull, Port Jersey Channel and South Brooklyn Channel during July. Weakfish were present in bottom trawl samples collected during July in the Arthur Kill and Newark Bay in previous studies (USCG 1995, NMFS 1994).

American shad and blueback herring accounted for 40% of the fish collected at navigation channel locations during September. Individual fish of both species ranged between 80 and 120 mm in length.

4.1.2 **Marine Terminal Interpier and Shoal Areas**

Species composition in bottom trawl samples collected at marine terminal interpier and adjacent shoal areas was markedly different from that of channel stations during late-fall and early winter sampling. Unlike samples collected in navigation channels, winter flounder was the dominate species, accounting for 20% of the fish collected (Table 4-6). Black seas bass, bay anchovy and striped bass were also relatively abundant. Both striped bass and black sea bass were absent from bottom trawls collected at navigation channel stations.

Similar differences in species composition between navigation channel and shoal/ interpier areas species composition were also apparent in November and December. Striped bass were absent from bottom trawls at approach-channel stations (SB-4 and PJ-4) during November, but accounted for over 60% of the fish collected at shoal/interpier areas. Striped bass CPUE averaged more than 40 fish per 10-minute tow during this time (Table 4-7). The majority of these fish were collected at interpier stations at South Brooklyn and ranged between 70 and 130 mm in length, corresponding to known length intervals for young-of-year striped bass (LMS 1995). Young-of-year striped bass from the Hudson River generally move downstream from spawning areas and spend their first winter in the lower Hudson River Estuary (McKown 1991) and have been found in and around pier pilings and deep interpier habitats in the (Able and Studholme 1994).

Overall CPUE dropped considerably at shoal/interpier areas from December through March. The total number of species collected also dropped during this period. Although winter flounder and Atlantic silverside were the dominate species, CPUE for both species was relatively low compared to other months. Winter flounder CPUE was below 2 fish per 10-minute tow for each month from December through March.

Overall CPUE and the number of species collected at shoal stations increased in April and May, with large catches of striped bass and anadromous herring, primarily alewife and blueback herring. CPUE was greater than 50 fish per 10-minute tow for both striped bass and alewife.

Similar to bottom trawl samples in navigation channels, bay anchovy was ubiquitous at shoal/interpier stations from early summer through September; however, striped bass and weakfish dominated species composition during July, accounting for more than 70% of the fish collected. The majority of striped bass were collected at South Brooklyn interpier stations, all ranging between 30 and 70 mm in length. Weakfish were collected predominately at Port Jersey, at pierhead and berthing areas (PJ-2, PJ-5, and PJ-6). Relatively fewer weakfish were collected at Port Jersey shoal stations (PJ-1 and PJ-3).

Bay anchovy dominated catches in August and September, comprising over 70% of the fish collected and averaging over 230 fish per 10-minute tow during both months. Atlantic silverside, alewife, scup and butterfish were also collected in large numbers during this period.

4.2 HYDROACOUSTIC SURVEY

Hydroacoustic surveys were conducted simultaneously with bottom trawl surveys, beginning in December 1998. Hydroacoustic surveys were conducted to obtain information on abundance, distribution, and size (i.e., length) of fish in the water column above the navigation channel bottom.

Results of each hydroacoustic survey was generally comparable to the corresponding bottom trawl survey with regards to relative abundance of targets (i.e., acoustic echoes) or fish tracked each month. Differences between bottom trawl and hydroacoustic surveys were noted among most stations and months during periods of high fish abundance. Differences between bottom trawl surveys are expected due to differences in sampling area (bottom vs. water column) and gear recruitment (i.e., ability to sample a given size fish). Relatively small echoes (-50 to -60 dB) comprise the majority of targets observed during periods of high abundance, primarily late-spring through early fall. Target strength to fish length conversion tables (Appendix D, Table D-1) indicate the majority of these echoes were likely fish less than 55 mm in length.

4.2.1 Navigation Channels

Hydroacoustic surveys conducted in navigation channel areas revealed a seasonal change in target depth distribution and abundance at most stations. Tracked echo targets were generally distributed throughout the water column during periods of high abundance. Notable examples of this ubiquitous distribution were observed in the Lower Harbor and Arthur Kill areas (HW-1 and HW-6) during August (Appendix C). Bay anchovy and other small, pelagic forage species are often present at this time in large numbers. Target strength distribution in these areas confirmed the majority of tracked echoes were small, approximately 30 to 40 mm in length (Appendix D).

During winter months, echo target distribution was generally stratified. Targets were distributed toward the bottom of the navigation channel at most stations.

4.2.2 Marine Terminal Interpier and Shoal Areas

Hydroacoustic surveys conducted in marine terminal interpier and shoal areas reflected the seasonal abundance of fish in the study area. Large numbers of echo targets were recorded during summer and fall months, while winter months were generally characterized by fewer targets.

Similar to hydroacoustic surveys in navigation channels, target depth distribution changed seasonally. Tracked echo targets were generally distributed in both lower and upper strata of the water column during periods of high abundance, primarily summer months; however, the overall depth distribution revealed echo targets were generally orientated toward bottom strata. Targets were often seen concentrated near sharp changes in bottom depth and at slope bottoms. Clear examples of this distribution were observed at a number of South Brooklyn interpier stations, most noticeably SB-3 during November and SB-1 during March (Appendix C). Target strength distribution in these areas during these months revealed the majority of tracked echoes were small, approximately 30 to 40 mm in length (Appendix D).

4.3 SEASONAL ICHTHYOPLANKTON SURVEY

Seasonal ichthyoplankton samples were collected at navigation channel and marine terminal interpier/ shoal areas from February through June 1999. A combined total of 48 epibenthic sled ichthyoplankton samples were collected.

A total of 19 species and four lifestages were collected . Species and lifestages were generally similar to recent biological sampling programs conducted in Newark Bay (Table 4-8). Unlike previous studies, weakfish was the most abundant species collected, followed by tautog and Atlantic menhaden. Bay anchovy, the normally predominate species among recent studies in Newark Bay, was ranked fourth. Other species collected in relative abundance were fourspot flounder, hogchoker, and winter flounder.

Eggs were the dominate lifestage collected in epibenthic ichthyoplantkon surveys. Average densities were highest during May and June (Table 4-9). Post-yolk sac larvae were also most abundant during this period.

4.3.1 Navigation Channels

Ichthyoplankton abundance and species composition followed a seasonal pattern. Post yolk-sac larvae of Atlantic herring and American sand lance were collected during February. Yolk sac larvae of winter flounder were also collected, although at low densities (Table 4-10).

Eggs were first collected in ichthyoplankton samples in navigation channel areas during March. The majority of these were fourbeard rockling, winter flounder, and sculpins

(e.g., grubby, stargazer). Winter flounder egg densities peaked in April, averaging 123 eggs per cubic meter. Atlantic menhaden eggs were also collected during this period.

Atlantic menhaden egg density increased in April, averaging over 1400 per 1000 cubic meters. Atlantic menhaden eggs were collected at all navigation channel areas, but were found in highest densities in the Lower Harbor (HW-1), Upper Harbor (HW-2 and HW-4) and Red Hook (HW-3). Weakfish and tautog egg densities replaced Atlantic menhaden and winter flounder as the dominant egg species during May and June. Weakfish egg density was highest in the Red Hook area (HW-3), at over 10,000 eggs per cubic meter (Appendix E).

Post yolk-sac larvae were collected in highest densities during May and June. Atlantic menhaden were collected in greatest densities, followed by windowpane flounder and bay anchovy in May and June, respectively. The average density of Atlantic menhaden yolk-sac larvae was highest at the Red Hook area during May (328 larvae per 1000 cubic meters) and in the Arthur Kill in June (1044 larvae per 1000 cubic meters). Windowpane flounder yolk-sac larvae densities were highest in the Upper Harbor area, averaging 82 larvae per 1000 cubic meter.

4.3.2 Marine Terminal Interpier and Shoal Areas

Species composition at interpier/shoal stations was similar to channel area stations (Table 4-11). Ichthyoplankton densities were also similar, except during May, when average densities were greater at shoal / interpier stations for all lifestages.

Species composition and relative abundance (i.e., rank) was similar within each month. Tautog egg density was slightly higher than weakfish egg density during May. Average tautog egg density was greater than 2000 eggs per 1000 cubic meters at Port Jersey and South Brooklyn. Tautog egg densities were also over 2000 eggs per 1000 cubic meters at approach channel stations (SB-4 and PJ-4) and at Red Hook (HW-3) during this time.

Post yolk-sac larval densities were highest during May and June, influenced by large densities of Atlantic menhaden. Atlantic menhaden post yolk-sac larvae were collected at both South Brooklyn and Port Jersey.

4.4 BENTHIC INVERTEBRATE SURVEY

A combined total of 71 benthic grab samples was collected during the biological monitoring program. Results of the benthic grab survey were divided into two categories for discussion: benthic invertebrate taxon and macroinvertebrate taxon. Benthic invertebrate taxon included all species collected in benthic grab samples, while macroinvertebrate collections focused on hard-bodied shellfish greater than 0.5-in overall length.

4.4.1 **Benthic Invertebrates**

Species diversity and seasonal abundance was generally similar to that collected in previous biological sampling programs. Species collected and average densities at navigation channel and interpier/shoal areas are provided in Tables 4-12 and 4-13, respectively.

4.4.1.1 ***Navigation Channels.*** Benthic invertebrate collections during November were dominated by the polychaete worms *S. viridis* and *S. benedicti*, accounting for 40% of the organisms collected (Figure 4-3). *S. benedicti* was collected in all navigation channel areas except the Lower Harbor and Port Jersey and South Brooklyn approach channels (Appendix F). *S. viridis* was collected only in the Kill Van Kull. The bivalve mollusk *M. lateralis* was also abundant at most stations, comprising 28% of the organisms collected.

Average density of *M. lateralis* increased in February to 132 organisms per 0.1 square meter, accounting for over 60% of the organisms collected at navigation channel areas. Average densities were highest in the Upper Harbor and Red Hook areas, as well as in the South Brooklyn approach channel. Both *S. viridis* and *S. benedicti* remained relatively abundant during Febraury compared to other species collected. Similar to November samples *S. viridis* was collected only in the Kill Van Kull. The bivalve mollusk *Tellina* sp. was also abundant.

Although the relative abundance of benthic invertebrate species was different during May collections, the dominant species remained the same. The bivalve mollusk *M. lateralis* and *Tellina* sp. comprised 36% of the invertebrates collected, while *S. viridis* and *S. benedicti* accounted for 20% of the invertebrates collected. Members of the family Ampharetidae, also a polychaete worm, comprised 4% of the organisms collected. Average densities of Ampharetidae invertebrates were highest in the Lower Harbor, Upper Harbor, and Red Hook areas of the Harbor.

S. viridis accounted for over half of the organisms collected during August samples collected in navigation channel areas. Once again, *S. viridis* was collected only in the Kill Van Kull at high densities. Although *S. viridis* was collected in previous sampling programs conducted in the Arthur Kill and Kill Van Kull during 1995-1996 (LMS 1996), it was not considered a dominant species. *S. viridis* is known to inhabit deeper, brackish waters of estuaries (Gosner 1971).

4.4.1.2 ***Marine Terminal Interpier and Shoal Areas.*** Similar to channel area stations, benthic invertebrate collections during November were dominated by a few species of polychaete worms, primarily *S. benedicti*. The polychaete worms *Nereis* spp. and members of the family Paraonidae were also abundant. Oligochaetes and the bivalve mollusk *Lacuna vincta* were the remaining dominant species. Polychaete worms continued to dominate benthic invertebrate collections at shoal and interpier areas during February, accounting for 44% of the organisms collected.

Benthic invertebrate collections during May reflected a clear shift in the dominance of invertebrates from polychaete worms to mollusks. *M. edulis* and *M. lateralis* dominated benthic invertebrate collections. *M. edulis* was collected only in the Port Jersey area during this period, averaging over 230 organisms per 0.1 square meter. The average density of *M. lateralis* was also relatively high at the Port Jersey area (76.2 organisms per 0.1 square meter) as compared to the South Brooklyn area (1.5 organisms per 0.1 square meter).

Sea grapes, *M. manhattensis*, and little surf clams, *M. lateralis*, accounted for over 40% of the benthic invertebrates collected in grab samples during August. Oligochaetes and the polychaete worms *L. fragilis* and *Tellina* sp. were also dominant.

4.4.2 **Macroinvertebrates**

Species collected and average densities at navigation channel and interpier/shoal areas are provided in Tables 4-14 and 4-15, respectively.

4.4.2.1 ***Navigation Channels.*** The dwarf surf clam (*M. lateralis*) was by far the most abundant species collected at navigation channel areas, accounting for 75.8% of the total macroinvertebrate shellfish collected. The bivalve mollusks, *Tellina* sp. and *M. edulis*, were the second and third most abundant species collected. Gammarid amphipods were also among the most abundant.

4.4.2.2 ***Marine Terminal Interpier and Shoal Areas.*** Similar to navigation channel areas, *M. lateralis* and *M. edulis*, were the dominant macroinvertebrate shellfish collected at interpier/shoal areas. The average density of both species was highest in the Port Jersey area. Two species of slipper shells, *C. plana*, and *C. fornicata*, were the third and fourth most abundant species. Gammarid amphipods and softshell clams were also among the most abundant.

4.4.3 **Station Depths**

Survey stations were located at several depths in both shoal/interpier and navigation channel areas. The survey stations were separated by depth into four categories; shallow stations (0 to 15 ft), intepier stations (30 to 40 ft), middle-depth and approach channels, and deep (>40 ft). The results of the survey utilizing these depth categories are discussed below.

Shallow stations were located in the Jersey Flats, Constable Hook, and the Global Marine Terminal (Table 4-16). The polychaete worm *S. benedicti* accounted for 25.2% of the total number of organisms collected. The next two abundant taxa in the area were the polychaete worms, *L. fragilis* (10.6% of total) and *M. lateralis* (8.9% of total). The remaining species amongst the top ten in abundance included: the polychaete worm *Nereis* sp. and members of the family Paraonidae; the gastropod mollusks, *C. plana* and

C. fornicata; and the polychaete worms Phyllodocidae, *Glycera* sp., *Nereis* sp., and Orbiniidae.

Stations located in the 30 to 40 ft depth range are listed in Table 4-17. The bivalve mollusk, *M. lateralis* accounted for 33.3% of the total number of organisms collected at these stations. The next three most abundant species were the polychaete worms, *S. viridis* (13.3% of total), *S. benedicti* (12.2% of total), and *L. fragilis* (4.3% of total). The species fifth in abundance was the bivalve mollusk, *Tellina* sp. The gammarid amphipod, *A. abdita*, and a polychaete worm (Orbiniidae) were ranked sixth and seventh in abundance, respectively. The polychaete worms *Nephtys* sp., and *Glycera* sp. were both ranked eighth.

Middle depths consisted of stations at Port Jersey Pierhead Channel, Claremont Terminal Channel, and Gowanus Bay Interpier (3 sites) (Table 4-18). The two most abundant species in these locations were the bivalve mollusks, *M. edulis* (29.5% of total) and *M. lateralis* (29.3% of total). The third most abundant species was the polychaete worm, *S. benedicti* (10.9% of total). The polchaete worm *Nereis* sp. was fourth most abundant and the bivalve mollusk, *Tellina* sp. was fifth most abundant. The polychaete worm *L. fragilis* was fifth most abundant. The remaining species amongst the top ten in abundance were the gastropod mollusk *A. canaliculata*, the amphipod, *A. abdita*, the polychaete worm, *Glycera* sp., the gastropod mollusk, *C. plana* and a gammarid amphipod.

Very deep depth stations were located in Ambrose Channel North, and at two locations in Anchorage channel (Table 4-19). The three most abundant species in this area were bivalve mollusks, *M. lateralis* (49.3% of total), *Tellina* sp. (11.1% of total), and *M. edulis* (5.6%). Polychaete worms were among the next three species in highest abundance. These were *Nephtys* sp., *S. benedicti*, and Ampharetidae. The remaining species among the top ten in abundance were: the polychaete *P. gouldii*; the amphipod *A. abdita*; a sea urchin (Strongylocentrotidae); the polychaetes *Glycera* sp., Spionidae, Paraonidae, and Phyllodocidae, and a gammarid amphipod.

Data from these surveys show a high level of shellfish diversity throughout the Harbor regardless of depth. These data suggest that polychaete worms account for a great deal of the benthos throughout the Harbor area. Together with bivalve mollusks and gammarid amphipods, polychaete worms accounted for the top ten species in abundance at all of the sites sampled.

4.5 CRAB DREDGE SURVEY

A total of 58 crab dredge samples was collected during the biological monitoring program. Seven species of crabs were collected in sampling efforts from February 1999 through April 1999 (Table 4-20 and 4-21). Species diversity was highest during February and April (six species collected each month), while overall abundance was highest during March. Rock crab dominated the overall abundance during this month.

Shellfish collected in bottom trawl samples were also identified and enumerated during the biological monitoring program. Species diversity in bottom trawl samples was similar to crab dredge collections (Table 4-22 and 4-23). The seasonal distribution and abundance of crab species collected in bottom trawl and crab dredge samples is described below.

4.5.1 **Navigation Channels**

The seasonal abundance of crab species collected in crab dredge and bottom trawl samples varied, reflecting the general movement of crab species between shallow water and deep water areas, as well as differences in seasonal behavior (e.g., burrowing).

Crab Dredge

Overall abundance in crab dredge collections during February were low compared to other months. The two most abundant species were rock crab and blue crab. Although rock crab was the most abundant species collected, it was found at only three areas, the Upper Harbor, Red Hook and South Brooklyn approach channel. Blue crab was the most common species collected, found at all navigation channel areas except the Lower Harbor and Kill Van Kull.

Overall abundance in crab dredge collections increased in March, due primarily to large catches of rock crab in the Red Hook and South Brooklyn approach channel. CPUE was over 200 crabs per 5-minute tow at both areas. Blue crab CPUE in crab dredge samples also increased during March, likely reflecting overwintering behavior (i.e., burrowing) and recruitment to the crab dredge. Blue crab CPUE was highest in Port Jersey and the South Brooklyn approach channel (Figure 4-4).

Bottom Trawl

Blue crab were collected in bottom trawl samples at all navigation channel areas except the Lower Harbor and the Kill Van Kull during April. Blue crab CPUE was highest in the Port Jersey approach channel and the Arthur Kill, averaging 14 and 12 crabs per 10-minute tow, respectively. Blue crab were not as abundant in crab dredge samples collected in these areas during this same period. Green crab, collected only at Red Hook, and rock crab, collected primarily in the Lower Harbor, were also abundant in bottom trawl samples.

Crab species diversity was relatively high in bottom trawl samples collected during October compared to late-fall and winter months (i.e., November through January). Five species of crab were collected, including blue crab, green crab, lady crab rock crab, and spider crab. Overall abundance was highest in the Arthur Kill and Kill Van Kull. CPUE at both areas averaged over 20 crabs per 10-min tow. Blue crab was the only species collected in the Arthur Kill.

There was a clear drop in CPUE during November, December and January. Blue crab was the only species collected in navigation channel areas. Blue crabs were collected in the Arthur Kill, Newark Bay, and Port Jersey approach channel. Blue crab abundance in bottom trawls was generally low in these areas. Blue crab CPUE was greater than 5 crabs per 10-min tow only Newark Bay.

Overall abundance of crabs in bottom trawls increased in February, although abundance remained relatively low compared to other months. Although green crab and blue crab were similar in overall abundance, green crab were only collected in the Red Hook area. Blue crab abundance remained low in bottom trawl samples in February and March. Blue crab dredge CPUE was relatively high compared to bottom trawl samples during this period. Overwintering blue crab burrow into sediments and are not as susceptible to capture in bottom trawl samples as crab dredge samples.

Blue crab CPUE in bottom trawl samples increased dramatically during May and June. CPUE at Port Jersey and South Brooklyn was over 40 blue crabs per 10-minute tow (Figure 4-5). No bottom samples were collected at other navigation channel areas during May. Blue crab CPUE in bottom trawl samples peaked in June, with large catches of blue crab at Red Hook, Arthur Kill and Newark Bay. Blue crab were collected at all areas except the Lower Harbor. Other crab species collected in relative abundance during this period included horseshoe crab, mud crab and rock crab.

Blue crab remained relatively common in bottom trawl samples collected during July, August and September as compared to other months. Similar to May and June, blue crab were collected at all areas sampled during this period except the Lower Harbor. Blue crab CPUE was generally lowest at the Port Jersey approach channel (among those stations where blue crab was present) and highest in the Kill Van Kull.

4.5.2 **Marine Terminal Interpier and Shoal Areas**

Species diversity and abundance in bottom trawl samples collected at marine terminal interpier and shoal area stations was generally similar to navigation channel stations. Some exceptions were horseshoe crab and mud crab, which were collected more often at interpier/shoal stations, and fiddler crab, which was collected only at interpier/shoal stations. Rock crab and green crab were generally less abundant at interpier/shoal areas than at navigation channel areas.

Crab Dredge

Average blue crab CPUE in Port Jersey crab dredge samples collected during February and March was noticeably higher than bottom trawl samples. This difference likely reflects the overwintering behavior of blue crabs to burrow into soft sediments and the efficiency of the crab dredge to sample burrowing crabs. This difference between gears was not apparent among South Brooklyn interpier samples. Blue crab CPUE in crab

dredge sample decreased at both South Brooklyn and Port Jersey in April, while blue crab CPUE in bottom trawl samples increased.

Bottom Trawl

October bottom trawl samples were dominated by blue crab, averaging over 24 crabs per 10-minute tow at both South Brooklyn and Port Jersey. Mud crab were also abundant, primarily at South Brooklyn.

Similar to bottom trawl samples collected at navigation channel areas, species diversity in bottom trawl samples decreased during late-fall and winter months. Blue crab was the dominant species each month. Between December 1998 and February 1999, blue crab CPUE in bottom trawl samples ranged from an average 0.7 crabs per 10-minute tow at South Brooklyn during December to 15.1 crabs per 10-minute tow at Port Jersey, also during December.

Similar to bottom trawl samples collected at navigation channel areas, blue crab CPUE in bottom trawl samples increased dramatically during May. Crab species diversity also increased. Horseshoe crab and fiddler crab were among the other species of crab collected. Average blue crab CPUE continued to increase at Port Jersey during June, reaching almost 80 crabs per 10-minute tow. Blue crab CPUE remained relatively high compared to CPUE at Port Jersey and South Brooklyn approach channels during August and September.

4.5.3 **Station Depths**

Survey stations were located at several depths in both shoal/interpier and navigation channel areas. The survey stations were separated by depth into four categories; shallow stations (0 to 15 ft), intepier stations (30 to 40 ft), middle-depth and approach channels, and deep (>40 ft). The results of the survey utilizing these depth categories are discussed below.

Overall CPUE was highest at non-channel sites during February and March. The number of overwintering crabs was lowest in April, regardless of depth. Crabs were present in very low numbers in the deepest-water stations located in the Ambrose and Anchorage channels (Figure 4-6).

The average CPUE in shoal and shallow channel sites was generally higher than in deep channel sites (Figures 4-7 and 4-8). All shoal and shallow channel sites, with the exception of the South Brooklyn interpier site (SB-1), had an average CPUE of over 5 crabs, while the deep channel sites had an average CPUE of less than 5 crabs. This may indicate a preference for relatively sheltered areas during overwintering. A comparison of shoal and shallow channel sites indicates that the South Brooklyn interpier area (SB-3) and Global Marine Terminal sites have the highest average CPUEs (Figure 4-7).

Overall results of the sampling program indicate the blue crab's preference for non-channel areas for overwintering. The lowest number of blue crabs was collected in the deeper Ambrose and Anchorage channels and the greatest number were collected at the shallow-water stations located at Port Jersey and the South Brooklyn interpier stations.

TABLE 4-1 (page 1 of 2)

Average Bottom Trawl CPUE (number per 10-minute tow)

		Highest Annual CPUE		Highest Monthly CPUE	
Species	Avg CPUE	Area	CPUE	Month	CPUE
Bay anchovy	34.4	PJ	75.8	SEP	182.7
Striped bass	29.8	SB	107.9	JUL	329.8
Weakfish	27.5	KVK	59.3	JUL	292.5
Alewife	6.3	PJ	15.1	JUL	34.5
Winter flounder	5.5	NB	25.0	MAR	17.9
Atlantic silverside	4.4	PJ	9.0	JUL	52.1
Atlantic tomcod	4.1	PJ-C	9.6	MAY	47.0
Spotted hake	4.0	NB	21.7	APR	25.6
Butterfish	3.4	LH	10.3	JUL	24.4
White Perch	3.1	NB	35.6	MAR	23.3
Scup	2.9	SB	7.7	JUL	16.3
Windowpane	1.8	LH	10.7	APR	5.5
Blueback herring	1.7	PJ	4.3	MAY	17.5
Striped searobin	1.5	SB	3.6	JUL	11.7
American shad	1.2	SB-C	6.6	NOV	11.0
Summer flounder	1.1	LH	1.7	MAY	5.1
Atlantic herring	0.9	SB	3.0	MAY	10.9
Striped anchovy	0.7	UH	2.5	SEP	7.1
Atlantic menhaden	0.5	PJ-C	2.4	AUG	2.7
Silver hake	0.4	UH	1.3	APR	2.0
Black sea bass	0.3	SB	0.6	OCT	1.5
Grubby	0.2	AK	0.8	MAR	0.5
Lookdown	0.2	PJ-C	2.4	OCT	2.0
Northern pipefish	0.2	KVK	0.6	JUL	1.0
Bluefish	0.2	AK	0.3	SEP	1.2
Cunner	0.2	UH	0.8	MAY	0.4
Tautog	0.1	UH	0.6	SEP	0.5
Smallmouth flounder	0.1	KVK	0.3	OCT	0.6
Atlantic moonfish	0.1	PJ-C	0.8	SEP	1.1
Pollock	0.1	PJ	0.3	MAY	1.8
Northern kingfish	0.1	PJ	0.1	OCT	0.8
Northern searobin	0.1	UH	0.7	JUN	0.4
Spot	0.1	PJ-C	0.6	JUN	0.4
Little skate	0.1	UH	0.3	APR	0.3
Inshore lizardfish	0.1	KVK	0.1	SEP	0.6
Gizzard Shad	< 0.1	NB	0.3	DEC	0.3
Red hake	< 0.1	PJ-C	0.3	NOV	0.2
American eel	< 0.1	RH	0.3	JUN	0.2
Oyster toadfish	< 0.1	AK	0.2	JUN	0.2
Fourspot flounder	< 0.1	PJ-C	0.2	OCT	0.2
American sandlance	< 0.1	PJ	0.1	OCT	0.2
Rainbow smelt	< 0.1	SB	0.1	JUL	0.3
Northern puffer	< 0.1	PJ-C	0.1	JUL	0.2
Lined seahorse	< 0.1	SB-C	0.1	APR	0.1
Rock gunnel	< 0.1	RH	0.2	JUL	0.1
Spotted goatfish	< 0.1	SB	0.1	JUL	0.2
Hickory shad	< 0.1	KVK	0.1	OCT	0.1
Naked goby	< 0.1	PJ	<0.1	NOV	0.1
Conger eel	< 0.1	AK	0.1	AUG	0.1
Atlantic mackerel	< 0.1	PJ	< 0.1	JUN	0.1
Striped cusk-eel	< 0.1	SB-C	0.1	APR	0.1

TABLE 4-1 (page 2 of 2)

Average Bottom Trawl CPUE (number per 10-minute tow)

		Highest Annual CPUE		Highest Monthly CPUE	
Species	Avg CPUE	Area	CPUE	Month	CPUE
Crevalle jack	< 0.1	PJ	< 0.1	SEP	0.1
Feather blenny	< 0.1	UH	0.1	JUN	0.1
Northern stargazer	< 0.1	KVK	0.1	JUL	0.1

Note: Not all stations sampled each month, see sampling schedule for actual months and stations sampled. Avg CPUE and highest monthly CPUE based on all stations combined.

Stations: LH - Lower Harbor (HW 1), UH - Upper Harbor (HW 2,4), RH - Red Hook (HW 3) KVK - Kill Van Kull (HW 5), AK – Arthur Kill (HW 6-7), NB - Newark Bay (HW 8-10), PJ-C Port Jersey Channel (PJ 4), SB-C South Brooklyn Channel (SB 4), PJ - Port Jersey (PJ 1-3, 5-6), SB – South Brooklyn (SB 1-3)

TABLE 4-2

Percent Composition of Finfish Species Collected in the Study Area – All Stations Combined, October 1998 – September 1999

October		November		December		January	
Bay anchovy	52.8	Striped bass	50.8	White Perch	29.1	Atlantic silverside	74.4
Weakfish	25.6	American shad	16.4	Striped bass	24.1	Atlantic herring	16.7
Winter flounder	3.8	Atlantic silverside	16.3	Alewife	9.9	Striped bass	5.1
Butterfish	3.3	Blueback herring	7.8	American shad	7.7	Other	3.8
Other	14.5	Winter flounder	3.3	Bay anchovy	7.4		
		Other	5.3	Winter flounder	6.5		
				Weakfish	4.0		
				Smallmouth flounder	3.1		
				Other	8.0		
February		**March**		**April**		**May**	
White Perch	52.8	White Perch	36.6	Striped bass	31.1	Atlantic tomcod	38.4
Atlantic silverside	11.3	Winter flounder	28.2	Spotted hake	24.5	Bay anchovy	21.9
Striped bass	11.3	Striped bass	26.4	Alewife	21.7	Blueback herring	14.3
American shad	4.8	Other	8.9	Winter flounder	11.8	Atlantic herring	8.9
Winter flounder	4.8			Windowpane	5.2	Summer flounder	4.2
Silver hake	4.4			Other	5.7	Spotted hake	3.8
Other	10.5					Other	8.5
June		**July**		**August**		**September**	
Bay anchovy	30.5	Striped bass	41.1	Bay anchovy	50.7	Bay anchovy	76.3
Atlantic tomcod	19.1	Weakfish	36.4	Weakfish	24.8	Scup	5.7
Winter flounder	18.4	Atlantic silverside	6.5	Striped bass	6.2	Alewife	3.6
Spotted hake	9.6	Alewife	4.3	Butterfish	3.6	Butterfish	3.2
Summer flounder	6.2	Butterfish	3.0	Scup	3.3	Striped anchovy	3.0
Windowpane	5.7	Bay anchovy	3.0	Alewife	3.0	Weakfish	2.5
Other	10.5	Other	11.7	Other	8.4	Other	5.8

Note: Percent composition based on bottom trawl CPUE (number per 10-min tow)
Stations: October HW 1-8, SB 1-4, PJ 1-5; November SB 1-4, PJ 1-5; December HW 1-8, SB 1-4, PJ 1-5; January SB 1-4, PJ 1-5
February SB 1-4, PJ 1-6; March HW 5, HW 8-10, SB 1-4, PJ 1-6; April HW 1-10, SB 1-4, PJ 1-6; May SB 1-4, PJ 1-6
June HW 1-10, SB 1-4, PJ 1-6; July HW 5, SB 1-4, PJ 1-6; August HW 1-10, SB 1-4, PJ 1-6; September HW 5, SB 1-4, PJ 1-6

TABLE 4-3 (page 1 of 2)

Average Bottom Trawl CPUE (number per 10-minute tow) in the Study Area – All Stations Combined, October 1998 – September 1999

October		November		December		January		February		March	
Bay anchovy	45.6	Striped bass	34.0	White Perch	5.5	Atlantic silverside	6.4	White Perch	7.3	White Perch	23.3
Weakfish	22.1	American shad	11.0	Striped bass	4.6	Atlantic herring	1.4	Atlantic silverside	1.6	Winter flounder	17.9
Winter flounder	3.3	Atlantic silverside	10.9	Alewife	1.9	Striped bass	0.4	Striped bass	1.6	Striped bass	16.8
Butterfish	2.8	Blueback herring	5.2	American shad	1.5	Bay anchovy	0.1	American shad	0.7	Atlantic herring	1.3
Lookdown	2.0	Winter flounder	2.2	Bay anchovy	1.4	Windowpane	0.1	Winter flounder	0.7	Spotted hake	1.2
Black sea bass	1.5	Butterfish	1.0	Winter flounder	1.2	Winter flounder	0.1	Silver hake	0.6	American shad	1.1
Windowpane	1.5	Bay anchovy	0.8	Weakfish	0.8			Spotted hake	0.3	Grubby	0.5
Striped bass	1.1	Weakfish	0.7	Smallmouth flounder	0.6			Windowpane	0.3	Silver hake	0.4
Striped searobin	0.9	Striped searobin	0.3	Butterfish	0.3			Cunner	0.2	Windowpane	0.4
Bluefish	0.8	Alewife	0.2	Gizzard Shad	0.3			Atlantic menhaden	0.2	Alewife	0.2
Northern kingfish	0.8	Red hake	0.2	Spotted hake	0.2			Alewife	0.1	Atlantic silverside	0.1
Scup	0.8	Atlantic menhaden	0.1	Windowpane	0.2			Grubby	0.1	Blueback herring	0.1
Smallmouth flounder	0.6	Naked goby	0.1	Atlantic silverside	0.1			Northern pipefish	0.1	Cunner	0.1
Grubby	0.3	Smallmouth flounder	0.1	Grubby	0.1			Atlantic herring	0.1	Gizzard Shad	0.1
Tautog	0.3			Atlantic menhaden	0.1			Little skate	0.1	Red hake	0.1
American sandlance	0.2			Atlantic tomcod	0.1						
Fourspot flounder	0.2			Black sea bass	0.1						
Summer flounder	0.2			Little skate	0.1						
American shad	0.1			Silver hake	0.1						
Atlantic menhaden	0.1			Striped searobin	0.1						
Northern pipefish	0.1										
Alewife	0.1										
American eel	0.1										
Atlantic silverside	0.1										
Cunner	0.1										
Hickory shad	0.1										
Little skate	0.1										
Northern searobin	0.1										

TABLE 4-3 (page 2 of 2)

Average Bottom Trawl CPUE (number per 10-minute tow) in the Study Area – All Stations Combined, October 1998 – September 1999

April		May		June		July		August		September	
Striped bass	32.5	Atlantic tomcod	47.0	Bay anchovy	18.7	Striped bass	329.8	Bay anchovy	116.9	Bay anchovy	182.7
Spotted hake	25.6	Bay anchovy	26.8	Atlantic tomcod	11.7	Weakfish	292.5	Weakfish	57.3	Scup	13.5
Alewife	22.7	Blueback herring	17.5	Winter flounder	11.3	Atlantic silverside	52.1	Striped bass	14.2	Alewife	8.6
Winter flounder	12.4	Atlantic herring	10.9	Spotted hake	5.9	Alewife	34.5	Butterfish	8.3	Butterfish	7.6
Windowpane	5.5	Summer flounder	5.1	Summer flounder	3.8	Butterfish	24.4	Scup	7.5	Striped anchovy	7.1
Silver hake	2.0	Spotted hake	4.7	Windowpane	3.5	Bay anchovy	24.0	Alewife	7.0	Weakfish	6.0
American shad	1.3	Winter flounder	2.3	Atlantic herring	1.0	Scup	16.3	Striped searobin	5.1	Blueback herring	2.5
Blueback herring	0.9	Pollock	1.8	Weakfish	1.0	Striped searobin	11.7	Winter flounder	2.9	Atlantic menhaden	1.8
Grubby	0.5	Windowpane	1.2	Blueback herring	0.6	Windowpane	4.8	Atlantic menhaden	2.7	Atlantic silverside	1.6
Northern pipefish	0.5	Striped bass	0.9	Striped searobin	0.5	Winter flounder	4.5	Striped anchovy	2.7	American shad	1.5
Little skate	0.3	Butterfish	0.8	Northern searobin	0.4	Summer flounder	3.8	Windowpane	1.5	Bluefish	1.2
White Perch	0.2	Scup	0.8	Spot	0.4	Blueback herring	1.4	Summer flounder	1.2	Atlantic moonfish	1.1
Bay anchovy	0.1	Silver hake	0.7	Cunner	0.4	Northern pipefish	1.0	Black sea bass	0.7	Black sea bass	0.6
Cunner	0.1	Cunner	0.4	Tautog	0.3	Atlantic menhaden	0.5	Atlantic moonfish	0.3	Inshore lizardfish	0.6
Atlantic tomcod	0.1	Tautog	0.4	Scup	0.3	American shad	0.3	Cunner	0.3	Tautog	0.5
Fourspot flounder	0.1	Weakfish	0.4	Black sea bass	0.2	Rainbow smelt	0.3	Grubby	0.3	Winter flounder	0.5
Lined seahorse	0.1	Northern pipefish	0.3	Grubby	0.2	Atlantic tomcod	0.2	American shad	0.3	Summer flounder	0.5
Striped cusk-eel	0.1	Alewife	0.2	Northern pipefish	0.2	Grubby	0.2	Atlantic tomcod	0.3	Striped searobin	0.4
Striped searobin	0.1	Little skate	0.2	Alewife	0.2	Northern puffer	0.2	Bluefish	0.3	Lookdown	0.3
Summer flounder	0.1			American eel	0.2	Spot	0.2	Northern pipefish	0.3	Gizzard Shad	0.2
				Butterfish	0.2	Spotted goatfish	0.2	Atlantic silverside	0.2	Striped bass	0.2
				Oyster toadfish	0.2	Atlantic moonfish	0.1	American eel	0.1	Crevalle jack	0.1
				Red hake	0.2	Cunner	0.1	Inshore lizardfish	0.1	Cunner	0.1
				Striped bass	0.2	Northern stargazer	0.1	Northern searobin	0.1	Northern kingfish	0.1
				Bluefish	0.1	Oyster toadfish	0.1	Spotted hake	0.1	Windowpane	0.1
				American shad	0.1	Rock gunnel	0.1	Tautog	0.1		
				Atlantic mackerel	0.1			Atalntic menhaden	0.1		
				Feather blenny	0.1			Blueback herring	0.1		
				Rock gunnel	0.1			Conger eel	0.1		
				Silver hake	0.1			Lined seahorse	0.1		
								Red hake	0.1		
								Smallmouth flounder	0.1		

Note: Not all stations sampled each month, see sampling schedule for actual months and stations sampled.

TABLE 4-4

Percent Composition of Finfish Species Collected at Channel Stations – All Areas Combined, October 1998 – September 1999

October		November		December		January	
Bay anchovy	58.3	American shad	67.0	White Perch	34.2		
Weakfish	27.9	Blueback herring	13.8	Striped bass	26.5		
Butterfish	3.6	Bay anchovy	7.4	Alewife	11.6		
Lookdown	2.6	Butterfish	7.4	American shad	8.4		
Winter flounder	1.8	Alewife	2.1	Bay anchovy	6.5		
Windowpane	1.4	Atlantic menhaden	1.1	Weakfish	3.6		
Bluefish	1.1	Weakfish	1.1	Winter flounder	3.3		
Other	3.4			Gizzard Shad	1.8		
				Smallmouth flounder	1.1		
				Other	2.9		
February		**March**		**April**		**May**	
White Perch	63.3	White Perch	37.3	Spotted hake	44.6	Spotted hake	30.5
Striped bass	13.5	Winter flounder	27.8	Winter flounder	18.2	Summer flounder	13.6
Silver hake	5.3	Striped bass	26.9	Striped bass	17.3	Windowpane	13.6
American shad	4.8	Spotted hake	1.9	Windowpane	9.3	Silver hake	11.9
Winter flounder	3.9	American shad	1.8	Alewife	4.1	Winter flounder	8.5
Spotted hake	2.9	Atlantic herring	1.5	Silver hake	2.6	Atlantic tomcod	3.4
Windowpane	1.9	Other	2.6	Other	4.0	Butterfish	3.4
Cunner	1.0					Cunner	3.4
Grubby	1.0					Little skate	3.4
Northern pipefish	1.0					Northern pipefish	3.4
Other	1.4					Tautog	3.4
						Scup	1.7
June		**July**		**August**		**September**	
Atlantic tomcod	25.9	Weakfish	75.4	Weakfish	53.3	Bay anchovy	24.7
Winter flounder	19.7	Atlantic silverside	6.5	Bay anchovy	22.9	American shad	21.9
Bay anchovy	18.8	Alewife	4.9	Butterfish	5.7	Blueback herring	20.5
Spotted hake	14.1	Bay anchovy	3.8	Scup	3.4	Atlantic moonfish	9.6
Summer flounder	6.4	Scup	2.2	Alewife	3.4	Scup	5.5
Windowpane	4.9	Summer flounder	1.8	Winter flounder	2.8	Weakfish	4.1
Weakfish	1.7	Winter flounder	1.4	Atlantic menhaden	1.8	Alewife	2.7
Striped searobin	1.1	Windowpane	1.1	Striped anchovy	1.6	Butterfish	1.4
Atlantic herring	1.0	Butterfish	1.0	Striped bass	1.0	Cunner	1.4
Northern searobin	1.0	Other	1.9	Other	4.2	Striped anchovy	1.4
Other	5.4					Striped searobin	1.4
						Summer flounder	1.4
						Tautog	1.4
						Windowpane	1.4
						Winter flounder	1.4

Note: Percent composition based on bottom trawl CPUE (10 min tow). Not all stations sampled each month, see sampling schedule for actual months and stations sampled.
Channel Stations – HW-1 through HW-10, PJ-4, and SB-4

TABLE 4-5 (page 1 of 2)

Average Bottom Trawl CPUE (number per 10-minute tow) at Channel Stations – All Areas Combined, October 1998 – September 1999

October		November		December		January		February		March	
Bay anchovy	75.5	American shad	31.5	White Perch	9.4			White Perch	13.1	White Perch	54.3
Weakfish	36.1	Blueback herring	6.5	Striped bass	7.3			Striped bass	2.8	Winter flounder	40.5
Butterfish	4.7	Bay anchovy	3.5	Alewife	3.2			Silver hake	1.1	Striped bass	39.2
Lookdown	3.4	Butterfish	3.5	American shad	2.3			American shad	1.0	Spotted hake	2.8
Winter flounder	2.3	Alewife	1.0	Bay anchovy	1.8			Winter flounder	0.8	American shad	2.7
Windowpane	1.8	Atlantic menhaden	0.5	Weakfish	1.0			Spotted hake	0.6	Atlantic herring	2.2
Bluefish	1.4	Weakfish	0.5	Winter flounder	0.9			Windowpane	0.4	Grubby	1.2
Striped searobin	1.2			Gizzard Shad	0.5			Cunner	0.2	Windowpane	1.0
Scup	0.7			Smallmouth flounder	0.3			Grubby	0.2	Silver hake	0.7
Smallmouth flounder	0.6			Spotted hake	0.2			Northern pipefish	0.2	Alewife	0.3
Black sea bass	0.3			Windowpane	0.2			Alewife	0.1	Blueback herring	0.2
Summer flounder	0.3			Atlantic menhaden	0.1			Atlantic herring	0.1	Cunner	0.2
Atlantic menhaden	0.2			Atlantic silverside	0.1			Little skate	0.1	Gizzard Shad	0.2
Fourspot flounder	0.2			Butterfish	0.1					Red hake	0.2
Alewife	0.1			Striped searobin	0.1						
American eel	0.1										
American shad	0.1										
Cunner	0.1										
Hickory shad	0.1										
Little skate	0.1										
Northern kingfish	0.1										
Northern searobin	0.1										
Tautog	0.1										

TABLE 4-5 (page 2 of 2)

Average Bottom Trawl CPUE (number per 10-minute tow) at Channel Stations – All Areas Combined, October 1998 – September 1999

April		May		June		July		August		September	
Spotted hake	39.2	Spotted hake	9.0	Atlantic tomcod	17.3	Weakfish	292.0	Weakfish	84.6	Bay anchovy	6.0
Winter flounder	16.0	Summer flounder	4.0	Winter flounder	13.2	Atlantic silverside	25.3	Bay anchovy	36.4	American shad	5.3
Striped bass	15.2	Windowpane	4.0	Bay anchovy	12.6	Alewife	19.0	Butterfish	9.0	Blueback herring	5.0
Windowpane	8.2	Silver hake	3.5	Spotted hake	9.4	Bay anchovy	14.7	Scup	5.4	Atlantic moonfish	2.3
Alewife	3.6	Winter flounder	2.5	Summer flounder	4.3	Scup	8.3	Alewife	5.3	Scup	1.3
Silver hake	2.3	Atlantic tomcod	1.0	Windowpane	3.3	Summer flounder	7.0	Winter flounder	4.4	Weakfish	1.0
American shad	0.8	Butterfish	1.0	Weakfish	1.2	Winter flounder	5.3	Atlantic menhaden	2.8	Alewife	0.7
Grubby	0.7	Cunner	1.0	Striped searobin	0.8	Windowpane	4.3	Striped anchovy	2.5	Butterfish	0.3
Northern pipefish	0.6	Little skate	1.0	Atlantic herring	0.7	Butterfish	4.0	Striped bass	1.6	Cunner	0.3
Little skate	0.4	Northern pipefish	1.0	Northern searobin	0.7	Striped searobin	2.3	Striped searobin	1.5	Striped anchovy	0.3
Blueback herring	0.3	Tautog	1.0	Spot	0.6	Striped bass	1.7	Summer flounder	1.1	Striped searobin	0.3
White Perch	0.3	Scup	0.5	Cunner	0.5	American shad	1.0	Windowpane	1.0	Summer flounder	0.3
Cunner	0.2			Tautog	0.5	Atlantic tomcod	0.7	Grubby	0.5	Tautog	0.3
Atlantic tomcod	0.1			Grubby	0.3	Atlantic menhaden	0.3	Atlantic tomcod	0.4	Windowpane	0.3
Bay anchovy	0.1			American eel	0.3	Atlantic moonfish	0.3	Cunner	0.3	Winter flounder	0.3
Striped cusk-eel	0.1			Butterfish	0.3	Northern puffer	0.3	Northern pipefish	0.3		
Striped searobin	0.1			Oyster toadfish	0.3	Northern stargazer	0.3	American eel	0.2		
Summer flounder	0.1			Red hake	0.3	Oyster toadfish	0.3	American shad	0.2		
				Alewife	0.2			Atlantic moonfish	0.2		
				Black sea bass	0.1			Bluefish	0.2		
				Bluefish	0.1			Northern searobin	0.2		
				Feather blenny	0.1			Spotted hake	0.2		
				Rock gunnel	0.1			Atalntic menhaden	0.1		
				Silver hake	0.1			Black sea bass	0.1		
				Striped bass	0.1			Blueback herring	0.1		
								Conger eel	0.1		
								Inshore lizardfish	0.1		
								Lined seahorse	0.1		
								Red hake	0.1		
								Tautog	0.1		

Note: Not all stations sampled each month, see sampling schedule for actual months and stations sampled. Channel Stations – HW-1 through HW-10, PJ-4, and SB-4

TABLE 4-6

Percent Composition of Finfish Species Collected at Shoal / Interpier Stations – All Areas Combined, October 1998 – September 1999

October		November		December		January	
Winter flounder	20.1	Striped bass	60.2	Winter flounder	25.0	Atlantic silverside	74.4
Black sea bass	14.0	Atlantic silverside	19.3	Smallmouth flounder	14.6	Atlantic herring	16.7
Bay anchovy	12.8	American shad	7.1	Bay anchovy	12.5	Striped bass	5.1
Striped bass	11.6	Blueback herring	6.7	Striped bass	10.4	Bay anchovy	1.3
Weakfish	9.1	Winter flounder	3.9	Butterfish	8.3	Windowpane	1.3
Northern kingfish	7.3	Weakfish	1.0	Weakfish	6.3	Winter flounder	1.3
Windowpane	4.3	Striped searobin	0.6	American shad	4.2		
Scup	3.7	Butterfish	0.4	Grubby	4.2		
Grubby	3.0	Red hake	0.4	Atlantic silverside	2.1		
Smallmouth flounder	3.0	Naked goby	0.2	Atlantic tomcod	2.1		
American sandlance	2.4	Smallmouth flounder	0.2	Black sea bass	2.1		
Striped searobin	2.4			Little skate	2.1		
Tautog	2.4			Silver hake	2.1		
Northern pipefish	1.2			Spotted hake	2.1		
Other	2.4			Windowpane	2.1		
February		**March**		**April**		**May**	
Atlantic silverside	68.3	Winter flounder	44.4	Striped bass	45.1	Atlantic tomcod	40.2
Winter flounder	9.8	Atlantic herring	27.8	Alewife	39.6	Bay anchovy	23.0
Atlantic menhaden	7.3	Atlantic silverside	11.1	Winter flounder	5.3	Blueback herring	15.0
American shad	4.9	Silver hake	11.1	Spotted hake	4.1	Atlantic herring	9.4
Cunner	4.9	Alewife	5.6	American shad	1.6	Summer flounder	3.7
Alewife	2.4			Blueback herring	1.4	Spotted hake	2.5
Windowpane	2.4			Silver hake	1.2	Pollock	1.5
				Windowpane	1.1	Winter flounder	1.5
				Other	0.6	Other	3.2
June		**July**		**August**		**September**	
Bay anchovy	52.7	Striped bass	47.2	Bay anchovy	70.2	Bay anchovy	77.8
Winter flounder	15.8	Weakfish	30.5	Striped bass	9.8	Scup	5.7
Windowpane	7.3	Atlantic silverside	6.5	Weakfish	4.8	Alewife	3.6
Atlantic tomcod	6.1	Alewife	4.2	Scup	3.1	Butterfish	3.2
Summer flounder	5.9	Butterfish	3.3	Striped searobin	3.1	Striped anchovy	3.0
Atlantic herring	2.6	Bay anchovy	2.9	Alewife	2.8	Weakfish	2.5
Blueback herring	2.6	Scup	2.0	Butterfish	2.1	Other	4.2
Scup	1.2	Striped searobin	1.6	Other	4.0		
Weakfish	1.2	Other	1.8				
Other	4.5						

Note: Percent composition based on bottom trawl CPUE (10 min tow). Not all stations sampled each month, see sampling schedule for actual months and stations sampled.
Shoal / Interpier Stations – PJ-1 through PJ-3, PJ-5 and PJ-6, and SB-1 through SB-3

TABLE 4-7 (page 1 of 2)

Monthly Average Bottom Trawl CPUE (number per 10-minute tow) at Shoal / Interpier Stations – All Areas Combined, October 1998 – September 1999

October		November		December		January		February		March	
Winter flounder	4.7	Striped bass	43.7	Winter flounder	1.7	Atlantic silverside	8.3	Atlantic silverside	3.5	Winter flounder	1.0
Black sea bass	3.3	Atlantic silverside	14.0	Smallmouth flounder	1.0	Atlantic herring	1.9	Winter flounder	0.5	Atlantic herring	0.6
Bay anchovy	3.0	American shad	5.1	Bay anchovy	0.9	Striped bass	0.6	Atlantic menhaden	0.4	Atlantic silverside	0.3
Striped bass	2.7	Blueback herring	4.9	Striped bass	0.7	Bay anchovy	0.1	American shad	0.3	Silver hake	0.3
Weakfish	2.1	Winter flounder	2.9	Butterfish	0.6	Windowpane	0.1	Cunner	0.3	Alewife	0.1
Northern kingfish	1.7	Weakfish	0.7	Weakfish	0.4	Winter flounder	0.1	Alewife	0.1		
Windowpane	1.0	Striped searobin	0.4	American shad	0.3			Windowpane	0.1		
Scup	0.9	Butterfish	0.3	Grubby	0.3						
Grubby	0.7	Red hake	0.3	Atlantic silverside	0.1						
Smallmouth flounder	0.7	Naked goby	0.1	Atlantic tomcod	0.1						
American sandlance	0.6	Smallmouth flounder	0.1	Black sea bass	0.1						
Striped searobin	0.6			Little skate	0.1						
Tautog	0.6			Silver hake	0.1						
Northern pipefish	0.3			Spotted hake	0.1						
American shad	0.1			Windowpane	0.1						
Atlantic silverside	0.1										
Butterfish	0.1										
Fourspot flounder	0.1										

TABLE 4-7 (page 2 of 2)

Average Bottom Trawl CPUE (number per 10-minute tow) at Shoal / Interpier Stations – All Areas Combined, October 1998 – September 1999

April		May		June		July		August		September	
Striped bass	58.5	Atlantic tomcod	58.5	Bay anchovy	27.9	Striped bass	452.9	Bay anchovy	237.5	Bay anchovy	249.0
Alewife	51.4	Bay anchovy	33.5	Winter flounder	8.4	Weakfish	292.6	Striped bass	33.1	Scup	18.1
Winter flounder	6.9	Blueback herring	21.9	Windowpane	3.9	Atlantic silverside	62.1	Weakfish	16.3	Alewife	11.6
Spotted hake	5.3	Atlantic herring	13.6	Atlantic tomcod	3.3	Alewife	40.4	Scup	10.6	Butterfish	10.4
American shad	2.1	Summer flounder	5.4	Summer flounder	3.1	Butterfish	32.0	Striped searobin	10.4	Striped anchovy	9.6
Blueback herring	1.9	Spotted hake	3.6	Atlantic herring	1.4	Bay anchovy	27.5	Alewife	9.4	Weakfish	7.9
Silver hake	1.5	Pollock	2.3	Blueback herring	1.4	Scup	19.3	Butterfish	7.3	Atlantic menhaden	2.5
Windowpane	1.4	Winter flounder	2.3	Scup	0.6	Striped searobin	15.3	Striped anchovy	2.9	Atlantic silverside	2.3
Northern pipefish	0.3	Striped bass	1.1	Weakfish	0.6	Windowpane	5.0	Atlantic menhaden	2.5	Bluefish	1.6
Bay anchovy	0.1	Scup	0.9	Northern pipefish	0.5	Winter flounder	4.3	Windowpane	2.3	Blueback herring	1.5
Fourspot flounder	0.1	Butterfish	0.8	Spotted hake	0.5	Summer flounder	2.6	Black sea bass	1.6	Black sea bass	0.9
Grubby	0.1	Weakfish	0.5	Black sea bass	0.4	Blueback herring	1.9	Summer flounder	1.3	Inshore lizardfish	0.9
Lined seahorse	0.1	Windowpane	0.5	Striped bass	0.3	Northern pipefish	1.4	Atlantic moonfish	0.5	Atlantic moonfish	0.6
		Alewife	0.3	Alewife	0.1	Atlantic menhaden	0.6	Winter flounder	0.5	Tautog	0.6
		Cunner	0.3	American shad	0.1	Rainbow smelt	0.4	American shad	0.4	Winter flounder	0.6
		Tautog	0.3	Atlantic mackerel	0.1	Grubby	0.3	Atlantic silverside	0.4	Summer flounder	0.5
		Northern pipefish	0.1	Bluefish	0.1	Spot	0.3	Bluefish	0.4	Lookdown	0.4
				Cunner	0.1	Spotted goatfish	0.3	Cunner	0.4	Striped searobin	0.4
				Spot	0.1	Cunner	0.1	Northern pipefish	0.3	Gizzard Shad	0.3
						Northern puffer	0.1	Inshore lizardfish	0.1	Striped bass	0.3
						Rock gunnel	0.1	Smallmouth flounder	0.1	Crevalle jack	0.1
								Tautog	0.1	Northern kingfish	0.1

Note: Not all stations sampled each month, see sampling schedule for actual months and stations sampled. Shoal / Interpier Stations – PJ-1 through PJ-3, PJ-5 and PJ-6, and SB-1 through SB-3

TABLE 4-8

Rank of the Most Common Ichthyoplankton Species Collected in Recent Studies

Source	Current Study	LMS (1996)	NOAA (1995)	Versar (1989)
Year(s)	1998-1999	1995-1996	1993-1994	1986
Weakfish	1	3	NC	8
Tautog	2	2	6	2
Atlantic menhaden	3	NC	10	NC
Bay anchovy	4	1	1	1
Fourspot flounder	5	NC	9	NC
Hogchoker	6	NC	8	NC
Winter flounder	7	7	3	5
Fourbeard rockling	8	NC	NC	NC
Sculpins	9	8	4	NC
Windowpane	10	NC	10	NC

Note: NC – Not collected.

TABLE 4-9

Average Ichthyoplankton Density (no./ 1000 cubic meters) in the Study Area – All Stations Combined, February – June 1999

Lifestage: Egg

February		March		April		May		June	
Fourbeard rockling	< 1	Fourbeard rockling	114	Atlantic menhaden	1409	Weakfish	2401	Weakfish	1698
		Winter flounder	73	Winter flounder	117	Tautog	1938	Tautog	792
		Sculpins	44	Fourbeard rockling	106	Fourspot flounder	525	Bay anchovy	640
		Atlantic menhaden	8			Bay anchovy	459	Hogchoker	277
		Pollock	1			Hogchoker	336	Fourspot flounder	117
						Atlantic menhaden	150	Unidentified	1

Lifestage: Yolk-sac larvae

February		March		April		May		June	
Sculpins	4	Sculpins	16	Sculpins	11	Atlantic menhaden	21		
Winter flounder	1	Winter flounder	4	Winter flounder	1				

Lifestage: Post yolk-sac larvae

February		March		April		May		June	
American sand lance	5	Sculpins	50	Winter flounder	157	Atlantic menhaden	204	Atlantic menhaden	291
Atlantic herring	4	Atlantic herring	5	Sculpins	30	Windowpane	25	Bay anchovy	82
Sculpins	2	Winter flounder	1			Winter flounder	5	Weakfish	39
		American sand lance	1			Tautog	< 1	Gobiidae	14
						Northern pipefish	< 1	Unidentified	8
								Northern pipefish	7
								Windowpane	5
								Searobins	1
								Northern puffer	1
								Tautog	< 1
								Goosefish	< 1

Lifestage: Juvenile

February		March		April		May		June	
						Atlantic tomcod	1	Northern pipefish	4
						Windowpane	< 1	Winter flounder	< 1

Notes: All samples collected with epibenthic sled. Not all stations sampled each month, see sampling schedule for actual months and stations sampled.

TABLE 4-10

Average Ichthyoplankton Density (no./ 1000 cubic meters) at Channel Stations – All Areas Combined, February – June 1999

Lifestage: Egg

February		March		April		May		June	
		Fourbeard rockling	113	Atlantic menhaden	1470	Weakfish	2464	Weakfish	1706
		Winter flounder	75	Winter flounder	123	Tautog	1970	Tautog	777
		Sculpins	26	Fourbeard rockling	111	Fourspot flounder	548	Bay anchovy	660
		Atlantic menhaden	8			Bay anchovy	466	Hogchoker	285
		Pollock	2			Hogchoker	354	Fourspot flounder	118
						Atlantic menhaden	99	Unidentified	1

Lifestage: Yolk-sac larvae

February		March		April		May		June	
Sculpins	4	Sculpins	16	Sculpins	9	Atlantic menhaden	16		
Winter flounder	1	Winter flounder	5	Winter flounder	1				

Lifestage: Post yolk-sac larvae

February		March		April		May		June	
American sand lance	5	Sculpins	51	Winter flounder	125	Atlantic menhaden	165	Atlantic menhaden	284
Atlantic herring	5	Atlantic herring	5	Sculpins	28	Windowpane	24	Bay anchovy	86
Sculpins	3	Winter flounder	1			Winter flounder	5	Weakfish	41
		American sand lance	1			Tautog	< 1	Gobiidae	15
						Northern pipefish	< 1	Unidentified	8
								Northern pipefish	7
								Windowpane	5
								Searobins	1
								Northern puffer	1
								Tautog	< 1
								Goosefish	< 1

Lifestage: Juvenile

February		March		April		May		June	
						Atlantic tomcod	1	Northern pipefish	4
						Windowpane	< 1	Winter flounder	< 1

Notes: All samples collected with epibenthic sled. Not all stations sampled each month, see sampling schedule for actual months and stations sampled.
Channel Stations – HW-1 through HW-10, PJ-4, and SB-4

TABLE 4-11

Average Ichthyoplankton Density (no./ 1000 cubic meters) at Shoal/ Interpier Stations – All Areas Combined, February – June 1999

Lifestage: Egg

February		March		April		May		June	
Fourbeard rockling	1	Fourbeard rockling	152	Atlantic menhaden	2008	Tautog	3291	Weakfish	2626
		Winter flounder	55	Winter flounder	250	Weakfish	3285	Bay anchovy	868
		Sculpins	47	Fourbeard rockling	202	Fourspot flounder	935	Tautog	832
		Atlantic menhaden	9			Bay anchovy	757	Hogchoker	382
		Pollock	1			Atlantic menhaden	288	Fourspot flounder	170
						Hogchoker	48	Unidentified	3

Lifestage: Yolk-sac larvae

February		March		April		May		June	
Sculpins	4	Sculpins	17	Sculpins	16	Atlantic menhaden	40		
Winter flounder	1	Winter flounder	1	Winter flounder	3				

Lifestage: Post yolk-sac larvae

February		March		April		May		June	
American sand lance	4	Sculpins	52	Winter flounder	158	Atlantic menhaden	414	Atlantic menhaden	235
Atlantic herring	4	Atlantic herring	4	Sculpins	37	Windowpane	19	Bay anchovy	68
Sculpins	1	Winter flounder	1			Winter flounder	3	Gobiidae	15
						Tautog	1	Unidentified	15
								Northern pipefish	9
								Weakfish	8
								Northern puffer	1
								Tautog	1

Lifestage: Juvenile

February		March		April		May		June	
						Atlantic tomcod	1	Northern pipefish	3
						Windowpane	1		

Notes: All samples collected with epibenthic sled. Not all stations sampled each month, see sampling schedule for actual months and stations sampled.
Shoal/ Interpier Stations – PJ-1 through 3, PJ-5 and 6, and SB-1 through 3

TABLE 4-12 (page 1 of 4)

Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Channel Stations Among Sample Areas, November 1998 - September 1999

Taxonomic Listing	LH	UH	RH	KVK	NB	AK	SB	PJ	Total	%
CNIDARIA										
ANTHOZOA										
ACTINIARIANS			0.2	0.5		0.1			0.8	<0.1
ASCHELMINTHES										
NEMATODES	0.8		0.2						1.0	<0.1
PLATYHELMINTHES		0.1	0.5						0.6	<0.1
RHYNCHOCOELA										
NEMERTEANS	0.5	0.1	0.5		<0.1	0.9			2.0	0.2
ANNELIDA										
OLIGOCHAETES		1.2	3.2		<0.1	1.2	0.2	0.2	6.0	0.6
POLYCHAETES										
Ampharetidae	2.2	5.5	5.2		25.2	5.0	1.8		44.9	4.3
Capitellidae	0.2					0.1			0.3	<0.1
Cirratulidae		0.2	0.2			0.2			0.6	<0.1
Pherusa sp.	0.2	0.1	0.2						0.5	<0.1
Glycera sp.	0.8	2.2	4.5	3.8	2.2	0.4	0.8		14.7	1.4
Lumbrinereidae	0.2								0.2	<0.1
Magelona rosea	1.2	0.1							1.3	0.1
Nephtys sp.	7.0	6.2	2.0	6.0	0.5	0.4	4.8	2.0	28.9	2.8
Nereis sp.	0.8		0.8	2.8	0.4	0.2	0.2	0.2	5.4	0.5
Diopatra cuprea		0.2			0.7	0.6			1.5	0.1
Orbiniidae		0.4	4.5	0.2	4.3	0.8			10.2	1.0
Haploscoloplos robustus					0.2				0.2	<0.1
Leitoscoloplos fragilis		1.7	9.8		8.2	4.5	0.2	0.8	25.2	2.4
Paraonidae	0.5	1.8	4.2	3.0	0.5	1.0			11.0	1.1
Aricidea sp.	0.5								0.5	<0.1
Pectinaria gouldii		3.4	3.0	0.2	2.3	0.4	1.2	0.2	10.7	1.0
Phyllodocidae	1.8	0.8	1.5	7.2	0.9	1.6			13.8	1.3
Sabellidae			0.2						0.2	<0.1
Polynoidae		0.2	0.2						0.4	<0.1
Harmothoe sp.	0.5								0.5	<0.1
Lepidametria commensalis	0.2								0.2	<0.1
Lepidonotus sp.	0.2	0.1							0.3	<0.1

TABLE 4-12 (page 2 of 4)

Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Channel Stations Among Sample Areas, November 1998 - September 1999

Taxonomic Listing	LH	UH	RH	KVK	NB	AK	SB	PJ	Total	%
ANNELIDA (cont.)										
Lepidonotus squamatus			0.2	0.2					0.4	<0.1
Sigalionidae	0.2								0.2	<0.1
Sabellariadae						0.1			0.1	<0.1
Sabellaria vulgaris				0.5	0.3	0.4			1.2	0.1
Spionidae	3.8	0.8	0.2		<0.1	1.1			5.9	0.6
Streblospio benedicti	2.0	5.9	27.8	37.5	6.2	21.5	0.5	0.2	101.6	9.8
Polydora ligni	0.2	0.5	0.5			0.6	0.2		2.0	0.2
Scolecolepides viridis		0.2	0.2	138.8		0.1			139.3	13.5
Spiophanes bombyx		0.1							0.1	>0.1
Syllidae	2.0	0.4		1.0	0.7		0.2		4.3	0.4
ARTHROPODA										
AMPHIPODS										
Caprellidae		0.1							0.1	<0.1
Gammaridea	1.2	1.1	3.8	6.2	0.8	0.1			13.2	1.3
Ampelisca abdita		3.1	13.8		2.1	0.6	0.8		20.4	2.0
Unciola sp.		0.1							0.1	<0.1
Unciola dissimilis		0.1							0.1	<0.1
Corophium sp.	0.2	0.6	0.5		0.2	0.2			1.7	0.2
Erichthonius braziliensis		0.2							0.2	<0.1
Gammarus sp.	0.5	0.2	0.2		1.7	0.1			2.7	0.3
Melitidae		0.1							0.1	<0.1
Melita sp.	0.5	0.5	2.0		0.5		0.2		3.7	0.4
Paraphoxus spinosus		0.1							0.1	<0.1
Phoxocephalus holbolli	0.8								0.8	<0.1
Protohaustorius sp.	1.0								1.0	<0.1
Trichophoxus epistomus		0.2							0.2	<0.1
CUMACIDS					0.2				0.2	<0.1
Diastylis quadrispinosa		0.4	0.2	0.2	0.7	0.1			1.6	0.2
Leucon americanus		0.1			4.0	8.8			12.9	1.2
DECAPODS										
Pagurus sp.	3.0	0.4							3.4	0.3

TABLE 4-12 (page 3 of 4)

Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Channel Stations Among Sample Areas, November 1998 – September 1999

Taxonomic Listing	LH	UH	RH	KVK	NB	AK	SB	PJ	Total	%
ARTHROPODA (cont.)										
Pinnixa sayana		0.1							0.1	<0.1
Libinia sp.			0.5						0.5	<0.1
Callinectes sapidus					<0.1				<0.1	<0.1
Ovalipes ocellatus	0.2	0.1							0.3	<0.1
Cancer sp.		0.1							0.1	<0.1
Cancer irroratus	0.5								0.5	<0.1
Xanthidae		0.2	0.2						0.4	<0.1
Hexapanopeus angustifrons		0.1							0.1	<0.1
Crangon septemspinosa	0.2	0.1	0.2	0.5	<0.1		0.2		1.2	0.1
Upogebiidae					<0.1				<0.1	<0.1
MYSIDS										
Neomysis americana						0.1			0.1	<0.1
ECHINOIDS										
Strongylocentrotidae	5.5								5.5	0.5
ISOPODS										
Cyathura polita				1.8					1.8	0.2
Idoteidae					<0.1				<0.1	<0.1
Idotea baltica		0.1							0.1	<0.1
Idotea metallica					0.2	0.1			0.3	<0.1
Edotea triloba		0.8	2.0	0.2	0.8		0.2		4.0	0.4
OSTRACODS		0.4	0.8		0.2			0.2	1.6	0.2
MOLLUSCA										
BIVALVES	0.2			1.5			0.5		2.2	0.2
Lyonsia hyalina		0.5	1.0		1.3		0.2		3.0	0.3
Mulinia lateralis	1.2	105.0	61.0	1.2	22.6	2.6	202.8	9.2	405.6	39.2
Mya arenaria	0.5	1.4	0.5	1.0	2.3	1.5	0.5	0.5	8.2	0.8
Mytilidae		0.1	0.2						0.3	<0.1
Mytilus edulis	0.5	11.6	3.5	0.2	0.7				16.5	1.6
Yoldia sp.					0.3		1.0		1.3	0.1
Solenidae	0.2								0.2	<0.1
Ensis directus	0.2	0.2							0.4	<0.1
Siliqua costata	1.0	0.1							1.1	0.1

TABLE 4-12 (page 4 of 4)

Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Channel Stations Among Sample Areas, November 1998 – September 1999

Taxonomic Listing	LH	UH	RH	KVK	NB	AK	SB	PJ	Total	%
MOLLUSCA (cont.)										
Solen viridis		0.5	0.2						0.7	<0.1
Tellinidae						0.1			0.1	<0.1
Tellina sp.	8.5	19.5	16.0	4.0	3.2	0.4	1.8	0.2	53.6	5.2
Mercenaria mercenaria	0.5	1.0	0.5		0.2				2.2	0.2
GASTROPODS		0.2							0.2	<0.1
Crepidula fornicata	0.2	1.2	1.0		0.2				2.6	0.3
Crepidula plana	0.8	1.1	1.5		0.2				3.6	0.3
Lacuna vincta		0.4			0.2	0.1	1.2	3.2	5.1	0.5
Ilyanassa trivittata	1.0	1.2	1.8				0.2	0.5	4.7	0.5
Acteocina canaliculata		1.0	1.0		0.6		1.2	2.8	6.6	0.6
CHORDATA										
Molgula manhattensis		0.1	0.2		0.2	0.2			0.7	<0.1
TOTAL	54.2	186.6	182.4	218.5	96.0	56.2	220.9	20.2	1035.0	

Notes:
1. Average density is the station average of monthly replicates.
2. Months sampled: November (HW-9 & HW-10 not sampled),, February (HW-9 & HW-10 not sampled), May, and August.
3. Sample Areas: LH – Ambrose Channel (HW-1), UH – Anchorage Channel (HW-2, HW-4), RH – Red Hook (HW-3), KVK – Kill Van Kull (HW-5), NB – Newark Bay (HW-8, HW-9, HW-10), AK – Arthur Kill (HW-6, HW-7), SB – South Brooklyn (SB-4), PJ – Port Jersey (PJ-4)
4. Organisms that appear at family level, or higher, were identified to the lowest possible taxon.

TABLE 4-13 (page 1 of 3) Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Interpier / Shoal Areas, November 1998 – September 1999				
Taxonomic Listing	**SB**	**PJ**	**Total**	**%**
ASCHELMINTHES				
NEMATODES		<0.1	<0.1	<0.1
PLATYHELMINTHES		<0.1	<0.1	<0.1
RHYNCHOCOELA				
NEMERTEANS		<0.1	<0.1	<0.1
ANNELIDA				
OLIGOCHAETES	3.6	3.4	7.0	3.3
POLYCHAETES				
Ampharetidae	<0.1	0.8	0.8	0.4
Capitellidae	1.3		1.3	0.6
Flabelligeridae	<0.1		<0.1	<0.1
Pherusa sp.		<0.1	<0.1	<0.1
Glycera sp.	0.3	4.0	4.3	2.0
Maldanidae	<0.1		<0.1	<0.1
Nephtys sp.	0.8	1.2	2.0	0.9
Nereis sp.	4.0	5.6	9.6	4.5
Diopatra cuprea	0.1	0.1	0.2	<0.1
Orbiniidae	0.7	3.2	3.9	1.8
Leitoscoloplos fragilis	2.5	11.0	13.5	6.4
Paraonidae	<0.1	7.8	7.8	3.7
Pectinaria gouldii		1.4	1.4	0.7
Phyllodocidae	0.5	4.0	4.5	2.1
Harmothoe sp.		<0.1	<0.1	<0.1
Lepidonotus squamatus		0.1	0.1	<0.1
Sabellaria vulgaris		<0.1	<0.1	<0.1
Sabellidae		0.3	0.3	0.1
Sabella sp.	0.1		0.1	<0.1
Spionidae		0.1	0.1	<0.1
Streblospio benedicti	13.1	27.8	40.9	19.3
Polydora ligni	<0.1	0.3	0.3	0.1
Scolecolepides viridis	0.3		0.3	0.1
Syllidae		0.9	0.9	0.4
ARTHROPODA				
AMPHIPODS				
Caprellidea		<0.1	<0.1	<0.1
Caprellidae		<0.1	<0.1	<0.1
Gammaridea	<0.1	2.5	2.5	1.2
Ampelisca abdita	0.3	2.6	3.9	1.8
Aoridae		0.1	0.1	<0.1
Unciola sp.		<0.1	<0.1	<0.1
Unciola irrorata		0.3	0.3	0.1

TABLE 4-13 (page 2 of 3)
Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Interpier / Shoal Areas, November 1998 – September 1999

Taxonomic Listing	SB	PJ	Total	%
ARTHROPODA (cont.)				
Corophiidae	<0.1	<0.1	<0.1	<0.1
Corophium sp.		0.3	0.3	0.1
Erichthonius rubricornis		0.1	0.1	<0.1
Gammarus sp.	0.3	0.3	0.6	0.3
Melitidae		0.4	0.4	0.2
Melita sp.		0.8	0.8	0.4
Paraphoxus spinosus		<0.1	<0.1	<0.1
Phoxocephalidae		<0.1	<0.1	<0.1
Trichophoxus epistomus		0.1	0.1	<0.1
CUMACIDS		<0.1	<0.1	<0.1
Diastylis quadrispinosa		0.6	0.6	0.3
Leucon americanus	0.2	0.1	0.3	0.1
DECAPODS				
Pagurus sp.	<0.1	<0.1	<0.1	<0.1
Brachyura	<0.1		<0.1	<0.1
Callinectes sapidus		<0.1	<0.1	<0.1
Libinia emarginata		<0.1	<0.1	<0.1
Xanthidae		0.5	0.5	0.2
Dyspanopeus sayi	<0.1	0.1	0.1	<0.1
Panopeus herbstii		<0.1	<0.1	<0.1
Crangon septemspinosa		0.1	0.1	<0.1
Upogebia affinis	0.1	<0.1	0.1	<0.1
ECHINOIDS				
Strongylocentrotidae	<0.1		<0.1	<0.1
ISOPODS				
Edotea triloba		0.3	0.3	0.1
Cyathura polita		1.0	1.0	0.5
OSTRACODS	<0.1	0.4	0.4	0.2
MOLLUSCA				
BIVALVES				
Anomia simplex		<0.1	<0.1	<0.1
Astarte sp.		<0.1	<0.1	<0.1
Lyonsia hyalina		0.8	0.8	0.4
Mulinia lateralis	2.4	43.2	45.6	21.6
Mya arenaria	0.3	1.5	1.8	0.9
Mytilidae	<0.1	0.2	0.2	<0.1
Mytilus edulis		23.9	23.9	11.3
Yoldia sp.		0.1	0.1	<0.1
Solenidae		<0.1	<0.1	<0.1
Ensis directus		<0.1	<0.1	<0.1
Solen viridis		0.1	0.1	<0.1

TABLE 4-13 (page 3 of 3)
Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Interpier / Shoal Areas, November 1998 – September 1999

Taxonomic Listing	SB	PJ	Total	%
MOLLUSCA (cont.)				
Tellina sp.	0.1	4.0	4.1	1.9
Gemma gemma		0.4	0.4	0.2
Mercenaria mercenaria		0.5	0.5	0.2
GASTROPODS				
Haminoea solitaria		0.5	0.5	0.2
Crepidula fornicata		3.5	3.5	1.7
Crepidula plana	0.2	4.5	4.7	2.2
Lacuna vincta	0.4	2.6	3.0	1.4
Ilyanassa obsoleta	0.3		0.3	0.1
Ilyanassa trivittata	0.2	0.4	0.6	0.3
Acteocina canaliculata	0.5	2.7	3.2	1.5
NUDIBRANCHS		<0.1	<0.1	<0.1
CHORDATA				
Molgula manhattensis		6.3	6.3	3.0
TOTAL	33.6	177.4	211.4	

Notes:
1. Average density is the station average of monthly replicates.
2. Months sampled: November (PJ-6 not sampled), February, May, and August.
3. Sample Areas: South Brooklyn (SB-1, SB-2, SB-3), Port Jersey (PJ-1, PJ-2, PJ-3, PJ-5, PJ-6)
4. Organisms that appear at family level, or higher, were identified to the lowest possible taxon.

TABLE 4-14 (page 1 of 2)

Average Macroinvertebrate Densities (number / 0.1 m^2) Collected at Channel Stations November 1998, February 1999, May 1999, August 1999

Taxonomic Listing	LH	UH	RH	KVK	NB	AK	SB	PJ	Total	%
Bivalves	0.2			1.5			0.5		2.2	0.4
Lyonsia hyalina		0.5	1.0		1.3		0.2		3.0	0.6
Mulinia lateralis	1.2	105.0	61.0	1.2	22.6	2.6	202.8	9.2	405.6	75.8
Mya arenaria	0.5	1.4	0.5	1.0	2.5	1.5	0.5	0.5	8.4	1.6
Mytilidae		0.1	0.2						0.3	<0.1
Mytilus edulis	0.5	11.6	3.5	0.2	0.7				16.5	3.1
Yoldia sp.					0.3		1.0		1.3	0.2
Solenidae	0.2								0.2	<0.1
Ensis directus	0.2	0.2							0.4	<0.1
Siliqua costata	1.0	0.1							1.1	0.2
Solen viridis		0.5	0.2						0.7	0.1
Tellinidae						0.1			0.1	<0.1
Tellina sp.	8.5	19.5	16.0	4.0	3.2	0.4	1.5	0.2	53.3	10.0
Mercenaria mercenaria	0.5	1.0	0.5		0.2				2.2	0.4
Gastropods		0.2							0.2	<0.1
Crepidula fornicata	0.2	1.2	1.0		0.2				2.6	0.5
Crepidula plana	0.8	1.1	1.5		0.2				3.6	0.7
Ilyanassa trivittata	1.0	1.2	1.8				0.2	0.5	4.7	0.9
Arthropods										
Gammaridea	1.2	1.1	3.8	6.2	0.8	0.1			13.2	2.5
Gammarus sp.	0.5	0.2	0.2		1.7	0.1			2.7	0.5
Melitidae		0.1							0.1	<0.1
Melita sp.	0.5	0.5							1.0	0.2
Pagurus sp.	3.0	0.4							3.4	0.6
Brachyura					0.2				0.2	<0.1
Libinia sp.			0.5						0.5	<0.1
Callinectes sapidus					<0.1				<0.1	<0.1
Ovalipes ocellatus	0.2	0.1							0.3	<0.1
Crangon septemspinosa	0.2	0.1	0.2	0.5	<0.1				1.0	0.2
Upogebiidae					<0.1				<0.1	<0.1
Neomysis americana						0.1			0.1	<0.1

TABLE 4-14 (page 2 of 2)

Average Macroinvertebrate Densities (number / 0.1 m^2) Collected at Channel Stations
November 1998, February 1999, May 1999, August 1999

Taxonomic Listing	LH	UH	RH	KVK	NB	AK	SB	PJ	Total	%
Echinoderms										
Strongylocentrotidae	5.5								5.5	1.0
Chordates										
Molgula manhattensis			0.2		0.3	0.2			0.7	0.4
TOTAL	25.9	146.1	92.1	14.6	34.2	5.1	206.7	10.4	535.1	

Notes:
1. Average density is the station average of monthly replicates.
2. Months sampled: November (HW-9 & HW-10 not sampled),, February (HW-9 & HW-10 not sampled), May, and August.
3. Sample Areas: LH – Ambrose Channel (HW-1), UH – Anchorage Channel (HW-2, HW-4), RH – Red Hook (HW-3), KVK – Kill Van Kull (HW-5), NB – Newark Bay (HW-8, HW-9, HW-10), AK – Arthur Kill (HW-6, HW-7), SB – South Brooklyn (SB-4), PJ – Port Jersey (PJ-4)
4. Organisms that appear at family level, or higher, were identified to the lowest possible taxon.

TABLE 4-15

Average Macroinvertebrate Densities (number / 0.1 m^2) Collected at Shoal Stations November 1998, February 1999, May 1999, August 1999

Taxonomic Listing	SB	PJ	Total	%
Bivalves				
Anomia simplex		<0.1	<.1	<0.1
Astarte sp.		<0.1	<.1	<0.1
Lyonsia hyalina		0.8	0.8	0.9
Mulinia lateralis	2.4	43.2	45.6	49.3
Mya arenaria	0.2	1.5	1.7	1.8
Mytilidae	0.1	0.2	1.3	1.4
Mytilus edulis		23.9	23.9	25.8
Solenidae		<0.1	<0.1	<0.1
Ensis directus		<0.1	<0.1	<0.1
Solen viridis		0.1	0.1	0.1
Tellina sp.	0.1	4.0	4.1	4.4
Gemma gemma		0.4	0.4	0.4
Mercenaria mercenaria		0.5	0.5	0.5
Gastropods				
Haminoea solitaria		0.5	0.5	0.5
Crepidula fornicata		4.0	4.0	4.3
Crepidula plana	0.2	4.5	4.7	5.1
Ilyanassa obsoleta	0.3		0.3	0.3
Ilyanassa trivittata	0.2	0.2	0.4	0.4
Arthropods				
Gammaridea	0.1	2.4	2.5	2.7
Gammarus sp.	0.3	0.3	0.6	0.6
Pagurus sp.		<0.1	<0.1	<0.1
Brachyura	0.1		0.1	0.1
Callinectes sapidus		<0.1	<0.1	<0.1
Xanthidae		0.5	0.5	0.5
Dyspanopeus sayi	0.1	0.1	0.2	0.2
Panopeus herbstii		<0.1	<0.1	<0.1
Crangon septemspinosa		0.1	0.1	0.1
Neomysis americana		0.2	0.2	0.2
Upogebia affinis	0.1	<0.1	0.1	0.1
Nudibranchs		<0.1	<0.1	<0.1
TOTAL	4.2	87.4	91.6	

Notes:
1. Average density is the station average of monthly replicates.
2. Months sampled: November, February, May, and August.
3. Sample Areas: South Brooklyn (SB-1, SB-2, SB-3), Port Jersey (PJ-1, PJ-2, PJ-3, PJ-5, PJ-6)
4. Organisms that appear at family level, or higher, were identified to the lowest possible taxon.

TABLE 4-16 (page 1 of 2) Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Shallow-water (< 20 ft MLW) Stations, November 1998 – September 1999					
Species	**PJ-1**	**PJ-3**	**PJ-5**	**Total**	**%**
ASCHELMINTHES					
NEMATODES	0.2			0.2	<0.1
PLATEHELMINTHES	0.2			0.2	<0.1
ANNELIDA					
OLIGOCHAETES	12.0	0.5	0.2	12.7	2.6
POLYCHAETES					
Ampharetidae	1.5	0.5	0.2	2.2	0.4
Glycera sp.	9.5	5.0	0.5	15.0	3.0
Nephtys sp.		0.5	1.8	2.3	0.5
Nereis sp.	26.0	0.5		26.5	5.3
Diopatra cuprea	0.2			0.2	<0.1
Orbiniidae	3.8	10.3	0.5	14.6	2.9
Leitoscoloplos fragilis	13.0	37.8	2.0	52.8	10.6
Paraonidae	37.5	0.2		37.7	7.8
Pectinaria gouldii	2.8			2.8	0.6
Phyllodocidae	17.5	0.5		18.0	3.6
Lepidonotus squamatus	0.5			0.5	0.1
Sabellidae	1.2			1.2	0.2
Spionidae	0.2			0.2	<0.1
Streblospio benedicti	121.5	2.0	1.8	125.3	25.2
Polydora ligni	0.5		0.2	0.7	0.1
Syllidae	1.0			1.0	0.2
ARTHROPODA					
AMPHIPODS					
Caprellidea		0.2		0.2	<0.1
Caprellidae	0.2			0.2	<0.1
Gammaridea	8.2			8.2	1.6
Ampelisca abdita	3.5	1.0	0.8	5.3	1.1
Aoridae	0.5			0.5	0.1
Unciola irrorata	1.5			1.5	0.3
Corophium sp.	0.8	0.2		1.0	0.2
Gammarus sp.	1.5		0.2	1.7	0.3
Melitidae	1.8			1.8	0.4
Melita sp.	3.5			3.5	0.7
Paraphoxus spinosus	0.2			0.2	<0.1
Phoxocephalidae	0.2			0.2	<0.1
Trichophoxus epistomus	0.5			0.5	0.1
CUMACIDS	0.2			0.2	<0.1
Diastylis quadrispinosa	1.5	0.2		1.7	0.3
DECAPODS					
Callinectes sapidus	0.2			0.2	<0.1
Libinia emarginata	0.2			0.2	<0.1
Xanthidae	2.5			2.5	0.5
Panopeus herbstii	0.2			0.2	<0.1
Dispanopeus sayi	0.2			0.2	<0.1

TABLE 4-16 (page 2 of 2)
Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Shallow-water (< 20 ft MLW) Stations, November 1998 – September 1999

Species	PJ-1	PJ-3	PJ-5	Total	%
ARTHROPODA (cont.)					
Crangon septemspinosa	0.2	0.5		0.7	0.1
ISOPODS					
Cyathura polita	4.8			4.8	1.0
MYSIDS					
Neomysis americana	1.0			1.0	0.2
OSTRACODS	0.8			0.8	0.2
MOLLUSCA					
BIVALVES					
Anomia simplex	0.2			0.2	<0.1
Astarte sp.		0.2		0.2	<0.1
Lyonsia hyalina	1.8		0.2	2.0	0.4
Mulinia lateralis	4.8	27.5	11.8	44.1	8.9
Mya arenaria	3.8	0.5		4.3	0.9
Mytilidae	1.2			1.2	0.2
Mytilus edulis	0.2			0.2	<0.1
Yoldia sp.	0.5			0.5	0.1
Solen viridis	0.5			0.5	0.1
Tellina sp.	8.2	0.5	0.2	8.9	1.8
Mercenaria mercenaria	2.0	0.2		2.2	0.4
GASTROPODS					
Haminoea solitaria		2.5		2.5	0.5
Crepidula fornicata	14.5			14.5	2.9
Crepidula plana	17.5			17.5	3.5
Lacuna vincta		8.8	2.8	11.6	2.3
Ilyanassa trivittata		0.2		0.2	<0.1
Acteocina canaliculata	0.2	2.8	2.2	5.2	1.0
NUDIBRANCHS			0.2	0.2	<0.1
CHORDATA					
Molgula manhattensis	30.5			30.5	6.1
TOTAL	369.2	103.1	25.6	497.9	100.0

Notes: 1. Average density is the station average of monthly replicates.
2. Months sampled: November, February, May, and August.
3. Organisms that appear at family level, or higher, were identified to the lowest possible taxon.

TABLE 4-17 (page 1 of 3)
Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at 30 – 40 ft (MLW) Stations, November 1998 – September 1999

Species	SB-4	PJ-4	HW-3	HW-5	HW-6	HW-7	HW-8	HW-9	HW-10	Total	%
CNIDARIA											
ANTHOZOA											
ACTINIARIANS			0.2	0.5		0.2				0.9	<0.1
ASCHELMINTHES											
NEMATODES			0.2							0.2	<0.1
PLATYHELMINTHES			0.5							0.5	<0.1
RHYNCHOCOELA											
NEMERTEANS			0.5		0.8	1.0	0.2			2.5	0.2
ANNELIDA											
OLIGOCHAETES	0.2	0.2	3.2		0.8	1.5	0.2			6.1	0.6
POLYCHAETES											
Ampharetidae	1.8		5.2		7.8	2.2	11.0	40.5	24.0	92.5	8.9
Capitellidae					0.2					0.2	<0.1
Cirratulidae			0.2		0.2	0.2				0.6	<0.1
Pherusa sp.			0.2							0.2	<0.1
Glycera sp.	0.8		4.5	3.8	0.5	0.2	1.2	4.0	1.5	16.5	1.6
Nephtys sp.	4.8	2.0	2.0	6.0	0.5	0.2	0.5	0.5	0.5	17.0	1.6
Nereis sp.	0.2	0.2	0.8	2.8		0.5	0.2	0.5	0.5	5.7	0.5
Diopatra cuprea					0.8	0.5	0.2	1.0	1.0	3.5	0.3
Orbiniidae			4.5	0.2	0.5	1.0	4.8	4.0	4.0	19.0	1.8
Haploscoloplos robustus							0.5			0.5	<0.1
Leitoscoloplos fragilis	0.2	0.8	9.8		5.5	3.5	6.2	8.0	10.5	44.5	4.3
Paraonidae			4.2	3.0	1.2	0.8	1.0	0.5		10.7	1.0
Pectinaria gouldii	1.2	0.2	3.0	0.2	0.2	0.5		6.0	1.0	12.3	1.2
Phyllodocidae			1.5	7.2	1.0	2.2	0.2	2.5		14.6	1.4
Polynoidae			0.2							0.2	<0.1
Sabellidae			0.2							0.2	<0.1
Lepidonotus squamatus			0.2	0.2						0.4	<0.1

TABLE 4-17 (page 2 of 3)
Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at 30 – 40 ft (MLW) Stations, November 1998 – September 1999

Species	SB-4	PJ-4	HW-3	HW-5	HW-6	HW-7	HW-8	HW-9	HW-10	Total	%
ANNELIDA (cont.)											
Sabellariidae					0.2					0.2	<0.1
Sabellaria vulgaris				0.5		0.8		1.0		2.3	0.2
Spionidae			0.2		1.2	1.0	0.2			2.6	0.2
Streblospio benedicti	0.5	0.2	27.8	37.5	25.8	17.2	2.0	15.0	1.5	127.5	12.2
Polydora ligni	0.2		0.5			1.2				1.9	0.2
Scolecolepides viridis			0.2	138.8	0.2					139.2	13.3
Syllidae	0.2			1.0			0.2	2.0		3.4	0.3
ARTHROPODA											
AMPHIPODS											
Gammaridea			3.8	6.2		0.2		2.0	0.5	12.7	1.2
Ampelisca abdita	0.8		13.8		1.0	0.2	0.2	5.0	1.0	22.0	2.1
Corophium sp.			0.5			0.5		0.5		1.5	0.1
Gammarus sp.			0.2		0.2			1.0	4.0	5.4	0.5
Melita sp.	0.2		2.0					1.5		3.7	0.4
CUMACIDS									0.5	0.5	<0.1
Diastylis quadrispinosa			0.2	0.2		0.2	0.2	1.5	0.5	2.8	0.3
Leucon americanus					6.5	11.0	2.5	4.0	5.5	29.5	2.8
DECAPODS											
Callinectes sapidus							0.2			0.2	<0.1
Libinia sp.			0.5							0.5	<0.1
Xanthidae			0.2							0.2	<0.1
Crangon septemspinosa	0.2		0.2	0.5			0.2			1.1	0.1
Upogebiidae							0.2			0.2	<0.1
ISOPODS											
Cyathura polita				1.8						1.8	0.2
Idoteidae							0.2			0.2	<0.1
Idotea metallica						0.2		0.5		0.7	<0.1
Edotea triloba	0.2		2.0	0.2			0.5	1.5	0.5	4.9	0.5

TABLE 4-17 (page 3 of 3)
Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at 30 – 40 ft (MLW) Stations, November 1998 – September 1999

Species	SB-4	PJ-4	HW-3	HW-5	HW-6	HW-7	HW-8	HW-9	HW-10	Total	%
ARTHROPODA (cont.)											
MYSIDS											
Neomysis americana					0.2					0.2	<0.1
OSTRACODA		0.2	0.8				0.2	0.5		1.7	0.2
MOLLUSCA											
BIVALVES	0.5			1.5						2.0	0.2
Lyonsia hyalina	0.2		1.0				0.5	2.5	1.0	5.2	0.5
Mulinia lateralis	202.8	9.2	61.0	1.2	4.2	1.0	8.8	10.5	48.5	347.2	33.3
Mya arenaria	0.5	0.5	0.5	1.0	2.0	1.0	1.5	0.5	5.0	12.5	1.2
Mytilidae			0.2							0.2	<0.1
Mytilus edulis			3.5	0.2				2.0		5.7	0.5
Yoldia sp.	1.0							0.5	0.5	2.0	0.2
Solen viridis			0.2							0.2	<0.1
Tellinidae						0.2				0.2	<0.1
Tellina sp.	1.8	0.2	16.0	4.0	0.2	0.5	0.5	9.0		32.2	3.1
Mercenaria mercenaria			0.5				0.2	0.5		1.2	0.1
GASTROPODS											
Crepidula fornicata			1.0					0.5		1.5	0.1
Crepidula plana			1.5					0.5		2.0	0.2
Lacuna vincta	1.2	3.2				0.2		0.5		5.1	0.5
Ilyanassa trivittata	0.2	0.5	1.8							2.5	0.2
Acteocina canaliculata	1.2	2.8	1.0				0.8	0.5	0.5	6.8	0.7
CHORDATA											
Molgula manhattensis			0.2			0.5		0.5		1.2	0.1
TOTAL	220.9	20.2	182.4	218.5	61.7	50.4	45.3	131.5	112.5	1,043	100.0

Notes: 1. Average density is the station average of monthly replicates.
2. Months sampled: November, February, May, and August.
3. Organisms that appear at family level, or higher, were identified to the lowest possible taxon.
4. HW-9 and HW-10 were not sampled in November or February.

TABLE 4-18 (page 1 of 2)
Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Mid-depths (shallow channel) Stations, November 1998 – September 1999

Species	PJ-2	PJ-6	SB-1	SB-2	SB-3	Total	%
ASCHELMINTHES							
NEMATODES	0.2					0.2	0.1
PLATYHELMINTHES	0.2					0.2	
RHYNCHOCOELA							
NEMERTEANS	0.2					0.2	
ANNELIDA							
OLIGOCHAETES	0.2	4.0	6.8	0.8	3.2	15.0	0.9
POLYCHAETES							
Ampharetidae	0.2	1.7		0.2		2.1	0.1
Capitellidae			4.0			4.0	1.0
Flabelligeridae			0.2			0.2	0.1
Pherusa sp.	0.2					0.2	0.1
Glycera sp.	5.2		0.2	0.5	0.2	6.1	1.6
Maldanidae				0.2		0.2	0.1
Nephtys sp.	0.2	3.3	0.2	1.0	1.0	5.7	0.9
Nereis sp.	1.5		7.0	2.0	3.0	13.5	3.4
Diopatra cuprea	0.5			0.2	0.2	0.9	0.2
Orbiniidae	1.2		1.2	0.2	0.8	3.4	0.9
Leitoscoloplos fragilis	2.0	0.3	5.2	0.8	1.5	9.8	2.3
Paraonidae	0.8	0.3			0.2	1.3	0.2
Pectinaria gouldii	3.8	0.3				4.1	1.0
Phyllodocidae	1.8	0.3	0.8	0.8		3.7	0.8
Harmothoe sp.	0.2					0.2	0.1
Lepidonotus squamatus	0.2					0.2	0.1
Sabellaria vulgaris	0.2					0.2	0.1
Sabellidae	0.5					0.5	0.1
Sabella sp.				0.2	0.2	0.4	0.1
Spionidae	0.5					0.5	0.1
Polydora ligni	0.2	0.7		0.2		1.1	
Streblospio benedicti	7.5	6.0	15.2	4.5	19.5	52.7	10.9
Scolecolepides viridis				1.0		1.0	0.3
Syllidae	3.5					3.5	0.9
ARTHROPODA							
AMPHIPODS							
Gammaridea	4.0		0.2			4.2	1.2
Ampelisca abdita	6.5	1.0	0.8	0.5	2.5	11.3	1.9
Unciola sp.	0.2					0.2	
Corophiidae	0.2		0.2			0.4	0.1
Corophium sp.	0.5					0.5	0.2
Erichthonius rubricornis	0.5					0.5	0.1
Gammarus sp.				0.8		0.8	0.2
Melita sp.	0.5					0.5	
CUMACIDS							
Diastylis quadrispinosa	1.0	0.3				1.3	0.2
Leucon americanus		0.7		0.5		1.2	0.2

TABLE 4-18 (page 2 of 2)
Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Mid-depths (shallow channel) Stations, November 1998 – September 1999

Species	PJ-2	PJ-6	SB-1	SB-2	SB-3	Total	%
ARTHROPODA (cont.)							
DECAPODS							
Pagurus sp.	0.2			0.2		0.4	0.1
Brachyura				0.2		0.2	0.1
Callinectes sapidus	0.2					0.2	
Xanthidae	0.2					0.2	0.1
Dyspanopeus sayi	0.5			0.2		0.7	0.2
Upogebia affinis	0.2		0.2	0.2		0.6	0.1
ECHINOIDS							
Strongylocentrotidae					0.2	0.2	0.1
ISOPODS							
Edotea triloba	1.5					1.5	0.4
OSTRACODS	1.0	0.3			0.2	1.5	0.2
MOLLUSCA							
BIVALVES							
Lyonsia hyalina	1.5	0.3				1.8	0.4
Mulinia lateralis	124.2	47.7	0.5	5.8	0.8	179.0	29.3
Mya arenaria	1.8	1.3		0.8		3.9	0.7
Mytilidae					0.2	0.2	
Mytilus edulis	119.5					119.5	29.5
Solenidae	0.2					0.2	0.1
Ensis directus	0.2					0.2	0.1
Tellina sp.	11.0	0.3	0.2	0.2		11.7	2.6
Gemma gemma	2.2					2.2	0.6
Mercenaria mercenaria		0.3				0.3	0.1
GASTROPODS							
Crepidula fornicata	3.2					3.2	0.7
Crepidula plana	5.2			0.5		5.7	1.4
Lacuna vincta		1.3	0.2	0.8	0.2	2.5	0.6
Ilyanassa obsoleta					0.8	0.8	0.2
Ilyanassa trivittata	1.0	0.7	0.2	0.2	0.2	2.3	0.4
Acteocina canaliculata	3.2	5.0	0.2	0.5	0.8	9.7	2.0
CHORDATA							
Molgula manhattensis	1.0					1.0	
TOTAL	322.4	76.1	43.5	24.0	35.7	501.7	100.0

Notes: 1. Average density is the station average of monthly replicates.
2. Months sampled: November (PJ-6 not sampled), February, May, and August.
3. Organisms that appear at family level, or higher, were identified to the lowest possible taxon.

TABLE 4-19 (page 1 of 3) Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Deep-water (> 20 ft MLW) Stations, November 1998 – September 1999					
Species	**HW-1**	**HW-2**	**HW-4**	**Total**	**%**
ASCHELMINTHES					
NEMATODES	0.8			0.8	0.2
PLATYHELMINTHES			0.2	0.2	<0.1
RHYNCHOCOELA					
NEMERTEANS	0.5	0.2		0.7	0.2
ANNELIDA					
OLIGOCHAETES			2.5	2.5	0.6
POLYCHAETES					
Ampharetidae	2.2	0.2	10.8	13.2	3.1
Capitellidae	0.2			0.2	<0.1
Cirratulidae			0.5	0.5	0.1
Pherusa sp.	0.2		0.2	0.4	<0.1
Glycera sp.	0.8	0.2	4.2	5.2	1.2
Lumbrinereidae	0.2			0.2	<0.1
Magelona rosea	1.2	0.2		1.4	0.3
Nephtys sp.	7.0	10.8	1.5	19.3	4.5
Nereis sp.	0.8			0.8	0.2
Diopatra cuprea		0.5		0.5	0.1
Orbiniidae			0.8	0.8	0.2
Leitoscoloplos fragilis		0.2	3.2	3.4	0.8
Paraonidae	0.5		3.5	4.0	0.9
Aricidea sp.	0.5			0.5	0.1
Pectinaria gouldii			6.8	6.8	1.6
Phyllodocidae	1.8		1.5	3.3	0.8
Polynoidae			0.5	0.5	0.1
Harmothoe sp.	0.5			0.5	0.1
Lepidametria commensalis	0.2			0.2	<0.1
Lepidonotus sp.	0.2	0.2		0.4	<0.1
Sigalionidae	0.2			0.2	<0.1
Spionidae	3.8	0.5	1.0	5.3	1.2
Streblospio benedicti	2.0		11.8	13.8	3.2
Polydora ligni	0.2	0.2	0.8	1.2	0.3
Scolecolepides viridis			0.5	0.5	0.1
Spiophanes bombyx		0.2		0.2	<0.1
Syllidae	2.0		0.8	2.8	0.7
ARTHROPODA					
AMPHIPODS					
Caprellidae			0.2	0.2	<0.1
Gammaridea	1.2	0.2	2.0	3.4	0.8
Ampelisca abdita		0.2	6.0	6.2	1.4
Unciola sp.		0.2		0.2	<0.1
Unciola dissimilis		0.2		0.2	<0.1
Corophium sp.	0.2	0.8	0.5	1.5	0.4
Erichthonius braziliensis		0.5		0.5	0.1
Gammarus sp.	0.5	0.2	0.2	0.9	0.2
Melitidae		0.2		0.2	<0.1

TABLE 4-19 (page 2 of 3) Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Deep-water (> 20 ft MLW) Stations, November 1998 – September 1999					
Species	**HW-1**	**HW-2**	**HW-4**	**Total**	**%**
ARTHROPODA (cont.)					
Melita sp.	0.5	0.2	0.8	1.5	0.4
Paraphoxus spinosus		0.2		0.2	<0.1
Phoxocephalus holbolli	0.8			0.8	0.2
Protohaustorius sp.	1.0			1.0	0.2
Trichophoxus epistomus		0.5		0.5	0.1
CUMACIDS					
Diastylis quadrispinosa			0.8	0.8	0.2
Leucon americanus			0.2	0.2	<0.1
DECAPODS					
Pagurus sp.	3.0	0.5	0.2	3.7	0.9
Pinnixa sayana			0.2	0.2	<0.1
Cancer sp.		0.2		0.2	<0.1
Cancer irroratus	0.5			0.5	0.1
Xanthidae			0.5	0.5	0.1
Hexapanopeus angustifrons			0.2	0.2	<0.1
Ovalipes ocellatus	0.2	0.2		0.4	<0.1
Crangon septemspinosa	0.2	0.2		0.4	<0.1
ECHINOIDS					
Strongylocentrotidae	5.5			5.5	1.3
ISOPODS					
Edotea triloba		0.2	1.5	1.7	0.4
Idotea baltica		0.2		0.2	<0.1
OSTRACODS			0.8	0.8	0.2
MOLLUSCA					
BIVALVES	0.2			0.2	<0.1
Lyonsia hyalina			1.0	1.0	0.2
Mulinia lateralis	1.2	0.2	209.8	211.2	49.3
Mya arenaria	0.5	1.5	1.2	3.2	0.7
Mytilidae		0.2		0.2	<0.1
Mytilus edulis	0.5	1.5	21.8	23.8	5.6
Solenidae	0.2			0.2	<0.1
Ensis directus	0.2	0.2	0.2	0.6	0.1
Siliqua costata	1.0	0.2		1.2	0.3
Solen viridis		0.5	0.5	1.0	0.2
Tellina sp.	8.5	5.8	33.2	47.5	11.1
Mercenaria mercenaria	0.5		2.0	2.5	0.6
GASTROPODS			0.5	0.5	0.1
Crepidula fornicata	0.2		2.5	2.7	0.6
Crepidula plana	0.8	0.2	2.0	3.0	0.7
Lacuna vincta			0.8	0.8	0.2
Ilyanassa trivittata	1.0	0.8	1.5	3.3	0.8
Acteocina canaliculata			2.0	2.0	0.5

TABLE 4-19 (page 3 of 3)
Average Benthic Invertebrate Densities (number / 0.1 m^2) Collected at Deep-water (> 20 ft MLW) Stations, November 1998 – September 1999

Species	HW-1	HW-2	HW-4	Total	%
CHORDATA					
Molgula manhattensis			0.2	0.2	<0.1
TOTAL	54.2	29.4	344.4	428.0	100.0

Notes: 1. Average density is the station average of monthly replicates.
2. Months sampled: November, February, May, and August.
3. Organisms that appear at family level, or higher, were identified to the lowest possible taxon.

TABLE 4-20

Crab Dredge CPUE (number / 5-min tow) at Channel Stations
February – April 1999

Sample Area	LH	UH	RH	KVK	AK	NB	SB-C	PJ-C
Month	**February**							
Number of Stations	1	2	1	1	2	1	1	1
Blue crab (*Callinectes sapidus*)		0.5			2.0	1.0	1.0	6.0
Green crab (*Carcinus maenus*)			1.0					
Horseshoe crab (*Limulus polyphemus*)	1.0	1.0	1.0					1.0
Mud crab (Xanthidae)				1.0				
Rock crab (*Cancer* sp.)		10.0	2.0				1.0	
Spider crab (*Libinia* sp.)		1.0						
Month	**March**							
Number of Stations	1	2	1	1	2	3	1	1
Blue crab (*Callinectes sapidus*)			2.0		1.0	5.0	12.0	2.0
Horseshoe crab (*Limulus polyphemus*)			1.0				1.0	
Rock crab (*Cancer* sp.)	1.0		204.0				225.0	
Spider crab (*Libinia* sp.)			1.0					
Month	**April**							
Number of Stations	1	2	1	1	2	3	1	1
Blue crab (*Callinectes sapidus*)		0.5	1.0		2.0	0.67	1.0	1.0
Green crab (*Carcinus maenus*)			1.0					
Horseshoe crab (*Limulus polyphemus*)			1.0					2.0
Rock crab (*Cancer* sp.)	1.0	1.0					1.0	
Spider crab (*Libinia* sp.)		1.0	2.0					
Lady crab (*Ovalipes ocellatus*)	1.0							

Sample Areas: LH – Lower Harbor (HW 1), UH – Upper Harbor (HW 2, HW 4), RH – Red Hook (HW 3), KVK – Kill Van Kull (HW 5), AK – Arthur Kill (HW 6-7)
NB – Newark Bay (HW 8, HW 9, HW 10), SB-C South Brooklyn Channel (SB 4), PJ-C Port Jersey Channel (PJ 4)

TABLE 4-21

Crab Dredge CPUE (number / 5-min tow) at Shoal / Interpier Stations
February 1999 – April 1999

Month	**February**	
Sample Area	**SB**	**PJ**
Number of Samples	**3**	**5**
Blue crab (*Callinectes sapidus*)	8.0	14.2
Horseshoe crab (*Limulus polyphemus*)		0.4
Mud crab (Xanthidae)		1.4
Spider crab (*Libinia* sp.)		0.2
Month	**March**	
Number of Samples	**3**	**5**
Blue crab (*Callinectes sapidus*)	9.0	13.4
Rock crab (*Cancer* sp.)	0.3	
Horseshoe crab (*Limulus polyphemus*)		1.0
Month	**April**	
Number of Samples	**3**	**5**
Blue crab (*Callinectes sapidus*)	6.7	5.6
Horseshoe crab (*Limulus polyphemus*)	0.3	0.4
Rock crab (*Cancer* sp.)	0.3	
Lady crab (*Ovalipes ocellatus*)		0.6

Sample Areas: SB – South Brooklyn (SB 1, SB 2, SB 3), PJ – Port Jersey (PJ 1, PJ 2, PJ 3, PJ 5, PJ 6)

TABLE 4-22 (page 1 of 3)

Estimated Bottom Trawl Crab CPUE (number / 10-min tow) at Channel Stations
October 1998 – September 1999

Sample Area	LH	UH	RH	KVK	AK	NB	SB-C	PJ-C
Month	**October**							
Number of Stations	1	2	1	1	2	1	1	1
Blue crab (*Callinectes sapidus*)		7.0		9.0	27.0	7.0	2.0	4.0
Green crab (*Carcinus maenus*)				4.0				
Lady crab (*Ovalipes ocellatus*)		4.0		10.0				
Rock crab (*Cancer* sp.)	5.0							
Spider crab (*Libinia* sp.)	4.0							
Month	**November**							
Number of Stations	0	0	0	0	0	0	1	1
Blue crab (*Callinectes sapidus*)								2.0
Month	**December**							
Number of Stations	1	2	1	1	2	1	1	1
Blue crab (*Callinectes sapidus*)					1.0	14.0		
Month	**January**							
Number of Stations	0	0	0	0	0	0	1	1
Blue crab (*Callinectes sapidus*)								5.0
Month	**February**							
Number of Stations	1	2	1	1	2	1	1	1
Blue crab (*Callinectes sapidus*)	1.0		2.0		0.5	1.0	1.0	
Green crab (*Carcinus maenus*)			5.0					
Mud crab (Xanthidae)			2.0					
Month	**March**							
Number of Samples	0	0	0	1	0	3	1	1
Blue crab (*Callinectes sapidus*)						6.0		3.0
Green crab (*Carcinus maenus*)						0.3		
Lady crab (*Ovalipes ocellatus*)				1.0				
Mud crab (Xanthidae)						0.7		
Rock crab (*Cancer* sp.)							1.0	2.0

TABLE 4-22 (page 2 of 3)

Estimated Bottom Trawl Crab CPUE (number / 10-min tow) at Channel Stations
October 1998 – September 1999

Sample Area	LH	UH	RH	KVK	AK	NB	SB-C	PJ-C
Month	**April**							
Number of Samples	1	2	1	1	2	3	1	1
Blue crab (*Callinectes sapidus*)		0.5	3.0		12.0	6.3	3.0	14.0
Green crab (*Carcinus maenus*)			20.0					
Horseshoe crab (*Limulus polyphemus*)	4.0						2.0	2.0
Lady crab (*Ovalipes ocellatus*)	12.0			1.0				
Mud crab (Xanthidae)				1.0				2.0
Rock crab (*Cancer* sp.)	40.0	4.5					1.0	
Spider crab (*Libinia* sp.)			6.0					
Month	**May**							
Number of Samples	0	0	0	0	0	0	1	1
Blue crab (*Callinectes sapidus*)							45.0	46.7
Horseshoe crab (*Limulus polyphemus*)							8.0	
Rock crab (*Cancer* sp.)							2.0	
Spider crab (*Libinia* sp.)							1.0	
Month	**June**							
Number of Samples	1	2	1	1	2	3	1	1
Blue crab (*Callinectes sapidus*)		5.0	73.0	13.0	290.5	123.3	39.0	2.0
Green crab (*Carcinus maenus*)			2.0					
Lady crab (*Ovalipes ocellatus*)		0.5		6.0				
Mud crab (Xanthidae)		13.5		12.0	NE	NE	NE	
Rock crab (*Cancer* sp.)	3.0	6.0	6.0	4.0	NE			
Spider crab (*Libinia* sp.)		3.0	1.0			NE		
Month	**July**							
Number of Samples	0	0	0	1	0	0	1	1
Blue crab (*Callinectes sapidus*)				34.0			24.0	3.0
Lady crab (*Ovalipes ocellatus*)				NE				
Rock crab (*Cancer* sp.)				NE				
Spider crab (*Libinia* sp.)							NE	

TABLE 4-22 (page 3 of 3)

Estimated Bottom Trawl Crab CPUE (number / 10-min tow) at Channel Stations
October 1998 – September 1999

Sample Area	LH	UH	RH	KVK	AK	NB	SB-C	PJ-C
Month	**August**							
Number of Samples	1	2	1	1	2	3	1	1
Blue crab (*Callinectes sapidus*)		19.5	4.0	14.0	18.0	19.0	1.0	2.0
Lady crab (*Ovalipes ocellatus*)	NE			NE				
Mud crab (Xanthidae)					NE	NE		
Spider crab (*Libinia* sp.)	NE	NE	NE					3.0
Month	**September**							
Number of Samples	0	0	0	1	0	0	1	1
Blue crab (*Callinectes sapidus*)				14.7			10.0	1.0

Note: NE – Not enumerated (presence noted).
Sample Areas: LH – Lower Harbor (HW 1), UH – Upper Harbor (HW 2, HW 4), RH – Red Hook (HW 3), KVK – Kill Van Kull (HW 5), AK – Arthur Kill (HW 6-7)
NB – Newark Bay (HW 8, HW 9, HW 10), SB-C South Brooklyn Channel (SB 4), PJ-C Port Jersey Channel (PJ 4)

TABLE 4-23 (page 1 of 2)

Estimated Bottom Trawl Crab CPUE (number / 10-min. tow) at Shoal/ Interpier Stations October 1998 – September 1999

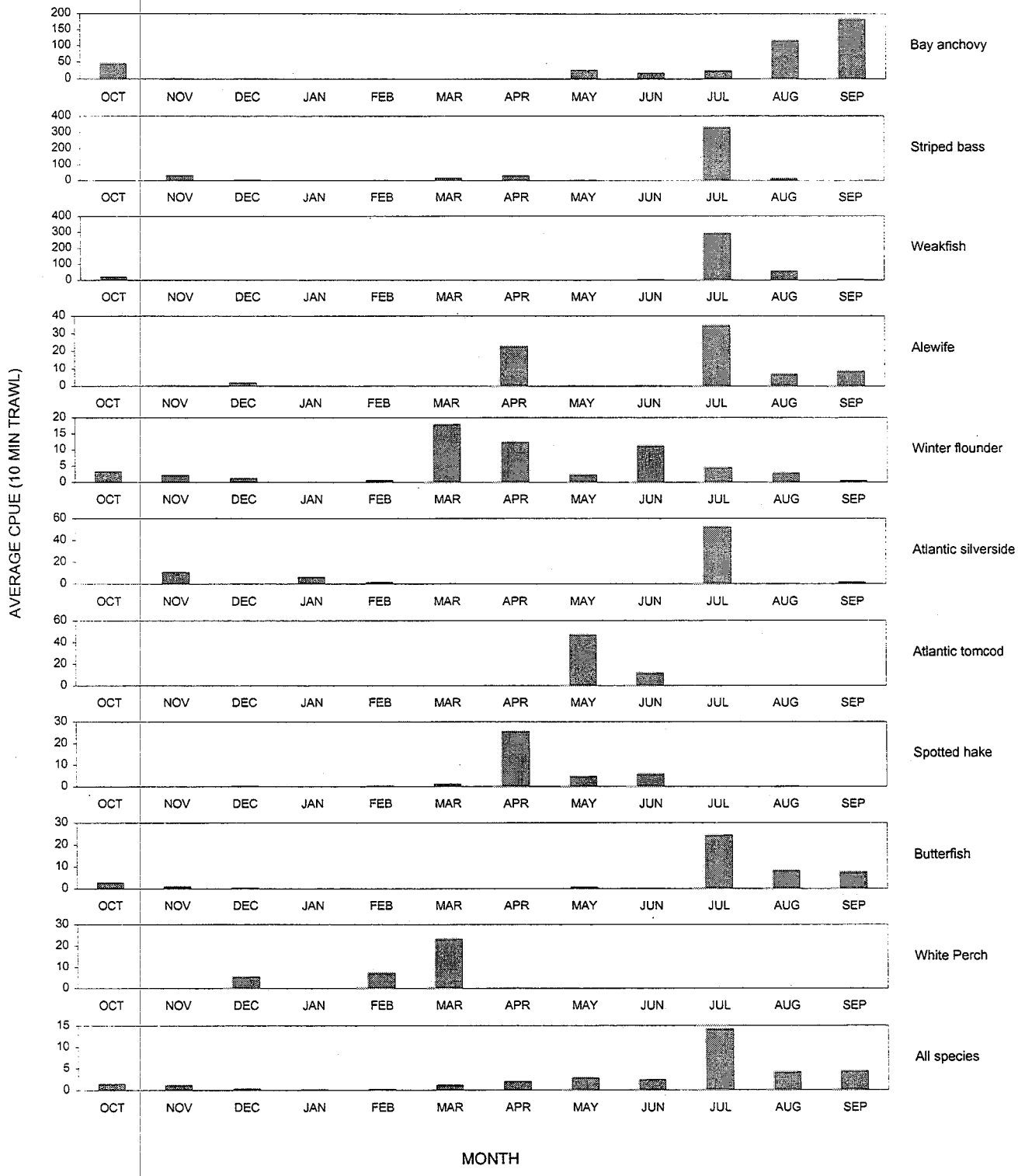
Month	**October**	
Sample Area	**SB**	**PJ**
Number of Samples	**3**	**4**
Blue crab (*Callinectes sapidus*)	24.9	24.3
Horseshoe crab (*Limulus polyphemus*)		0.4
Lady crab (*Ovalipes ocellatus*)		3.5
Mud crab (Xanthidae)	12.5	0.2
Spider crab (*Libinia* sp.)		1.7
Month	**November**	
Number of Samples	**3**	**4**
Blue crab (*Callinectes sapidus*)	42.2	12.2
Rock crab (*Cancer* sp.)		0.5
Month	**December**	
Number of Samples	**3**	**4**
Blue crab (*Callinectes sapidus*)	0.7	15.1
Green crab (*Carcinus maenus*)		0.2
Month	**January**	
Number of Samples	**3**	**4**
Blue crab (*Callinectes sapidus*)	4.4	6.6
Mud crab (Xanthidae)		1.1
Month	**February**	
Number of Samples	**3**	**5**
Blue crab (*Callinectes sapidus*)	9.1	8.7
Rock crab (*Cancer* sp.)	2.8	
Month	**March**	
Number of Samples	**3**	**5**
Blue crab (*Callinectes sapidus*)	7.8	3.9
Mud crab (Xanthidae)	4.0	
Spider crab (*Libinia* sp.)	1.0	
Month	**April**	
Number of Samples	**3**	**5**
Blue crab (*Callinectes sapidus*)	18.2	7.4
Horseshoe crab (*Limulus polyphemus*)	1.9	
Mud crab (Xanthidae)		2.6
Month	**May**	
Number of Samples	**3**	**5**
Blue crab (*Callinectes sapidus*)	32.7	52.1
Fiddler crab (*Uca* sp.)		1.5
Horseshoe crab (*Limulus polyphemus*)	1.7	0.3
Rock crab (*Cancer* sp.)		0.3
Spider crab (*Libinia* sp.)		1.0
Month	**June**	
Number of Samples	**3**	**5**
Blue crab (*Callinectes sapidus*)	18.8	79.9
Mud crab (Xanthidae)		NE
Spider crab (*Libinia* sp.)		1.0

TABLE 4-23 (page 2 of 2)

Estimated Bottom Trawl Crab CPUE (number / 10-min. tow) at Shoal/ Interpier Stations October 1998 – September 1999

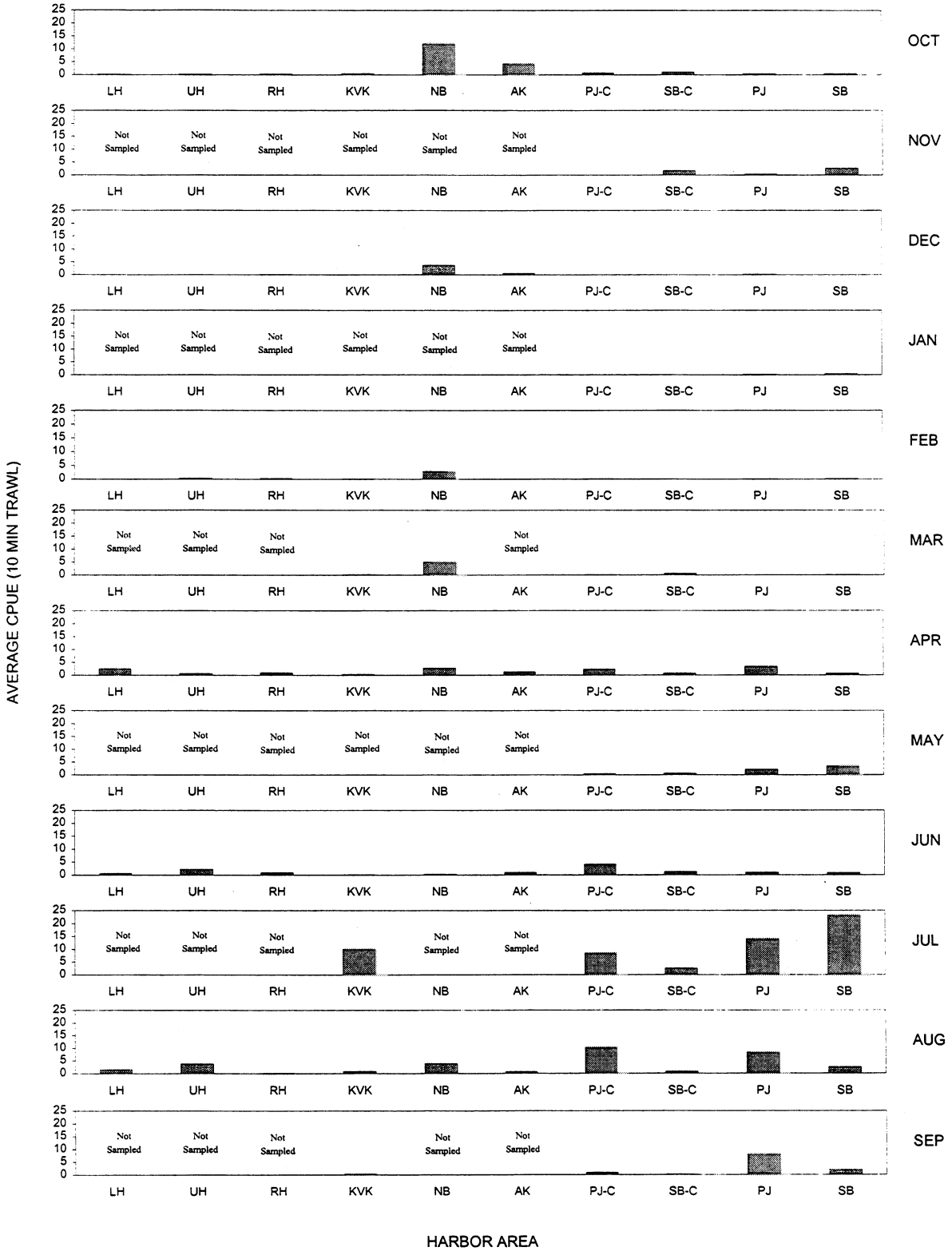
Month	**July**	
Number of Samples	3	5
Blue crab (*Callinectes sapidus*)	5.0	29.4
Mud crab (Xanthidae)		NE
Month	**August**	
Number of Samples	3	5
Blue crab (*Callinectes sapidus*)	8.9	6.6
Horseshoe crab (*Limulus polyphemus*)	1.0	
Lady crab (*Ovalipes ocellatus*)		NE
Spider crab (*Libinia* sp.)		NE
Month	**September**	
Number of Samples	3	5
Blue crab (*Callinectes sapidus*)	16.3	18.6
Mud crab (Xanthidae)		NE
Spider crab (*Libinia* sp.)	NE	

NE – Not enumerated (presence noted)
Sample Areas: SB – South Brooklyn (SB 1, SB 2, SB 3), PJ – Port Jersey (PJ 1, PJ 2, PJ 3, PJ 5, PJ 6)



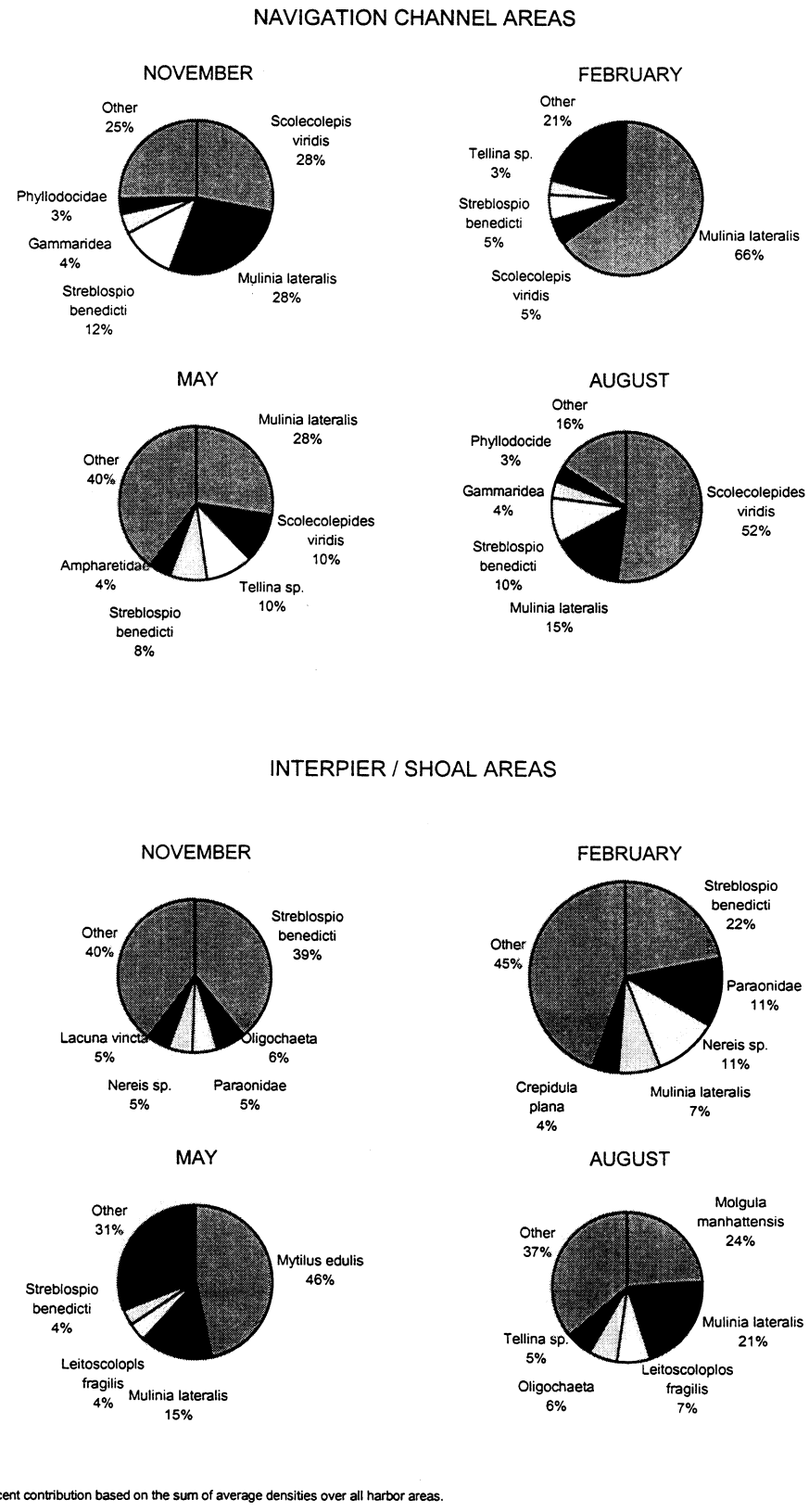
NOTES: Not all stations sampled each month, see sampling schedule for actual months and stations sampled.
All species includes all species collected.

Figure 4-1. Average bottom trawl CPUE (10 min. tow) of the 10 most dominant fish species October 1998 - September 1999



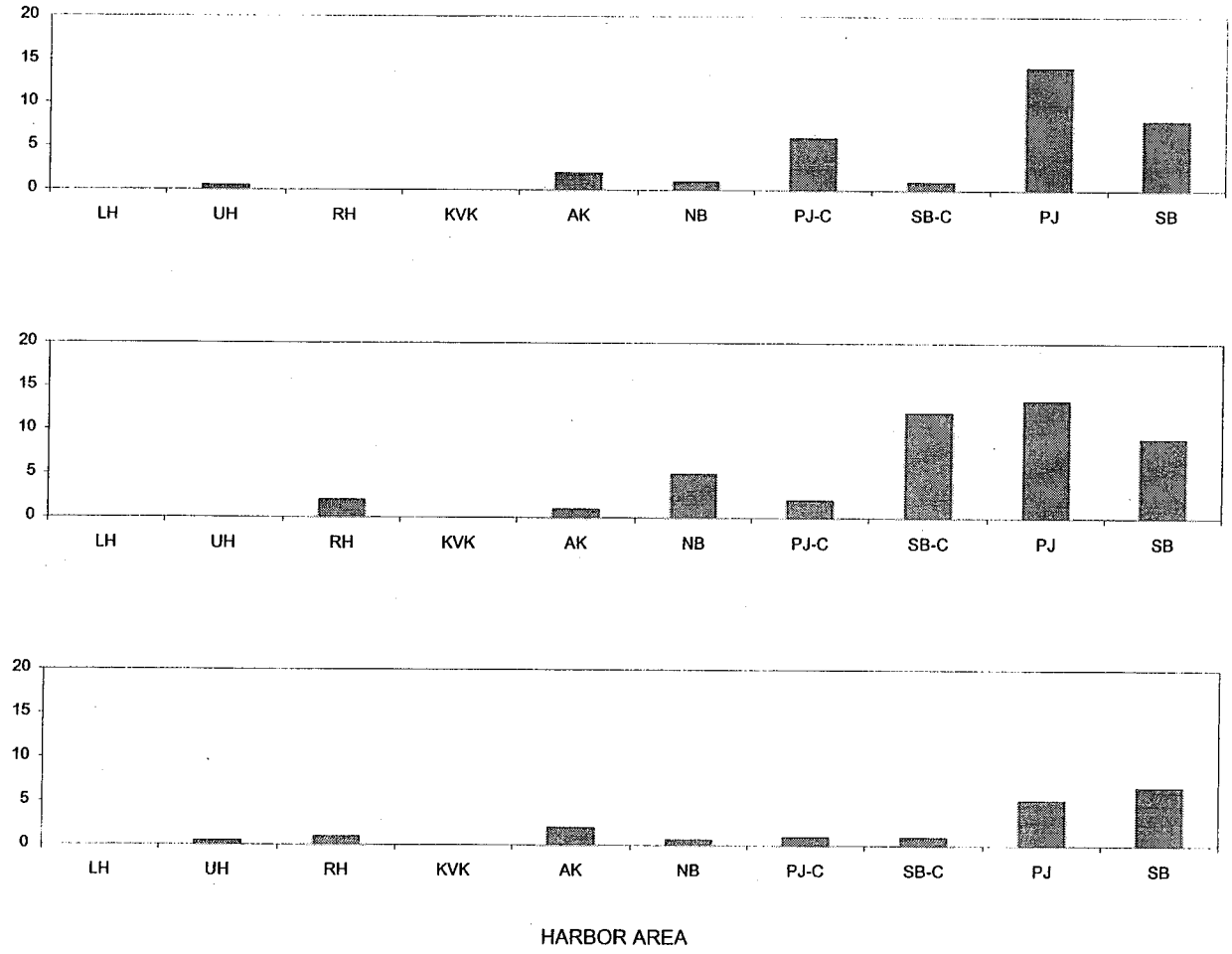
NOTE: Not Sampled - Not all stations sampled each month, see sampling schedule for actual months and stations sampled.
LH - Lower Harbor (HW 1), UH - Upper Harbor (HW 2,4), RH - Red Hook (HW 3) KVK - Kill Van Kull (HW 5), AK - Arthur Kill (HW 6-7),
NB - Newark Bay (HW 8-10), PJ-C Port Jersey Channel (PJ 4), SB-C South Brooklyn Channel (SB 4), PJ - Port Jersey (PJ 1-3, 5-6), SB - South Brooklyn (SB 1-3)

Figure 4-2. Average bottom trawl CPUE (10 min. tow) of all species combined, October 1998 - September 1999



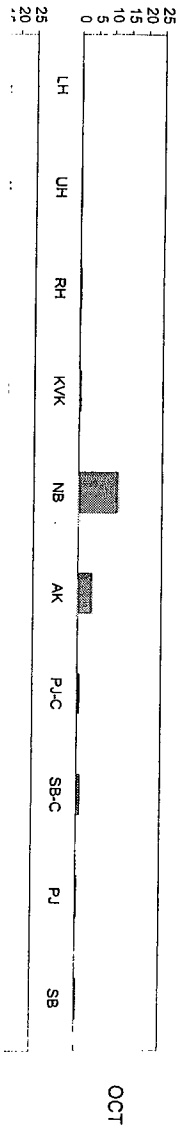
NOTE: Percent contribution based on the sum of average densities over all harbor areas.

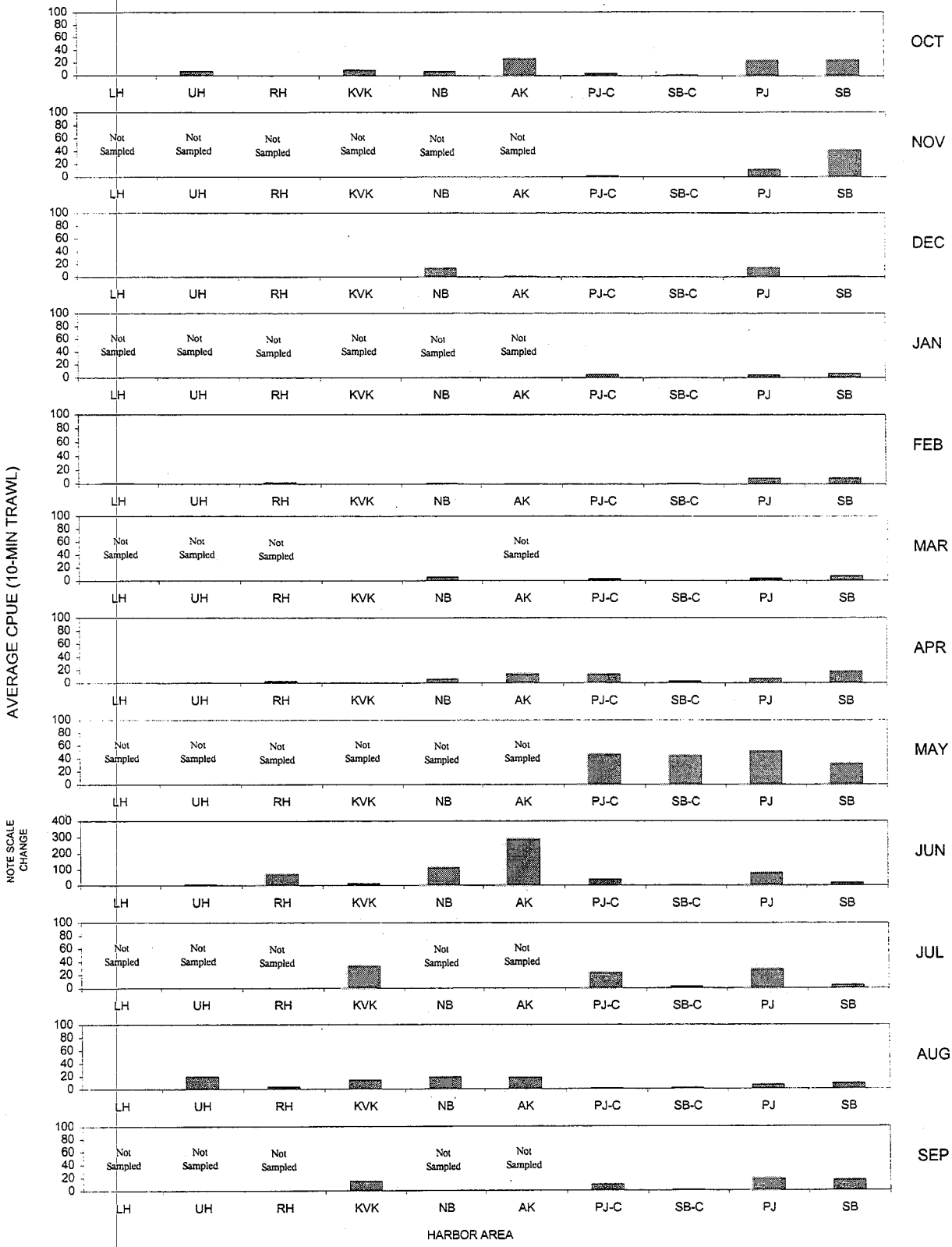
Figure 4-3. Percent contribution, based on average density, of benthic invertebrate species November 1998, February 1999, May, 1999 and August 1999



Area: LH - Lower Harbor (HW 1), UH - Upper Harbor (HW 2,4), RH - Red Hook (HW 3) KVK - Kill Van Kull (HW 5), AK - Arthur Kill (HW 6-7), SB-C South Brooklyn Channel (SB 4), Port Jersey Channel (PJ 4), SB - South Brooklyn (SB 1-3), Port Jersey (PJ 1-3, 5-6), NB - Newark Bay (HW 8-10)

Figure 4-4. Average crab dredge CPUE (no. / 5-min. tow) of blue crab, February - April 1999





NOTES: Not Sampled: Not all stations sampled each month, see sampling schedule for actual months and stations sampled.

STATIONS: LH - Lower Harbor (HW 1), UH - Upper Harbor (HW 2,4), RH - Red Hook (HW 3) KVK - Kill Van Kull (HW 5), AK - Arthur Kill (HW 6-7), SB-C South Brooklyn Channel (SB 4), Port Jersey Channel (PJ 4), SB - South Brooklyn (SB 1-3), Port Jersey (PJ 1-3, 5-6), NB - Newark Bay (HW 8-10)

Figure 4-5. Average bottom trawl CPUE (10-min. trawl) of blue crab, October 1998 - September 1999

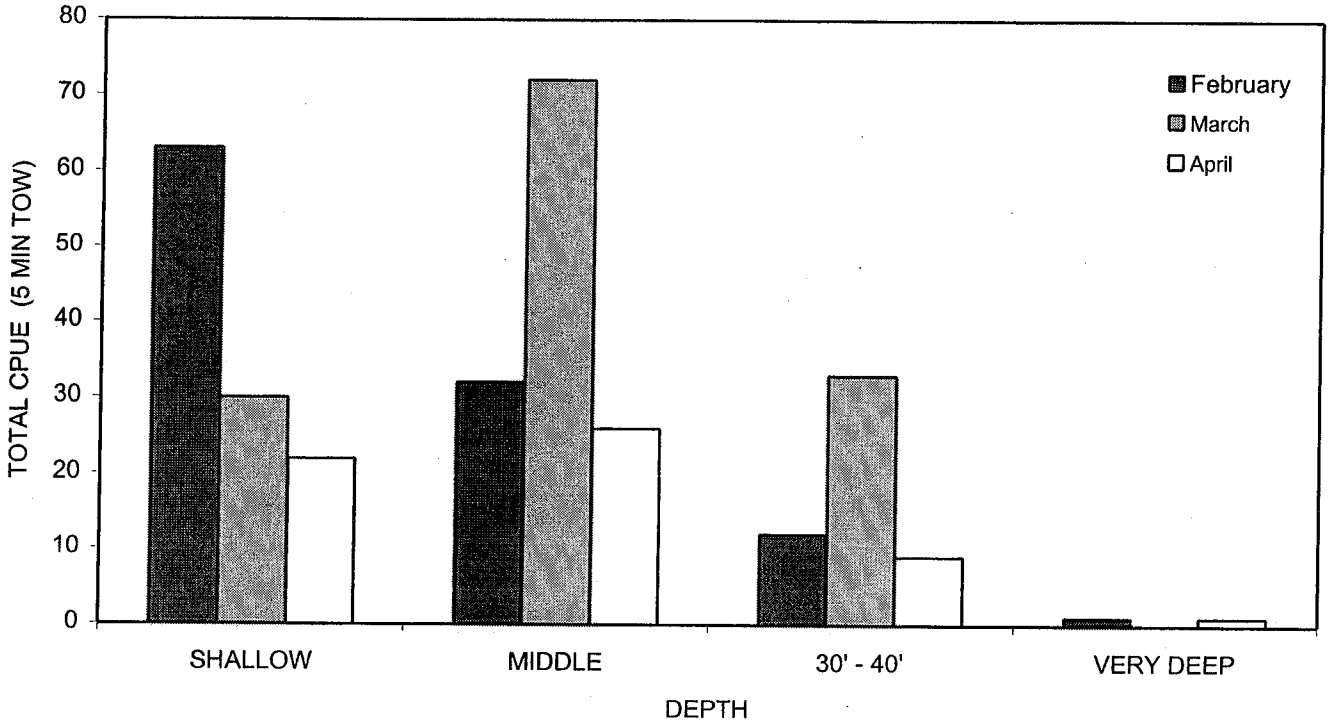


Figure 4-6. Total crab dredge CPUE (no. / 5-min. tow) of blue crab, February - April 1999

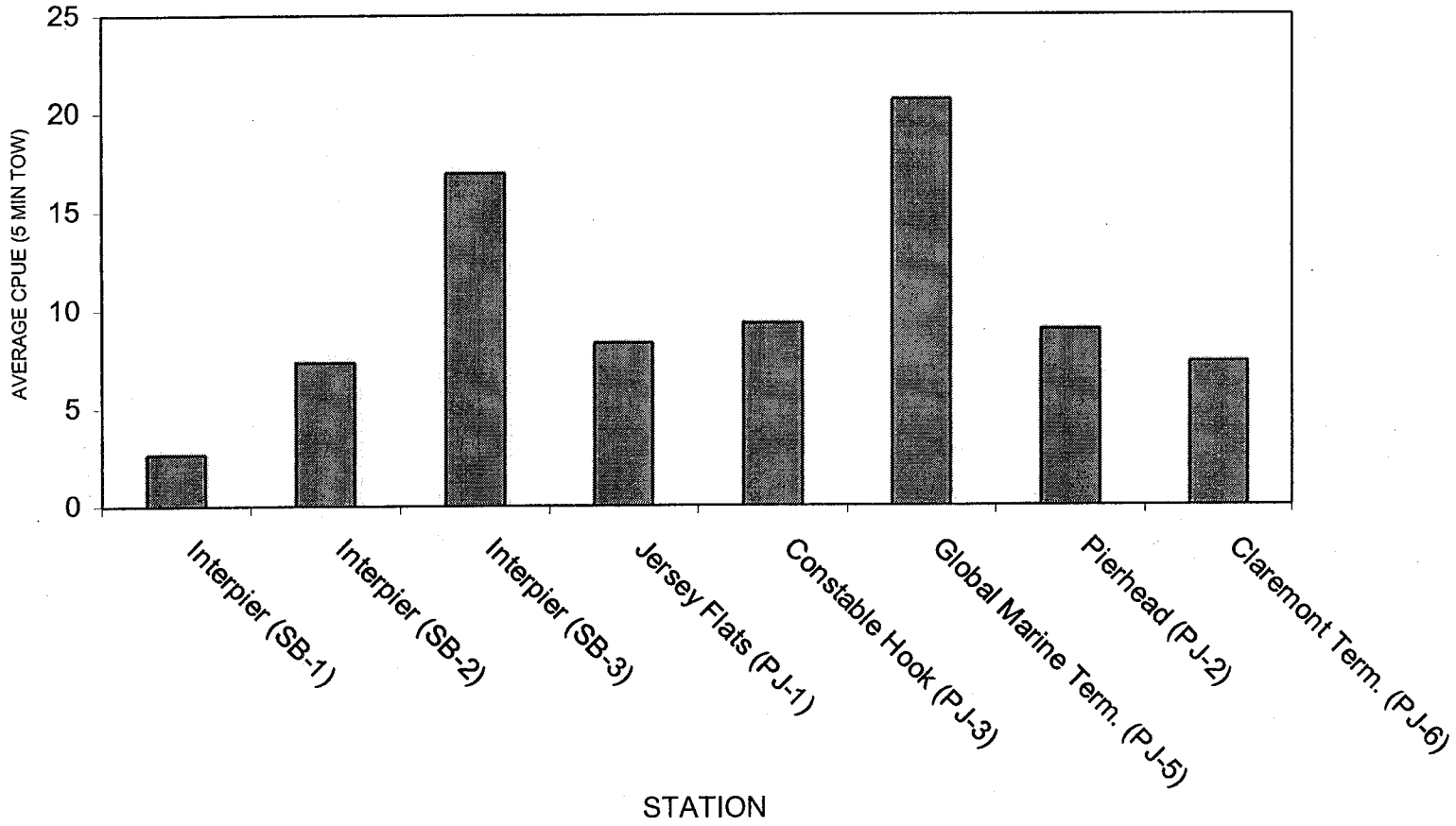


Figure 4-7. Average crab dredge CPUE (no. / 5-min tow) of blue crab at shoal and shallow depth stations February - April 1999

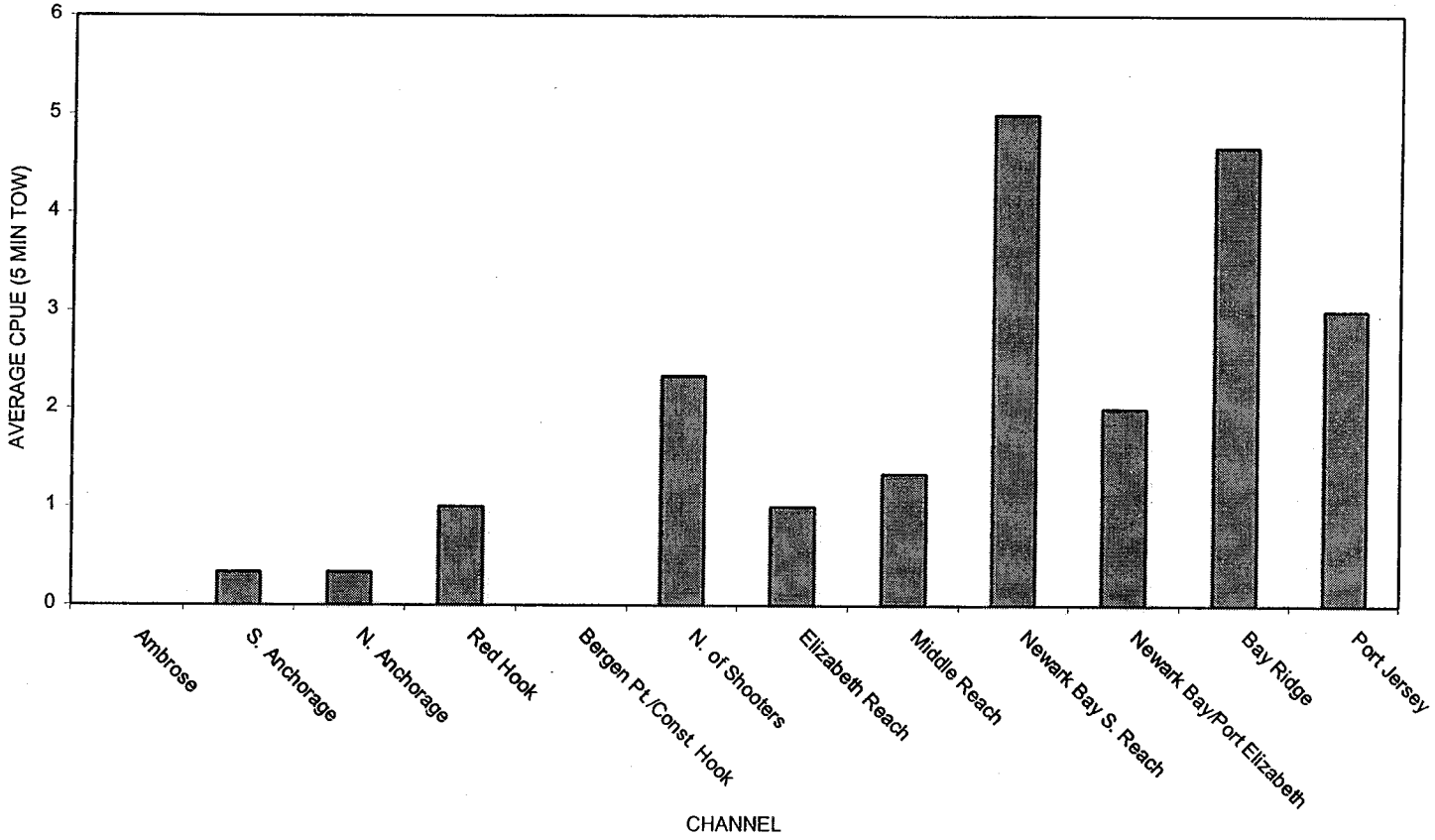


Figure 4-8. Average crab dredge CPUE (no. / 5-min. tow) of blue crab at channel stations February - April 1999

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FEIS APPENDIX B-1.3

CULTURAL RESOURCES

PROGRAMMATIC AGREEMENT
AMONG
THE U. S. ARMY CORPS OF ENGINEERS, NEW YORK DISTRICT,
THE NEW JERSEY STATE HISTORIC PRESERVATION OFFICER
AND
THE NEW YORK STATE HISTORIC PRESERVATION OFFICER
REGARDING
NEW YORK AND NEW JERSEY HARBOR NAVIGATION STUDY
KINGS, QUEENS AND RICHMOND COUNTIES, NEW YORK
ESSEX, HUDSON, MONMOUTH AND UNION COUNTIES, NEW JERSEY

WHEREAS, the U.S. Army Corps of Engineers, New York District, (New York District), has been authorized to conduct a feasibility study to evaluate the federal participation in navigation improvements in New York and New Jersey Harbor (Harbor). The New York and New Jersey Harbor Navigation Project (Project), authorized by Section 435 of the Water Resources Development Act of 1996, addresses improvements, including deepening of existing channels to 50 feet or greater, to provide economically efficient and environmentally sound navigation to meet current and future requirements;

WHEREAS, the National Economic Development Plan provides for navigation improvements to nine channels in the Harbor, which will permit access by larger, deeper-draft vessels to four main container terminals. Navigation improvements consist of channel deepening, widening and realignment. Selected for improvement are the Ambrose, Anchorage, Port Jersey, Kill Van Kull, Arthur Kill (to Howland Hook), Newark Bay, Elizabeth, South Elizabeth, and Bay Ridge Navigation Channels;

WHEREAS, the New York District has defined the "Area of Potential Effect" for this undertaking to include all areas within and adjacent to the Ambrose, Anchorage, Port Jersey, Kill Van Kull, Arthur Kill (to Howland Hook), Newark Bay, Elizabeth, South Elizabeth, and Bay Ridge Navigation Channels (Appendix 1). In locations where blasting will be undertaken the APE will also encompass nearshore and on-shore areas within zones anticipated to experience a certain force from the blast;

WHEREAS, the New York District has determined that properties listed and/or eligible for listing on the National Register of Historic Places (National Register) may be adversely affected by implementation of the Project;

WHEREAS, the New York District is applying the National Register Criteria (Criteria) to properties identified within the "Area of Potential Effect" on a phased basis, and to date has completed initial geomorphological and archaeological surveys in the Ambrose, Anchorage, Kill Van Kull, Arthur Kill, Newark Bay, Elizabeth, Port Jersey, Bay Ridge Channels;

WHEREAS, the New York District has identified locations within and adjacent to the Anchorage, Kill Van Kull, Newark Bay and Bay Ridge Channels and the Jersey Flats at

Port Jersey to be sensitive locations for prehistoric materials but has acknowledged that traditional archaeological techniques are not feasible for use in submerged areas;

WHEREAS, additional data is required to make an assessment of geomorphological and archaeological sensitivity in the Ambrose Channel;

WHEREAS, the New York District has identified National Register eligible vessels and structures in the nearshore area of the Arthur Kill, Kill Van Kull and Bay Ridge through the New York District's Collection and Removal of Drift Project. Signed MOAs are available for Shooters Island in the Arthur Kill, and for nearshore resources along the Brooklyn, NY waterfront on the Bay Ridge Channel, and for certain nearshore resources along the Bayonne, NJ shoreline on the Kill Van Kull and Newark Bay Channels. A draft MOA has been coordinated for nearshore resources along the Kill Van Kull. An amended MOA has been coordinated to include additional nearshore resources along the Bayonne shore of the Kill Van Kull and the Newark Bay shoreline. The stipulations contained in the existing MOAs will be implemented for any individual resources that will be impacted by this Project;

WHEREAS, the New York District, in consultation with the NJSHPO and NYSHPO has determined that there are no submerged historic period resources within the existing navigation channels;

WHEREAS, the New York District, in consultation with the appropriate State Historic Preservation Office (SHPO), will identify and develop treatment plans for any cultural resources that are identified and determined to be significant. These treatment plans, once implemented, will ensure that project plans will not adversely affect these properties;

WHEREAS, the New York District has identified several interested parties to participate in the Section 106 consultation process and project planning, to include the New York City Landmarks Preservation Commission, New Jersey Historical Society and other local municipalities, historical societies and organizations (Appendix 2);

WHEREAS the New York District is coordinating, and shall continue to coordinate a public outreach program for this undertaking which in the past has consisted of a number of public meetings and the circulation of cultural resource and environmental documents related to the Section 106 review process;

WHEREAS, the New York District shall continue to consult with appropriate SHPO(s) regarding plans and surveys to identify, evaluate and treat historic properties as the New York District and its agents implement all phases of the Project;

WHEREAS, the New York District shall provide the appropriate SHPO(s) all plans and reports, including but not limited to all comments, notifications, and scope of works by certified mail; and

NOW, THEREFORE, the New York District, the Council, NJSHPO and the NYSHPO agree that the Project shall be administered in accordance with the following stipulations to satisfy the New York District's Section 106 and Abandoned Shipwreck Act of 1987 (Appendix 3) responsibilities for all individual undertaking of the Project.

Stipulations

The New York District shall ensure that the following measures are carried out:

I. IDENTIFICATION AND EVALUATION

A. The New York District shall conduct remote sensing surveys along the channel edge of the Ambrose, Anchorage, Kill Van Kull, Arthur Kill and Newark Bay Channels and in area of proposed channel realignment at the Jersey Flats to identify potential shipwrecks or submerged historic resources.

B. The New York District shall conduct a cultural resource evaluation for both prehistoric and historic resources within and adjacent to the South Elizabeth Channel.

C. The New York District shall conduct architectural surveys within areas anticipated to experience a force of 0.5 peak particle velocity or greater where blasting is proposed along the Kill Van Kull, Arthur Kill, Bay Ridge and Newark Bay shorelines.

D. The New York District shall consult with the appropriate SHPO(s) to develop plans to complete the identification of historic properties within the remaining portion of the Project's Area of Potential Effect. The appropriate SHPO(s) will provide comments on the scope of work and final Plans within 30 days of receipt.

E. The New York District shall revise Plans to address comments and recommendations provided by the appropriate SHPO(s) prior to proceeding with identification and evaluation activities.

F. The New York District shall ensure that qualified professionals meeting the National Park Service professional qualifications for the appropriate discipline [National Park Service Professional Qualification Standards, Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44738-39)] are used to complete all identification and evaluation plans related to this undertaking, to include archaeological surveys and testing, historic structure inventories, and documentation.

G. The New York District and the appropriate SHPO(s) shall consider the views of the public or interested parties in completing its identification and evaluation responsibilities.

H. The New York District shall maintain records of all decisions it makes related to the National Register eligibility of properties.

II. TREATMENT OF HISTORIC PROPERTIES.

The New York District shall adhere to the following treatment strategies in order to avoid adverse effect to historic properties.

A. The New York District shall excavate a limited number of borings in locations determined by a qualified geomorphologist within or adjacent to the Ambrose, Anchorage, Kill Van Kull, Arthur Kill, Newark Bay, South Elizabeth and Bay Ridge Channels as well as in the Jersey Flats at Port Jersey. These sediments will be subject to foraminifera, pollen and Carbon-14 analysis. The results of this work will be incorporated into a sensitivity model of now inundated former prehistoric occupation areas. This work will be entered into a Geographic Information System (GIS) compatible with other GIS data developed for the Project.

B. The New York District shall notify appropriate institutions and organizations of the availability of the prehistoric sensitivity model on GIS. A list of appropriate institutions and organizations will be developed by the New York District and will be submitted to the SHPO(s) for review. If the New York District does not receive a response from the SHPO(s) within 45 days of receipt the New York District will notify availability to the institutions and organizations on the list submitted for review.

C. The New York District, in consultation with the SHPO, shall develop appropriate treatment plans for historic properties identified within the unsurveyed portion of the Area of Potential Effect which may be affected by the Project. Unless the SHPO objects within 30 days of receipt of any plan, the New York District shall ensure that treatment plans are implemented by the New York District or its representative(s). The New York District shall revise Plans to address comments and recommendations provided by the SHPO.

D. The New York District shall ensure that qualified professionals meeting the National Park Service professional qualifications for the appropriate discipline [National Park Service Professional Qualification Standards, Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44738-39)] are used to develop and implement all treatment plan.

E. Avoidance. The preferred treatment is avoidance of effects to historic properties. The New York District shall, to the extent feasible, avoid historic properties either through project design changes. The New York District, and the SHPO shall consult to develop plans for avoiding impacts to historic properties. The New York District shall incorporate feasible avoidance measures into project activities as part of the implementation of the Project. If, in consultation with the SHPO, avoidance is

determined to be infeasible, the New York District shall develop and implement treatment/mitigation plans.

III. RESOLUTION OF ADVERSE EFFECTS

A. When the New York District, in consultation with the SHPO, determines that Project related activities would have an adverse effect, the New York District shall:

1. Develop a Standard Mitigation Agreement (SMA) with the SHPO; or

2. Consult with the Council to develop a Memorandum of Agreement (MOA) in accordance with 36 CFR Part 800.6 (c).

B. The New York District shall invite the Council to participate in consultation when:

1. The New York District and SHPO determine that an agreement or a SMA cannot be reached;

2. a National Historic Landmark is involved;

3. human remains have been identified; or

4. there is widespread public interest in a historic property or properties.

C. The New York District and the SHPO, and interested parties as appropriate, shall consult to develop alternatives to mitigate or minimize adverse effects. The analysis of alternatives shall consider program needs, cost, public benefit and values, and design feasibility.

D. Development of Standard Mitigation Agreements (SMA).

1. The New York District, in consultation with the SHPO and interested parties, as appropriate, shall develop SMAs for historic properties which will be adversely affected by the Project. The New York District shall submit the SMA to the SHPO for review and approval by certified mail. The SHPO shall have 30 days from receipt of adequate information in which to review and comment on the SMA(s) . If the SHPO fails to respond within 30 days, or if there is disagreement, the New York District shall notify the Council and consult to develop the propose SMA into an MOA and submit copies of background information and the proposed SMA to facilitate consultation to develop an MOA in accordance with 36 CFR Part 800.

2. After signing by the New York District and SHPO, the New York District shall file all SMAs with the Council.

E. Standard Mitigation Agreements (SMA)

1. SMAs developed between the New York District and the SHPO, may include one or more of the following stipulations which address routine adverse effects that may occur to historic properties as a result of project implementation.

2. Recordation. The New York District shall consult with the SHPO or Historic American Building Survey/Historic American Engineering Record (HABS/HAER) to determine the appropriate level and type of recordation for affected resources. For historic properties with state and/or local significance, recordation shall be consistent with the requirements and standards of the Department of the Interior (October 1997).

All documentation must be submitted to SHPO and HABS/HAER for acceptance, prior to the initiation of project activities, unless otherwise agreed to by the SHPO or NPS.

3. Salvage and Donation of Significant Structural Elements. Prior to removal, partial removal, or substantial alteration of historic properties, the New York District, in consultation with the SHPO, shall develop a salvage and donation plan to identify appropriate parties willing and capable of receiving and preserving the salvaged significant structural elements. The New York District shall submit the plans to the SHPO for review and approval.

4. Data recovery for archaeological sites eligible under Criterion D and others and data recovery and treatment of archaeological sites where data recovery will not result in a finding of no adverse effect. The New York District shall conduct data recovery on archaeological sites following agreement on the perspective data recovery and treatment plans between the New York District and the SHPO when the archaeological sites are eligible for National Register inclusion under additional Criteria than Criterion D (for the information which they contain) or when the full informational value of the site cannot be substantially preserved through the conduct of appropriate research to professional standards and guidelines. To the maximum extent feasible, data recovery and treatment plans shall be developed to take into account and mitigate for the fullest range of archaeological site values and significance. Prior to construction, the New York District shall develop a data recovery plan for archaeological sites eligible under Criterion D and others. The New York District shall submit the plans to the SHPO for review and approval.

5. A blast plan will be developed in coordination with the appropriate SHPO in areas where blasting is proposed. This plan will include provisions to limit vibrations experienced at historic properties resulting from any proposed blasting and will include a pre-blast and pot-blast monitoring plan.

IV. UNATICIPATED DISCOVERY

A. If previously unidentified properties are discovered during Project implementation, the New York District shall cease all work in the vicinity of the discovered historic property until it can be evaluated pursuant to the guidelines in Stipulation I of this MOA. If the property is determined to be eligible, the New York District shall consult with the SHPO to develop a treatment plan or SMA in accordance with Stipulations II and III of this MOA.

B. The New York District shall implement the treatment or SMA once approved by the SHPO.

V. COORDINATION OF REVIEWS FOR PROJECT ACTIVITIES

A. All plans, documents, reports, and materials shall be submitted by the New York District (or its representative) to the appropriate SHPO(s) by certified mail, for a 30 day review period unless otherwise stipulated in this MOA. If the SHPO(s) fails to comment within the specified time, the New York District must request the Council's comments

unless the MOA provides for the New York District to assume the SHPO's concurrence when the 30-day review period has elapsed.

B. When interested parties are participating in the review of activities or actions outlined in this MOA the New York District shall ensure that all interested parties are provided documentation at the time it is forwarded to the SHPO and afforded a 30 day review period. As appropriate, the New York District shall submit the comments of interested parties to the SHPO to facilitate further consultation.

C. If after consulting with the SHPO and interested parties for a period of 90 days on any action or activity provided for in this MOA, the New York District or SHPO concludes there is no progress in developing treatment/mitigation plan or other documents required by this MOA, the New York District or SHPO may notify the Council and request the Council's involvement to expedite completion of the consultation process.

D. The New York District shall ensure that all submissions to the SHPO, interested parties, and the Council include all relevant information to facilitate their review. The New York District shall provide all additional information requested by SHPO, interested parties, or Council within a timely manner unless the signatories to this MOA agree otherwise.

E. The New York District shall ensure that all draft and final reports resulting from actions pursuant to the Stipulations of this MOA will be provided to the SHPO, and upon request, to other interested parties and will identify the Principal Investigator responsible for the report. All reports will be responsive to contemporary standards, and as appropriate to the Department of the Interior's Format Standards for Final Reports of Data Recovery Programs (42 FR 5377-79) and HPO report standards. Precise locational data may be provided only in a separate appendix if it appears that its release could jeopardize archaeological sites consistent with National Register Bulletin Number 29, Guidelines for Restricting Information about Historic and Prehistoric Resources.

G. If the District proposes revisions or addenda to SHPO approved treatment/ mitigation plans or other documents, the New York District and SHPO shall consult to determine whether additional conditions or mitigation measures are appropriate.

H. The New York District shall certify in writing that all requirements for identification and evaluation, and the implementation of treatment/mitigation plans have been satisfactorily completed prior to the initiation of construction activities for a specified portion of the Project. The New York District shall submit a copy of this certification to the SHPO by certified mail. The SHPO shall have 30 days to object to the certification based on the SHPO's finding of incomplete compliance or inadequate compliance with the terms of this MOA. If the SHPO does not object, the District may proceed with construction for the specified segment of the Project.

VI. DISPUTE RESOLUTION

A. The SHPO shall have 30 days to object to determinations, evaluations, plans, and documents submitted by the New York District . The New York District and SHPO shall attempt to resolve any disagreement arising from implementation of this MOA. If there is a determination that the disagreement cannot be resolved, the New York District shall request the Council's recommendations or request the comments of the Council in accordance with 36 CFR Part 800.6(b).

B. Any Council recommendations or comments provided in response will be considered in accordance with 36 CFR Part 800.6(c)(2), with reference only to the subject of the dispute. The New York District shall respond to Council recommendations or comments indicating how the New York District has taken the Council's recommendations or comments into account and complied with same prior to proceeding with Project activities that are subject to dispute. Responsibility to carry out all other actions under this MOA that are not the subject of the dispute will remain unchanged.

VII. PUBLIC INVOLVEMENT

A. In consultation with the SHPO, the New York District shall develop a plan to inform the interested public of the existence of this Agreement, and the New York District plan for meeting the terms of this MOA. Copies of this Agreement and relevant documentation prepared pursuant to the terms of this MOA shall be made available for public inspection (information regarding the locations of archaeological sites will be withheld in accordance with the Freedom of Information Act and National Register Bulletin 29, if it appears that this information could jeopardize archaeological sites). Any comments received from the public under this Agreement shall be taken into account by the New York District.

B. Public Objections. The New York District shall review and resolve timely substantive public objections. Public objections shall be considered timely when they are provided within the review periods specified in Appendix 4 of this MOA public participation plan specified. The New York District shall consult with the SHPO, and as appropriate with the Council, to resolve objections. Project actions which are not the subject of the objection may proceed while the consultation is conducted.

VIII. MONITORING

A. Upon execution of the Project Cooperation Agreement, the New York District shall prepare annual reports summarizing the status of compliance with the terms of this MOA and a summary of the completed activities and the exempt activities for the past year and proposed activities for the next fiscal year to the SHPO, Council, and interested parties by the New York District. Reports shall be submitted by January 31 of every year. The Annual Reports shall be provided to Council, SHPO, and interested parties until the Project-related activities are complete.

B. The Council and the SHPO may request a site visit to follow up information in the annual Report or to monitor activities carried out pursuant to this MOA. The Council and

the SHPO shall provide the New York District with 30 days written notice when requesting a site visit unless otherwise agreed. The New York District may also schedule a site visit with the SHPO and the Council at its discretion.

IX. AMENDMENTS

Any signatory to this MOA may request that it be amended, whereupon all the parties will consult in accordance with 36 CFR Part 800.6(b)(7) to consider such amendment.

X. TERMINATION

Any signatory to this MOA may terminate it by providing thirty days notice to the other parties, provided that the parties will consult during the period prior to termination by certified mail to seek agreement on amendments or other actions that would avoid termination.

XI. SUNSET CLAUSE.

This MOA will continue in full force and effect until the construction of the Project is complete and all terms of this MOA are met, unless the Project is terminated or authorization is rescinded.

Execution and implementation of this MOA evidences that the New York District has satisfied its Section 106 responsibilities for all individual undertakings of the Project, and that the New York District has afforded the Council and the SHPO an opportunity to comment on the undertaking and its effects on historic properties.

NEW JERSEY STATE HISTORIC PRESERVATION OFFICE

By: _____ Date: _____
Dorothy P. Guzzo, Deputy State Historic Preservation Officer

NEW YORK STATE HISTORIC PRESERVATION OFFICE

By: _____ Date: _____
Bernadette Castro, State Historic Preservation Officer

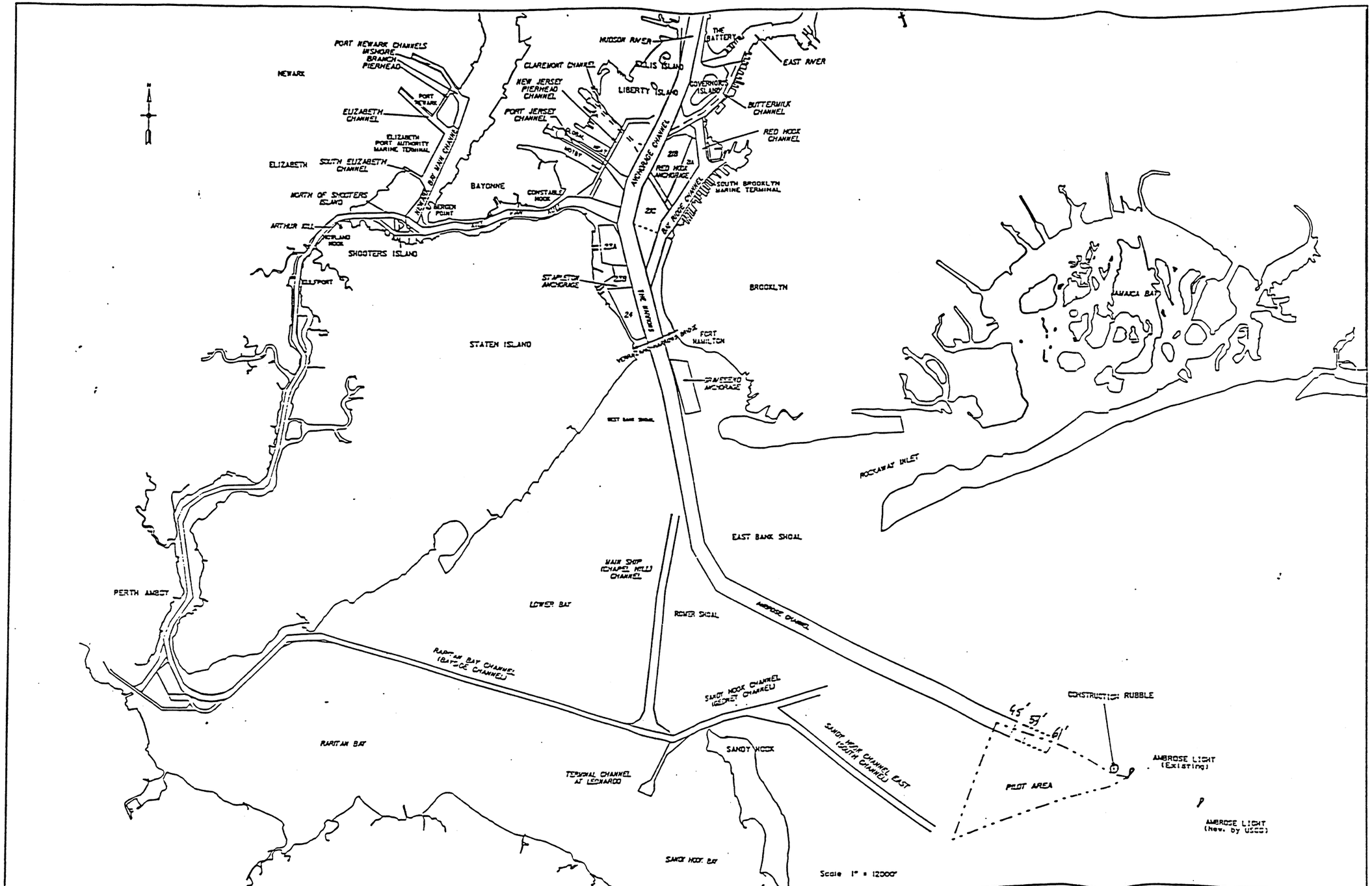
U.S. ARMY CORPS OF ENGINEERS

By: _____ Date: _____
William H. Pearce
District Engineer, New York District

Appendix 1. Area of Potential Effect

Appendix 2. Public Coordination for the Harbor Navigation Study

Appendix 3. Abandoned Shipwreck Act of 1987



U. S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
NEW YORK, NEW YORK

NEW YORK AND NEW JERSEY HARBOR
NAVIGATION STUDY
CHANNEL DESIGN APPENDIX

FIGURE 1
EXISTING NAVIGATION CHANNELS
NEW YORK HARBOR

FIG. 1

APPENDIX 2
Public Coordination for the Harbor Navigation Study

A series of public meetings were held in May and June of 1998 which provided a forum for public discussion of cultural resources. Poster boards explaining various facets of the Harbor Navigation Project and the National Environmental Policy Act (NEPA) review process were on display. A poster board which discussed the potential for prehistoric and historic cultural resources and the Section 106 process was included at each session. The USACE project archaeologist was available to discuss any issues or answer any questions from the public.

Letters were sent in October 1998 to over 20 state and local historical, maritime and archaeological societies and museums as well as municipal historical commissions notifying them of the Harbor Navigation Project. Seven organizations responded and indicated their interest in being included in the Section 106 process as interested parties. Letters were later sent as part of a NEPA required mailing to notify the interested parties of the availability of the Draft EIS. Further coordination with the interested parties will be undertaken as the project proceeds.

Ms. Susan P. Coen, Director
Union County Office of Cultural and Heritage Affairs
24-52 Rahway Avenue, 4th Floor
Elizabeth, N.J. 07202

Newark Landmarks and Historic Preservation Commission
Harry Hines, City Planning Officer
55 Liberty Street
Newark, NJ 07102

Dr. Hermalyn
Bronx County Historical Society
3309 Bainbridge Avenue
Bronx, N.Y 10467

Diane Dallal, President
Professional Archaeologists of New York City
c/o New York Unearthed
17 State Street
New York, N.Y. 10004

Lee Ellen Griffith, Executive Director
Monmouth County Historical Association
70 Court Street
Freehold, New Jersey 07728

Director
Bayonne Historical Society
P.O. Box 3034
Bayonne, New Jersey 07002-0297

Ms. Bierce Riley, President
Roebling Chapter
Society for Industrial Archaeology
19 Budd Street
Morristown, New Jersey 07960

New York Historical Society
Stewart Desmond
Director of Public Affairs
2 West 77th Street
New York, N.Y. 10024

Director
Union County Historical Society
P.O. Box 241
Elizabeth, New Jersey 07207

Union County Office - Cultural and Historic Affairs
c/o William Higginson
633 Pearl Street
Elizabeth, New Jersey 07202

Ms. Anna Aschkenes, Executive Director
Middlesex County Cultural and Heritage Commission
841 Georges Road
North Brunswick, New Jersey 08902

Catherine Abrams, Curator
Queens Historical Society
143-35 37th Avenue
Flushing, N.Y 11354

Mr. Richard Heaps, Director
Brooklyn Historical Society
128 Pierrepont Street
Brooklyn, N.Y 11201

Norman Brouwer
Ships Historian and Librarian
South Street Seaport Museum
207 Front Street
New York, New York 10038

Gail Hunton
Principal Historic Preservation Specialist,
Monmouth County Parks System
805 Newman Springs Road
Lincroft, New Jersey 07738-1695

Mr. Charles Bello
President
Archaeological Society of New Jersey
19 Ledge Street
Pipersville, PA 18947

Jersey City Historic Preservation Commission
Charles Balcer, Senior Planner
30 Montgomery Street
Jersey City, NJ 07302

Middlesex County Cultural & Heritage Commission
841 Georges Road
North Brunswick, New Jersey 08902

Union County Office of Cultural & Heritage Affairs
633 Pearl Street
Elizabeth, New Jersey 07202

Paul Kuchynskas
445 State Street
Brooklyn, N.Y 11217

Friends of Liberty State Park
c/o Sam Pesin, President
P.O. Box 3407
Jersey City, New Jersey 07303-3407

New Jersey Marine Educator Association
c/o Warren Marcioni, President
85 Brookside Drive
Caldwell, New Jersey 07006

Twin Lights Historical Society
c/o Richard Scheuing
Lighthouse Road
Highlands, New Jersey 07732

New Jersey Coastal Heritage Trail
c/o Janet Wolf, Project Director
P.O. Box 568
Newport, New Jersey 08345

Director
Preservation New Jersey
The Proprietary House
149 Kearny Avenue, 2nd Floor
Perth Amboy, New Jersey 08861-4700

APPENDIX 3

Public Law 100-298
100th Congress

An Act

Apr. 28, 1988
[S. 858]

To establish the title of States in certain abandoned shipwrecks, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Abandoned Shipwreck Act of 1987. Maritime affairs. 43 USC 2101 note.

SECTION 1. SHORT TITLE.

This Act may be cited as the "Abandoned Shipwreck Act of 1987".

43 USC 2101.

SEC. 2. FINDINGS.

The Congress finds that—

(a) States have the responsibility for management of a broad range of living and nonliving resources in State waters and submerged lands; and

(b) included in the range of resources are certain abandoned shipwrecks, which have been deserted and to which the owner has relinquished ownership rights with no retention.

43 USC 2102.

SEC. 3. DEFINITIONS.

For purposes of this Act—

(a) the term "embedded" means firmly affixed in the submerged lands or in coralline formations such that the use of tools of excavation is required in order to move the bottom sediments to gain access to the shipwreck, its cargo, and any part thereof;

(b) the term "National Register" means the National Register of Historic Places maintained by the Secretary of the Interior under section 101 of the National Historic Preservation Act (16 U.S.C. 470a);

(c) the terms "public lands", "Indian lands", and "Indian tribe" have the same meaning given the terms in the Archaeological Resource Protection Act of 1979 (16 U.S.C. 470aa-470ll);

(d) the term "shipwreck" means a vessel or wreck, its cargo, and other contents;

(e) the term "State" means a State of the United States, the District of Columbia, Puerto Rico, Guam, the Virgin Islands, American Samoa, and the Northern Mariana Islands; and

(f) the term "submerged lands" means the lands—

(1) that are "lands beneath navigable waters," as defined in section 2 of the Submerged Lands Act (43 U.S.C. 1301);

(2) of Puerto Rico, as described in section 8 of the Act of March 2, 1917, as amended (48 U.S.C. 749);

(3) of Guam, the Virgin Islands and American Samoa, as described in section 1 of Public Law 93-435 (48 U.S.C. 1705); and

(4) of the Commonwealth of the Northern Mariana Islands, as described in section 801 of Public Law 94-241 (48 U.S.C. 1681).

SEC. 4. RIGHTS OF ACCESS.

Cultural programs. Historic preservation. Environmental protection. 42 USC 2103.

(a) ACCESS RIGHTS.—In order to—

(1) clarify that State waters and shipwrecks offer recreational and educational opportunities to sport divers and other interested groups, as well as irreplaceable State resources for tourism, biological sanctuaries, and historical research; and

(2) provide that reasonable access by the public to such abandoned shipwrecks be permitted by the State holding title to such shipwrecks pursuant to section 6 of this Act,

it is the declared policy of the Congress that States carry out their responsibilities under this Act to develop appropriate and consistent policies so as to—

(A) protect natural resources and habitat areas;

(B) guarantee recreational exploration of shipwreck sites; and

(C) allow for appropriate public and private sector recovery of shipwrecks consistent with the protection of historical values and environmental integrity of the shipwrecks and the sites.

(b) PARKS AND PROTECTED AREAS.—In managing the resources subject to the provisions of this Act, States are encouraged to create underwater parks or areas to provide additional protection for such resources. Funds available to States from grants from the Historic Preservation Fund shall be available, in accordance with the provisions of title I of the National Historic Preservation Act, for the study, interpretation, protection, and preservation of historic shipwrecks and properties.

Grants.

SEC. 5. PREPARATION OF GUIDELINES.

43 USC 2104.

(a) In order to encourage the development of underwater parks and the administrative cooperation necessary for the comprehensive management of underwater resources related to historic shipwrecks, the Secretary of the Interior, acting through the Director of the National Park Service, shall within nine months after the date of enactment of this Act prepare and publish guidelines in the Federal Register which shall seek to:

National parks, monuments, etc. Federal Register, publication.

(1) maximize the enhancement of cultural resources;

(2) foster a partnership among sport divers, fishermen, archeologists, salvors, and other interests to manage shipwreck resources of the States and the United States;

(3) facilitate access and utilization by recreational interests;

(4) recognize the interests of individuals and groups engaged in shipwreck discovery and salvage.

(b) Such guidelines shall be developed after consultation with appropriate public and private sector interests (including the Secretary of Commerce, the Advisory Council on Historic Preservation, sport divers, State Historic Preservation Officers, professional dive operators, salvors, archeologists, historic preservationists, and fishermen).

(c) Such guidelines shall be available to assist States and the appropriate Federal agencies in developing legislation and regulations to carry out their responsibilities under this Act.

SEC. 6. RIGHTS OF OWNERSHIP.

43 USC 2105.

(a) UNITED STATES TITLE.—The United States asserts title to any abandoned shipwreck that is—

(1) embedded in submerged lands of a State;

(2) embedded in coralline formations protected by a State on submerged lands of a State; or

(3) on submerged lands of a State and is included in or determined eligible for inclusion in the National Register.

Public information. Historic preservation.

(b) The public shall be given adequate notice of the location of any shipwreck to which title is asserted under this section. The Secretary of the Interior, after consultation with the appropriate State Historic Preservation Officer, shall make a written determination that an abandoned shipwreck meets the criteria for eligibility for inclusion in the National Register of Historic Places under clause (a)(3).

(c) TRANSFER OF TITLE TO STATES.—The title of the United States to any abandoned shipwreck asserted under subsection (a) of this section is transferred to the State in or on whose submerged lands the shipwreck is located.

Gifts and property. Indians.

(d) EXCEPTION.—Any abandoned shipwreck in or on the public lands of the United States is the property of the United States Government. Any abandoned shipwreck in or on any Indian lands is the property of the Indian tribe owning such lands.

(e) RESERVATION OF RIGHTS.—This section does not affect any right reserved by the United States or by any State (including any right reserved with respect to Indian lands) under—

(1) section 3, 5, or 6 of the Submerged Lands Act (43 U.S.C. 1311, 1313, and 1314); or

(2) section 19 or 20 of the Act of March 3, 1899 (33 U.S.C. 414 and 415).

43 USC 2106.

SEC. 7. RELATIONSHIP TO OTHER LAWS.

(a) LAW OF SALVAGE AND THE LAW OF FINDS.—The law of salvage and the law of finds shall not apply to abandoned shipwrecks to which section 6 of this Act applies.

(b) LAWS OF THE UNITED STATES.—This Act shall not change the laws of the United States relating to shipwrecks, other than those to which this Act applies.

(c) EFFECTIVE DATE.—This Act shall not affect any legal proceeding brought prior to the date of enactment of this Act.

Approved April 28, 1988.

LEGISLATIVE HISTORY—S. 858:

HOUSE REPORTS: No. 100-514, Pt. 1 (Comm. on Interior and Insular Affairs) and Pt. 2 (Comm. on Merchant Marine and Fisheries).
SENATE REPORTS: No. 100-241 (Comm. on Energy and Natural Resources).
CONGRESSIONAL RECORD:
Vol. 133 (1987): Dec. 19, considered and passed Senate.
Vol. 134 (1988): Mar. 28, 29, Apr. 13, considered and passed House.

○

FEIS APPENDIX B-1.4

COORDINATION ACT REPORT

FISH AND WILDLIFE COORDINATION ACT
SECTION 2(b) REPORT

NEW YORK AND NEW JERSEY HARBOR NAVIGATION STUDY

Prepared by:

U.S. Fish and Wildlife Service
Ecological Services, Region 5
New Jersey Field Office
Pleasantville, New Jersey 08232

December 1999

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
927 North Main Street (Bldg. D1)
Pleasantville, New Jersey 08232

FP-99/73

December 16, 1999

Colonel William H. Pearce
District Engineer, New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, New York 10278-0090

Dear Colonel Pearce:

This is the report of the U.S. Fish and Wildlife Service (Service) regarding anticipated impacts to fish and wildlife resources from the U.S. Army Corps of Engineers (Corps) proposed New York and New Jersey Harbor Navigation Plan. This report was prepared pursuant to Section 2(b) of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended: 16 U.S.C. 661 *et seq.*). This report is based on plans and information provided by the Corps and is provided in accordance with our Fiscal Year - 1999 scope-of-work agreement.

The proposed project may affect marine turtles and whales via direct physical harm associated with dredging and blasting. Marine turtles and whales may also be struck by ships transporting dredged material. Additionally, the shortnose sturgeon (*Acipenser brevirostrum*) could be affected should the proposed project result in altered hydraulic and water quality parameters within the lower Hudson River.

Principal responsibility for marine turtles, whales, and the shortnose sturgeon is vested with the National Marine Fisheries Service. Therefore, the National Marine Fisheries Service must be contacted to fulfill consultation requirements pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*):

National Marine Fisheries Service
Habitat and Protected Resources Division
Sandy Hook Laboratory
Highlands, New Jersey 07732
(732) 872-3023

With regard to federally listed species under the purview of the Service, the piping plover (*Charadrius melodus*), roseate tern (*Sterna dougallii dougallii*), northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*), and seabeach amaranth (*Amaranthus pumilus*) are known to occur in the project area. The Service has determined that the proposed project may affect these federally listed species via degradation of water quality, altered erosion or accretion rates of beaches, and exposure to environmental contaminants. Therefore, the Corps must prepare a Biological Assessment (BA) to address potential project-related adverse impacts to federally listed species. The Service has reviewed a draft BA prepared by the Corps and will continue to coordinate with the Corps regarding Endangered Species Act compliance. Except for occasional transient individuals, no other federally listed or proposed threatened or endangered species under Service jurisdiction are known to occur in the project area.

Copies of the draft FWCA report were forwarded to the New Jersey Division of Fish, Game and Wildlife (NJDFG&W) and the New York State Department of Environmental Conservation (NYDEC) for concurrence. Both the NJDFG&W and the NYDEC concurred with the Service's findings as outlined in the draft FWCA report.

Additional information regarding this report can be provided by Thomas McDowell (609-646-9310, ext. 45) or John Staples (609-646-9310, ext. 18) of my staff. The Service would appreciate any written comments on this report within 30 days.

Sincerely,

Clifford G. Day
Supervisor

Enclosure

FISH AND WILDLIFE COORDINATION ACT
SECTION 2(b) REPORT

NEW YORK AND NEW JERSEY HARBOR NAVIGATION STUDY

Prepared for:

U.S. Army Corps of Engineers
New York District
New York, New York 10278-0090

Prepared by:

U.S. Fish and Wildlife Service
Ecological Services, Region 5
New Jersey Field Office
Pleasantville, New Jersey 08232

Preparer: Thomas L. McDowell
Assistant Project Leader: John C. Staples
Project Leader: Clifford G. Day

December 1999

EXECUTIVE SUMMARY

The U.S. Fish and Wildlife Service (Service) reviewed project plans and other information supplied by the U.S. Army Corps of Engineers (Corps) regarding the New York and New Jersey Harbor Navigation Study (Navigation Study). This is the Service's Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401; 16 U.S.C. 661 *et seq.*), Section 2(b) report on the fish and wildlife resources and supporting ecosystems in the project area.

This FWCA report documents the fish and wildlife resources and supporting ecosystems in the project area and provides an assessment of potential adverse impacts on these resources. This report also describes data gaps, provides recommendations for conducting studies to further assess project-related impacts, and provides recommended measures to avoid, minimize, and compensate for adverse impacts to fish and wildlife resources.

The Corps has identified the proposed project to include deepening of the following channels within the Port of New York / New Jersey: Ambrose to 53 feet (maintenance depth of 53 feet); Anchorage to 50 feet (maintenance depth of 50 feet); Bay Ridge to 50 feet (maintenance depth of 50 feet); Elizabeth Channel to 52 feet (maintenance depth of 50 feet); South Elizabeth Channel to 52 feet (maintenance depth of 50 feet); Port Jersey to 52 feet (maintenance depth of 50 feet); Kill Van Kull to 52 feet (maintenance depth of 50 feet); Newark Bay to 52 feet (maintenance depth of 50 feet); Arthur Kill to Howland Hook to 52 feet (maintenance depth of 50 feet) (U.S. Army Corps of Engineers, 1999a).

The proposed project would result in nearly 49 acres of disturbance to shallow water (0.0 - 15 feet deep) habitats within the New York / New Jersey Harbor estuary (Harbor estuary). The Corps proposes to compensate for these impacts via purchase and enhancement of 13 acres of wetlands in Staten Island, New York and Woodbridge, New Jersey.

The Corps has determined that port terminal expansions are not required for operators at present container terminals to benefit from deeper channels. Therefore, no fills of waters of the United States associated with port terminal expansion have been evaluated by the Corps. However, the discharge of fill material into waters of the United States associated with port facility expansions could be extensive; the Port Authority of New York and New Jersey (PANYNJ) previously identified potential filling of 1,350 acres to accommodate port facility expansions within the Harbor estuary (Port Authority of New York and New Jersey, 1998). Impacts of port facility expansions should be thoroughly addressed in the DEIS for two reasons: (1) port facility expansion is an indirect effect associated with the proposed project, as the deepening of channels will affect the location and timing and, therefore, amount of fill in aquatic habitats within the Harbor estuary; and, (2) port facility expansions are "cumulative" and "similar actions" (40 CFR 1508.25) and, therefore, fall within the scope of the environmental impact statement.

The Service understands that the Corps, U.S. Environmental Protection Agency, and PANYNJ have agreed, via memorandum of understanding, to begin a long-term port planning study known as the Comprehensive Port Improvement Plan. While the Service supports comprehensive planning efforts, we feel that separating the issue of port expansion from channel deepening may

eliminate potential design options and reduce opportunities to avoid impacts to fish and wildlife resources.

The Corps has identified generic dredge material disposal options for the proposed project. Non-rock material unsuitable for disposal at the Historic Area Remediation Site (HARS) would be disposed of at upland sites or sub-channel placement cells, known as confined aquatic disposal pits in Newark Bay. Suitable non-rock material will be disposed of at the HARS. Rock material will be used beneficially by placement as artificial reefs or shoreline stabilization.

The Harbor estuary and adjacent New York Bight Apex support a wide diversity of valuable fish and wildlife resources. Species groups of management concern in the Harbor estuary include fisheries, waterfowl, shorebirds, wading birds, raptors, passerine birds, and species designated as threatened or endangered at the federal or State level. The Service has identified areas of the Harbor estuary that support concentrations of these species groups or that support rare or unique vegetation communities and has mapped these areas as Regionally Significant Habitat Complexes (Habitat Complexes). In addition, significant fish and wildlife resources exist within the Harbor estuary outside of the Service-identified Habitat Complexes. For example, many areas of the Harbor estuary support commercially valuable finfish and shellfish. Additionally, the National Marine Fisheries Service (NMFS) is in the process of designating, pursuant to the Magnuson - Stevens Fishery Conservation and Management Act of 1996 (PL 94-265), Essential Fish Habitat for 57 species (Appendix A) managed by the Regional Fishery Management Councils. Essential Fish Habitat may be designated within the study area. Finally, numerous federally listed species and State-listed species, including whales, marine turtles, birds, fish, and plants are known to occur within the Harbor estuary and its adjacent marine and upland habitats.

The Service has determined that both direct and indirect impacts to fish and wildlife resources would be expected to occur from dredging of channels within the Harbor estuary. Direct impacts would be expected to occur as a result of dredging, blasting, and the release of sediment plumes into the water column. Indirect impacts would be expected to occur as a result of changes in estuarine hydrodynamic parameters, which would influence species composition, distribution, and abundance of aquatic organisms. Additional impacts include alterations to wetlands, shallow waters, mudflats, and beaches via impacts such as increased sedimentation or erosion due to altered hydrodynamics.

The Service concludes that the Harbor estuary and its adjacent marine and upland environments provide high-quality habitats for fish and wildlife resources and that the proposed dredging project has the potential to adversely impact these resources both directly and indirectly. To minimize adverse impacts of any project proposed by the Corps, the Service provides recommendations, which include the following:

- Evaluate the affects port facility expansions will have on fish and wildlife resources and the human environment within the Corps New York and New Jersey Harbor Navigation study Environmental Impact Statement.

- Conduct post construction benthic surveys and biological monitoring of fish and macroinvertebrates to determine the direct and indirect affects of project implementation. Coordinate with the Service, NMFS, and State resource agencies for recommendations based on results.

- Establish a long-term monitoring program to assess the impacts of Corps dredging projects on water quality.

- Investigate the feasibility and effectiveness of using protective devices, such as silt curtains and sealed buckets to protect project-vicinity wetlands, shallow waters, mudflats, and beaches from siltation.

- Compensate for impacts to approximately 49 acres of shallow water habitat that would result from project implementation. Consider compensatory mitigation opportunities in the Hackensack Meadowlands.

- Avoid adverse impacts on colonial nesting wading birds on Shooters Island during the breeding season.

- Test sediments to be dredged for environmental contaminants. Coordinate test results with the Service, NMFS, and State resource agencies.

- Consult with the NMFS pursuant to Section 7(a)(2) of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*) and the Magnuson - Stevens Fishery Conservation and Management Act regarding potential affects to federally listed species and species of management concern.

- Complete preparation of a Biological Assessment for the Service with regard to potential impacts to federally listed species.

- Consult with the appropriate State agencies regarding potential impacts to State-listed species as dredged material disposal options are planned.

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I. INTRODUCTION

The U.S. Fish and Wildlife Service (Service) reviewed project plans and other information supplied by the U.S. Army Corps of Engineers (Corps) regarding the New York and New Jersey Harbor Navigation Study. This is the Service's Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401; 16 U.S.C. 661 *et seq.*), Section 2(b) report on the fish and wildlife resources and supporting ecosystems in the project area. This FWCA report is provided in accordance with a Fiscal Year-1999 scope-of-work agreement with the New York District of the Corps. This report documents the fish and wildlife resources in the project area, provides an assessment of the potential effects of the proposed project on fish and wildlife resources, and provides recommendations to minimize or mitigate adverse impacts to those resources.

The Port of New York / New Jersey (Port) is the largest port on the east coast of the United States and provides more than 166,000 port-related jobs, generates $20 billion in economic activity, and serves more than 17 million consumers in New York and New Jersey (U.S. Army Corps of Engineers, 1997a). Additionally, the Port provides second-day access to another 80 million consumers in the Northeast and Midwest. The Port is the largest petroleum port and third largest container port in the United States. Channels within the port range in depths from 30 to 40 feet; however, several shipping lines are constructing vessels with drafts exceeding 45 feet (U.S. Army Corps of Engineers, 1997b). Current channel depths prevent newer vessels with deeper drafts from entering the Port, or limit their access to favorable tidal conditions or less-than-capacity loads. In order to provide economically efficient and environmentally sound navigation to meet current and future requirements, the Corps is conducting a comprehensive study of the navigational needs of the Port.

The study area (Figure 1) includes many of the channels within the New York / New Jersey Harbor estuary (Harbor estuary). Portions of the Harbor estuary that are within the Corps study area include Raritan Bay, Sandy Hook Bay, Arthur Kill, Newark Bay, Kill Van Kull, and the Upper and Lower New York Bays.

II. METHODS

The Service has been involved in the planning of dredging projects within the Port for over 20 years and has provided the Corps with numerous technical reports regarding such projects. The information and findings presented in this report are based on review of previous Service reports on various dredging projects as well as on project information supplied by the Corps. The content of this report is also based on review of Service files and library material, and coordination with the New Jersey Division of Fish, Game and Wildlife (NJDFG&W), the New York Department of Environmental Conservation (NYDEC), and the National Marine Fisheries Service (NMFS).

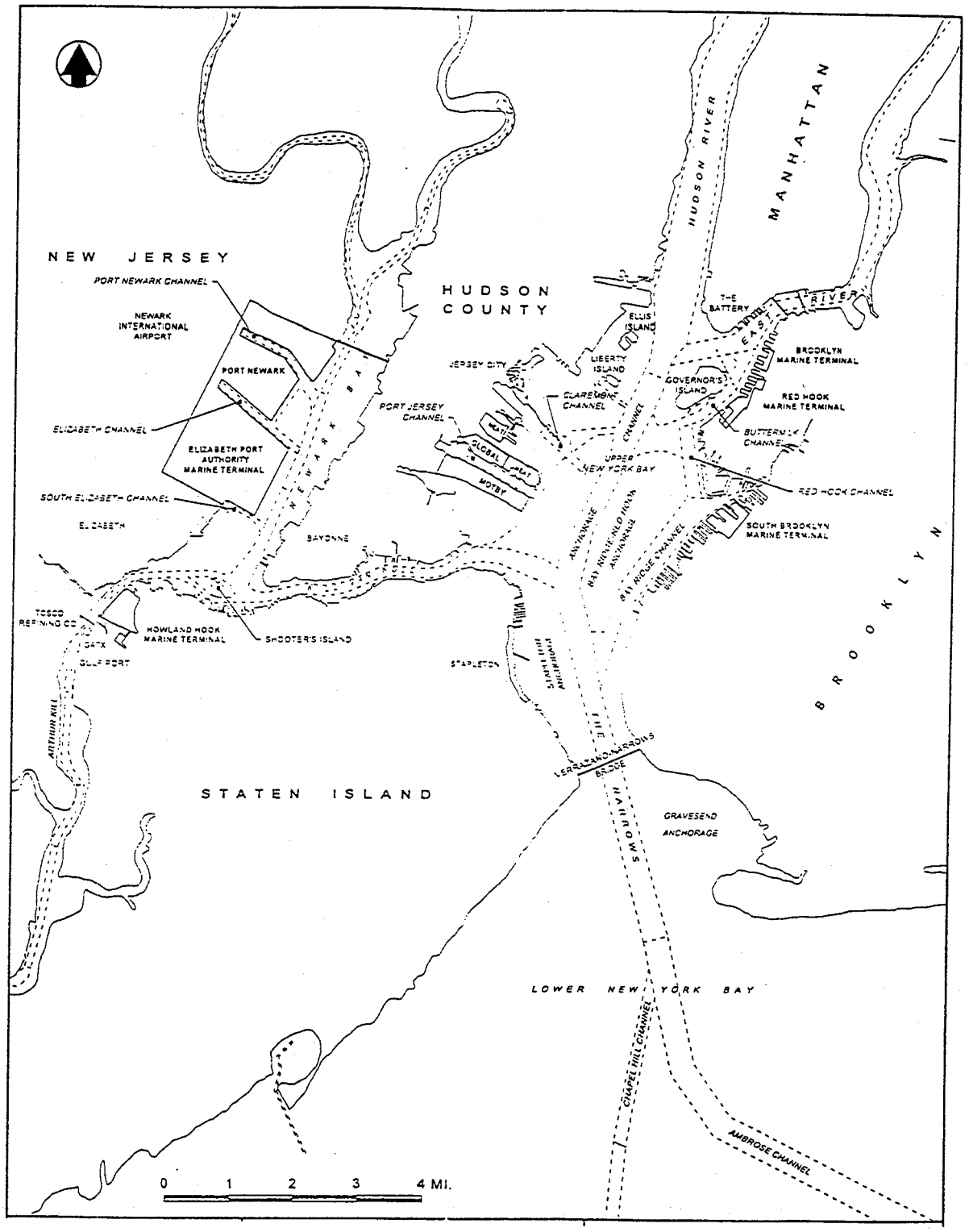

Figure 1. Location of the study area within the New York - New Jersey Harbor estuary (U.S. Army Corps of Engineers, 1999b).

III. PROJECT DESCRIPTION

The Corps (1999a) has identified the proposed project to include the deepening of the following channels: Ambrose to 53 feet (maintenance depth of 53 feet); Anchorage to 50 feet (maintenance depth of 50 feet); Bay Ridge to 50 feet (maintenance depth of 50 feet); Elizabeth Channel to 52 feet (maintenance depth of 50 feet); South Elizabeth Channel to 52 feet (maintenance depth of 50 feet); Port Jersey to 52 feet (maintenance depth of 50 feet); Kill Van Kull to 52 feet (maintenance depth of 50 feet); Newark Bay to 52 feet (maintenance depth of 50 feet); Arthur Kill to Howland Hook to 52 feet (maintenance depth of 50 feet).

The proposed project would disturb approximately 49 acres of shallow water (0.0-15 feet deep) habitats within the Harbor estuary. The Corps proposes to compensate for these impacts via purchase and enhancement of 13 acres of wetlands in Staten Island, New York and Woodbridge, New Jersey.

The Corps has identified generic dredge material disposal options for the proposed project. Non-rock material unsuitable for disposal at the Historic Area Remediation Site (HARS) would be disposed of at upland sites or sub-channel placement cells, or confined aquatic disposal (CAD) pits in Newark Bay. Suitable non-rock material will be disposed of at the HARS. Rock material will be used beneficially by placement as artificial reefs or shoreline stabilization. As all disposal sites have not been specifically identified by the Corps non-federal sponsors, the Service cannot address specific fish and wildlife resource concerns associated with all dredged material disposal options. The Corps is evaluating potential dredged material disposal areas in a separate Environmental Impact Statement entitled Dredged Material Management Plan (DMMP) for the Port of New York and New Jersey. The Service understands that the Corps will continue to coordinate with the Service and other federal and State resource agencies on the DMMP.

The HARS (previously known as the Mud Dump Site) is a 2.2-square-nautical-mile rectangular area located within the New York Bight Apex approximately 5.3 nautical miles east of Sandy Hook, New Jersey and 9.6 nautical miles south of Rockaway Beach, Long Island, New York (U.S. Environmental Protection Agency, 1997). Decades of use of the Mud Dump Site for the disposal of dredged material has left certain areas of the site with levels of contamination that are higher than considered acceptable (U.S. Environmental Protection Agency, 1997). The area has been re-designated as the HARS with the intent of using Category I (dredged material allowed for ocean disposal without restrictions (U.S. Environmental Protection Agency, 1997)) dredged material to cap contaminated areas.

Finally, the Corps has determined that port terminal expansions are not required for operators at present container terminals to benefit from deeper channels. Therefore, no fills of waters of the United States associated with port terminal expansion have been evaluated by the Corps. However, the discharge of fill material into waters of the United States associated with port facility expansions could be extensive; the Port Authority of New York and New Jersey

(PANYNJ) previously identified potential filling of 1,350 acres to accommodate port facility expansions within the Harbor estuary (Port Authority of New York and New Jersey, 1998).

The Service understands that the Corps, the U.S. Environmental Protection Agency, and the PANYNJ have agreed, via memorandum of understanding, to begin a long-term port planning study (Comprehensive Port Improvement Plan) to address issues related to expansion of port facilities. While the Service supports comprehensive planning efforts, we feel that separating the issue of port expansion from channel deepening may eliminate potential design options and reduce opportunities to avoid impacts to fish and wildlife resources.

The Department of the Interior (Department) commented (letter of November 22, 1999) that impacts of port facility expansions should be thoroughly addressed in the DEIS for the Harbor navigation study for two reasons: (1) port facility expansion is an indirect effect associated with the proposed project, as the deepening of channels will affect the location and timing and, therefore, the amount of fill in aquatic habitats within the Harbor estuary; and, (2) port facility expansions are "cumulative" and "similar actions" (40 CFR 1508.25) and, therefore, fall within the scope of the environmental impact statement. Therefore, the Department has recommended that the Corps revise the DEIS to incorporate a thorough evaluation of the potential impacts to fish and wildlife resources associated with port facility expansion.

IV. PHYSICAL ENVIRONMENT

The landforms surrounding the Port have been shaped by complex geological, and physiographic processes. Three physiographic provinces converge at the Harbor, including the Atlantic Coastal Plain; the Piedmont Province; and the New England Province, which includes the New York - New Jersey Highlands and the Manhattan Hills extensions. This convergence of physiographic provinces provides a great diversity of landforms, which is further complicated by the presence of terminal moraine from the Wisconsin glacial advance. The moraine is a linear and ridge-like landform of gravelly, stony, and bouldery materials that forms the lengthwise spine of Long Island extending southwest to the southern tip of Staten Island and then trending northwest into the New York - New Jersey Highlands.

In addition to the complex geology, the areas surrounding the Harbor estuary are some of the most densely populated and heavily industrialized areas in the world. This massive human presence has dramatically altered the ecology of the area; resulting in the near elimination of many upland plant communities and the loss of approximately 300,000 acres of tidal wetlands and shallow water habitats (U.S. Fish and Wildlife Service, 1996). In addition to the direct loss of habitats due to urban development, the human influence on the area has resulted in massive degradation of remaining habitats through industrial effluent and sewage discharges, chemical and oil spills, stormwater runoff, air pollution, and the introduction of invasive, non-native plants and animals.

Within Raritan Bay, major currents generally circulate counter-clockwise (Figure 2). Ocean water enters from the east and travels west along the coast of Staten Island toward the Raritan River. Raritan River water enters from the west and travels east along the southern shore of the estuary (Jefferies, 1962). This circulation pattern influences other physical and chemical characteristics of the bay (e.g., salinity gradients, dissolved oxygen, water clarity, sediment dynamics). Little information was found by the Service on the circulation patterns of the Harbor estuary outside of Raritan and Sandy Hook Bays.

Raritan Bay appears to be relatively well-mixed, as indicated by similarities in physical and chemical data (e.g., dissolved oxygen, temperature, salinity, nitrate, nitrite, phosphate, and iron) between surface and bottom waters (Draxler *et al.*, 1984). Thorough mixing is facilitated by a combination of factors: the shallowness of the bay; a long fetch from most directions; and, turbulent mixing of tides, river discharge, and wind. Additionally, the bay completely flushes within 60 tide cycles or 28 days (Jefferies, 1962).

The composition of surface sediments within the Harbor estuary is currently being studied by the Corps. However, preliminary results obtained from Will (pers. comm., 1998) indicate that significant areas of Raritan Bay north of the Raritan Bay Reach Channel and west of the Chapel Hill Channel are dominated by sandy sediments, although some areas of silty sediments exist. Sediments to the south of the Raritan Bay Reach Channel are generally finer (e.g., sandy silts and silts). Some small areas of Raritan Bay appear to have shell bottoms. These results appear to be consistent with previous sediment sampling done in Raritan Bay.

Multer *et al.* (1984) found that surface sediments in the western section of Raritan Bay are dominated by silt and clay. Fine-grained sediments dominate the head of the bay, primarily because the area is far from the open ocean (hence turbulent mixing is minimal) and because fine sediments drop out of the water column where water velocity slows as it enters the estuary. A fine-grained sediment plume originating from the Raritan River flows through the deeper, center area of the bay almost to Sandy Hook (Multer *et al.*, 1984).

V. NEW YORK AND NEW JERSEY HARBOR ESTUARY ECOSYSTEM

A. OVERVIEW

Despite extensive human-induced alterations, the Harbor estuary continues to support an impressive diversity of habitats and a rich diversity and abundance of fish and wildlife resources, including many federal trust resources. The Harbor estuary supports fisheries and shellfisheries of commercial, recreational, and ecological importance. Additionally, the Harbor estuary provides migratory, wintering, and breeding habitat for a large variety of migratory birds, including waterfowl, wading birds, shorebirds, raptors, and passerines.

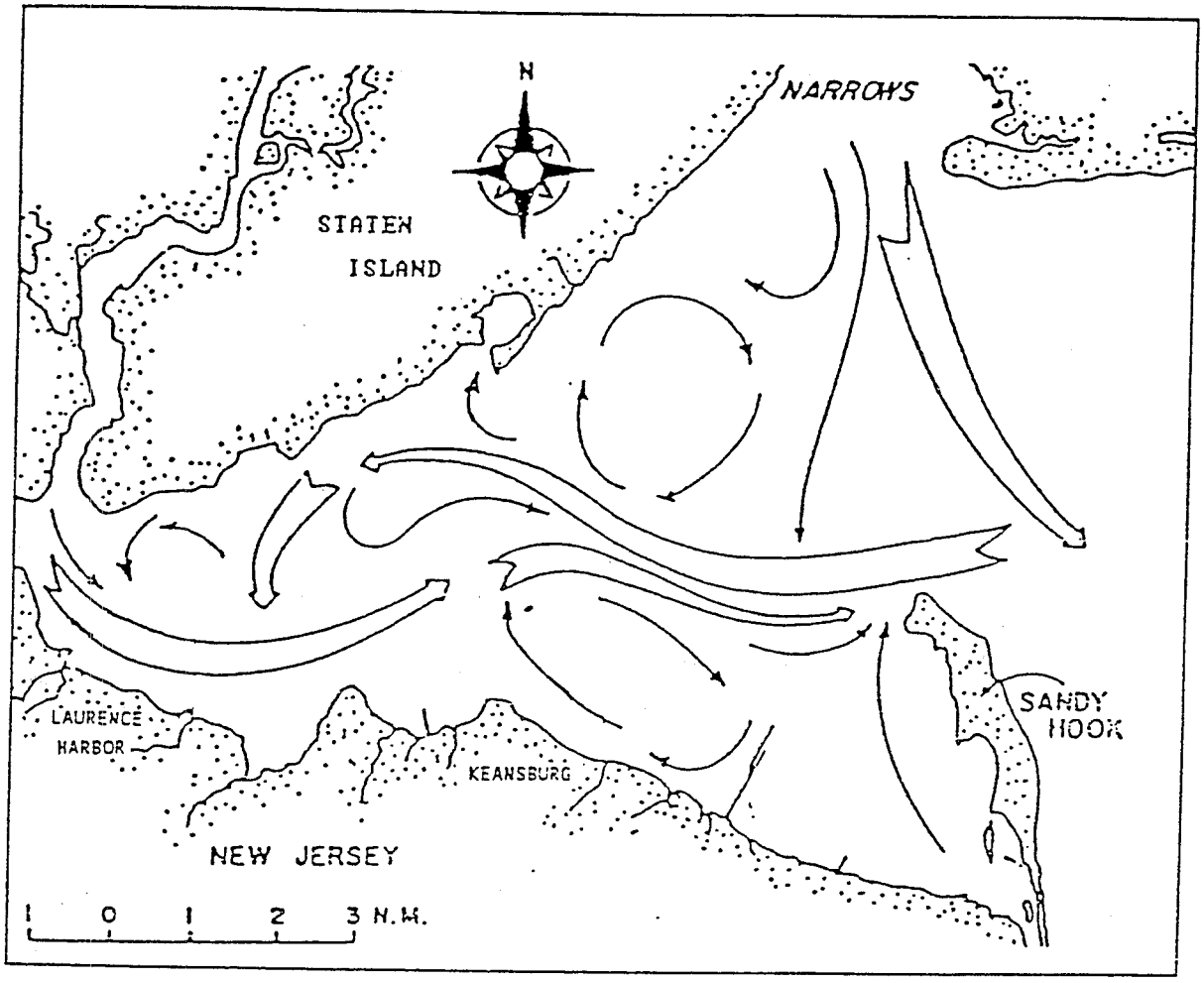

Figure 2. Circulation patterns of Raritan Bay (Jefferies, 1962).

According to Cowardin *et al.* (1979), estuarine systems consist of deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land but have open, partially obstructed, or sporadic access to the open ocean. Ocean water is at least occasionally diluted by freshwater runoff from the land. The estuarine system extends upstream and landward to where ocean-derived salts measure less than 0.5 ppt during the period of average annual low flow and to an imaginary line closing the mouth of a river, bay, or sound.

As part of the National Harbor Estuary Program, the Service identified species groups and ecological communities of management concern and compiled existing information regarding the distribution of these resources (U.S. Fish and Wildlife Service, 1996). The species groups identified by the Service as being of management concern in the Harbor estuary included fisheries, waterfowl, shorebirds, wading birds, raptors, passerine birds, and species designated as threatened or endangered at the State or federal level. As part of this effort, the Service also identified areas of the Harbor estuary that support concentrations of these species groups or that support rare or unique vegetation communities and mapped these areas as Regionally Significant Habitat Complexes (Habitat Complexes). Section B below identifies Habitat Complexes within and adjacent to the proposed project area, which are of particular importance to the long-term maintenance of the Harbor's fish and wildlife resources. Section C identifies resources of concern that are outside of the designated Habitat Complexes within the Harbor estuary, Section D identifies resources of concern within the New York Bight Apex, and Section E identifies federally listed and candidate species as well as State-listed species that occur in the Harbor estuary.

B. REGIONALLY SIGNIFICANT HABITAT COMPLEXES

1. Arthur Kill

The Arthur Kill Habitat Complex includes the northwestern corner of Staten Island in New York City, adjacent portions of the Arthur Kill and Kill Van Kull in both New York and New Jersey, and tributaries and wetlands feeding into the Arthur Kill from Union and Middlesex Counties, New Jersey (Figure 3).

Vast modifications of the physical features of the Arthur Kill have been made to serve the harbor area. The highly industrialized waterway is dredged to an average channel depth of 30 feet and much of the shoreline consists of bulkheads or riprap. However, considering the shoreline associated with islands, 55 percent of the total shoreline still remains as natural mudflats and marshes (U.S. Fish and Wildlife Service, 1996).

Of primary importance in this area is the presence of major nesting colonies and foraging areas of herons, egrets, and ibises in a complex of closely associated natural habitats occurring within a major metropolitan area. Three island colonies, or heronries, (located on Shooters Island, Pralls Island, and Isle of Meadows) were established in the 1970s; in 1995, these heronries collectively

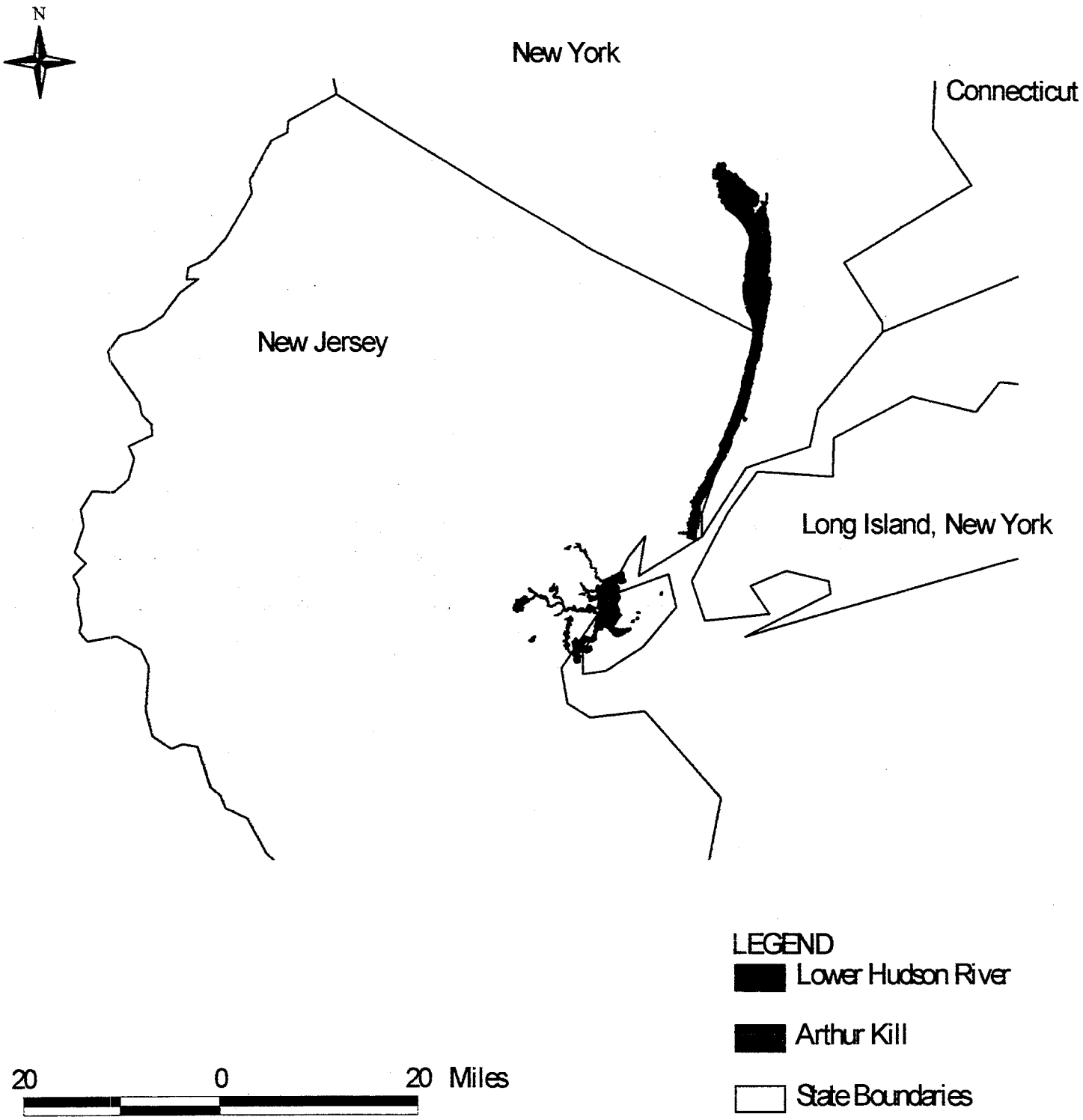

Figure 3. Location of Significant Habitat Complexes within the study area (U.S. Fish and Wildlife Service, 1996).

contained nearly 1,400 nesting pairs of colonial wading birds of special regional emphasis or management concern, including, in declining order of abundance, black-crowned night-heron *(Nycticorax nycticorax),* glossy ibis *(Plegadis falcinellus),* snowy egret *(Egretta thula),* great egret *(Casmerodius albus),* cattle egret *(Bubulcus ibis),* yellow-crowned night-heron *(Nycticorax violaceus)*, green-backed heron *(Butorides striatus),* and little blue heron *(Egretta caerulea)* nesting pairs. These island colonies represent the largest heronry in New York State and account for about 25 percent of the waders that breed in coastal New Jersey, New York, and Connecticut (U.S. Fish and Wildlife Service, 1996). The largest number of nesting great egrets, cattle egrets, snowy egrets, and yellow-crowned night herons in New York State occur at these colonies. In addition, over 1,000 herring gull *(Larus argentatus),* 30 great black-backed gull *(Larus marinus),* and 140 double-crested cormorant *(Phalacrocorax auritus)* pairs nested on these same sites. The islands collectively constitute one of the southernmost nesting areas for the Canadian sub-population of the cormorant (U.S. Fish and Wildlife Service, 1996). Adult and young herons and egrets forage extensively in the wetlands of the Arthur Kill Habitat Complex, feeding on rich concentrations of forage fish, particularly mummichog (*Fundulus heteroclitus*) and Atlantic silverside (*Menidia menidia*), and invertebrates, particularly grass shrimp *(Palaemonetes* spp.), in the marshes, flats, and shallow waters of ponds and tidal creeks.

Goethals Bridge Pond is an important feeding area for migratory shorebirds, particularly black-bellied plover (*Pluvialis squatarola*), red knot *(Calidris canutus),* pectoral sandpiper *(Calidris melanotos),* semi-palmated sandpiper *(Calidris pusilla*), sanderling (*Calidris alba*), common tern *(Sterna hirundo),* and least tern *(Sterna antillarum).* Wintering waterfowl of regional importance occurring in the open waters and marshes in this Habitat Complex include greater scaup (*Aythya marila*), lesser scaup *(Aythya affinis*), canvasback (*Aythya valisineria*), brant (*Branta bernicla*), American black duck (*Anas rubripes*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), bufflehead (*Bucephala albeola),* and American wigeon (*Anas clypeata*).

The deepwater habitats of the Arthur Kill have phytoplankton and zooplankton populations that are indicative of low light penetration (because of turbidity) and pollution. The most abundant microzooplankton in the area are crustaceans, while the macrozooplankton are dominated by larval mud crabs and grass shrimp. Blue crab (*Callinectes sapidus*) is an important part of the benthic community.

Ichthyoplankton surveys have collected eggs and larvae of 36 species of fish, the bulk of which are believed to spawn in the Raritan Bay or Lower New York Bay. The Service (1996) reviewed available literature regarding fisheries of the Arthur Kill and compiled a list of over 60 species known to occur in its waters. The fish fauna of the Arthur Kill includes year-round residents: mummichog and grubby sculpin (*Myoxocephalus aenaeus*); migratory species: bay anchovy (*Anchoa mitchilli*), Atlantic silverside, and alewife (*Alosa pseudoharengus*); and, predatory fish: bluefish (*Pomatomus saltatrix*), striped bass (*Morone saxatilis*), weakfish (*Cynoscion regalis*), and hakes (*Urophycis spp*). Additionally, the Arthur Kill, in particular salt marshes of Staten Island, provides important nursery and forage habitats for winter flounder (*Pseudopleuronectes americanus*) (Greene, pers. comm., 1999). The Service's review also noted an increase in fish

species diversity over the past 20 years, coincident with increased dissolved oxygen levels resulting from improved wastewater treatment.

2. Lower Hudson River

The Lower Hudson River Habitat Complex (Figure 3) is the portion of the Hudson River extending from the Battery at the southern tip of Manhattan north to Stony Point at the northern end of Haverstraw Bay.

The Hudson River is regionally significant as a productive estuary and is one of only a few major tidal rivers on the North Atlantic coast of the United States. The Lower Hudson River Habitat Complex supports regionally significant fish populations as well as populations of wintering and migratory birds that feed on the rich fish and benthic resources.

Many marine fish use the Lower Hudson River Habitat Complex as a nursery area; it provides an ideal habitat for the early critical life stages of these fish species. Marine finfish that use this area include Atlantic menhaden (*Brevoortia tyrannus*), fourbeard rockling (*Enchelyopus cimbrius*), bluefish, weakfish, northern pipefish (*Syngnathus fuscus*), and longhorn sculpin *(Myoxocephalus octodecemspinosus).* Estuarine fish that spawn in this stretch of the Hudson include winter flounder, bay anchovy, hogchoker, and mummichog. Additionally, juvenile winter flounder are known to overwinter in this area (Greene, pers. comm., 1999).

The southern portion of the Lower Hudson River Habitat Complex provides important wintering habitat for young-of-the-year, yearling, and older striped bass between mid-November and mid-April. These fish spawn upriver of Haverstraw Bay and utilize nursery areas in Haverstraw Bay and the Tappan Zee before moving downriver to overwinter, feeding on the abundant invertebrates in this area. Striped bass from the Hudson account for an impressive portion of the total North Atlantic population.

Additionally, the southern portion of the Lower Hudson River Habitat Complex has significant concentrations of wintering waterfowl, especially canvasback, with lesser numbers of scaup, mergansers, mallard, and Canada goose. Bald eagles (*Haliaeetus leucocephalus*) (federally listed as threatened) have recently been observed overwintering in this area.

C. NEW YORK / NEW JERSEY HARBOR ESTUARY

Although the above-mentioned Habitat Complexes are of great importance to fish and wildlife resources within the Harbor estuary, other significant concentrations of fish and wildlife resources exist outside of these areas that should be considered during project planning. For example, channels within the Harbor estuary provide important habitat for many species of fish. According to Wilk (pers. comm., 1998) the catch per unit effort, based on 8.5-meter otter trawl surveys, is always higher for channels than for shoals. Although there are numerous possible

explanations for why fish are more abundant within channels, the underlying cause for this distribution has not been specifically determined.

The NMFS (1995) captured 47 species of fish in Newark Bay during sampling from May 1993 to April 1994. The 5 most numerically dominant fish species collected using an 8.5-meter otter trawl were striped bass, Atlantic tomcod *(Microgadus tomcod)*, white perch (*Morone americanus*), weakfish, and winter flounder. The greatest numbers of these species were collected by the 8.5-meter otter trawl in the following months: striped bass - November, February, March; Atlantic tomcod - June, July, August; white perch - November, February, March; weakfish - August, September, October; and, winter flounder - August, November, December.

Significant fishery resources also occur within Raritan Bay. Notable with regard to fish species composition within the Harbor estuary are the large numbers of benthic-feeding fish, such as Atlantic tomcod, winter flounder, summer flounder (*Paralichthys dentatus*), fourspot flounder (*Paralichthys oblongus*), windowpane flounder (*Scophthalmus aquosus*), hogchoker, red hake (*Urophycis chuss*), spotted hake (*U. regia*), striped searobin (*Prionotus evolans*), northern searobin (*P. carolinus*), and northern kingfish (*Menticirrhus saxatilis*).

The Magnuson - Stevens Fishery Conservation and Management Act of 1996 (PL 94-265) requires that the essential habitat of any species managed by the Regional Fishery Management Councils be recognized and that attempts should be made to avoid degrading these habitats. According to the NMFS, the designation of Essential Fish Habitat (EFH) for 57 species (see Appendix A) is ongoing. Within the Harbor estuary, EFH will be or has been designated for 16 species: winter flounder, red hake, summer flounder, windowpane flounder, Atlantic sea herring (*Clupea harengus*), bluefish, black sea bass (*Centropristis striata*), Atlantic butterfish (*Peprilus triacanthus*), Atlantic mackerel (*Scomber scombrus*), scup, king mackerel (*Scomberomorus cavalla*), spanish mackerel (*Scomberomorus maculatus*), cobia (*Rachycentron canadum*), sandbar shark (*Carcharhinus plumbeus*), dusky shark (*Carcharhinus obscurus*), and sand tiger shark (*Odontaspis taurus*).

In addition to the above-identified Habitat Complexes, significant, commercially viable shellfish resources exist within other areas of the Harbor estuary. Shellfish stock assessments for the New Jersey portion of the Harbor estuary have not been conducted since 1984 (Joseph, pers. comm., 1998) and have never been officially conducted for the New York portion of the Harbor estuary (Fox, pers. comm., 1998). Although official stock assessments have never been conducted, the landings of hard-shelled clam (*Mercenaria mercenaria*) from the New York portion of Raritan Bay have accounted for 30 percent of New York's total production of hard-shelled clams (Fox, pers. comm., 1998). According to the NJDFG&W (1999), 50 percent of New Jersey's hard-shelled clam landings come from the New Jersey portion of Raritan and Sandy Hook Bays. Within New Jersey, valuable habitats identified by the NJDFG&W (1998) for hard-shelled clam, soft-shelled clam (*Mya arenaria*), surf clam (*Spisula solidissima*), blue mussel (*Mytilus edulis*), and common oyster (*Crassostrea virginica*) are displayed on Figures 4 through 6.

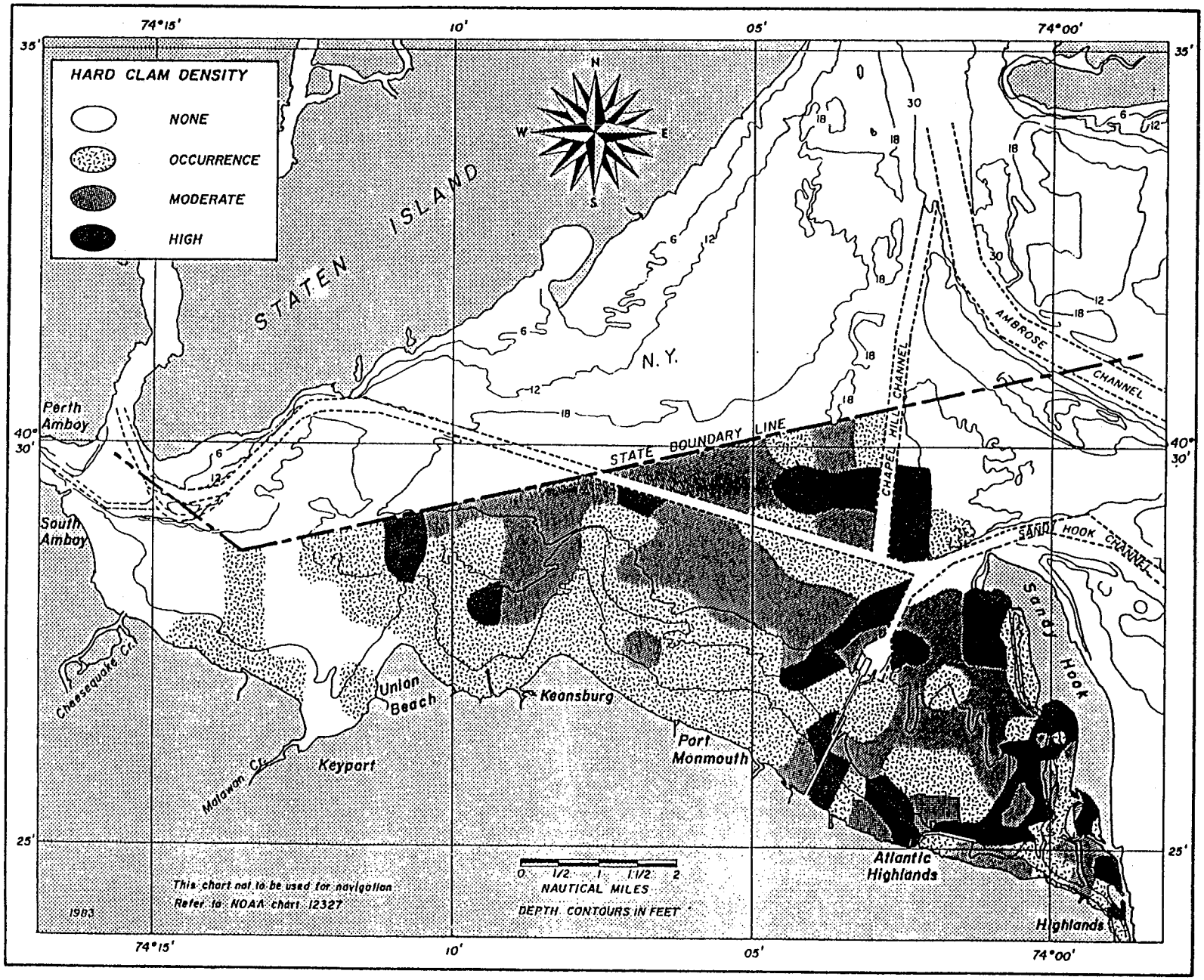

Figure 4. Hard-shelled clam (*Mercenaria mercenaria*) densities in the New Jersey portion of Raritan Bay (New Jersey Division of Fish, Game and Wildlife 1988).

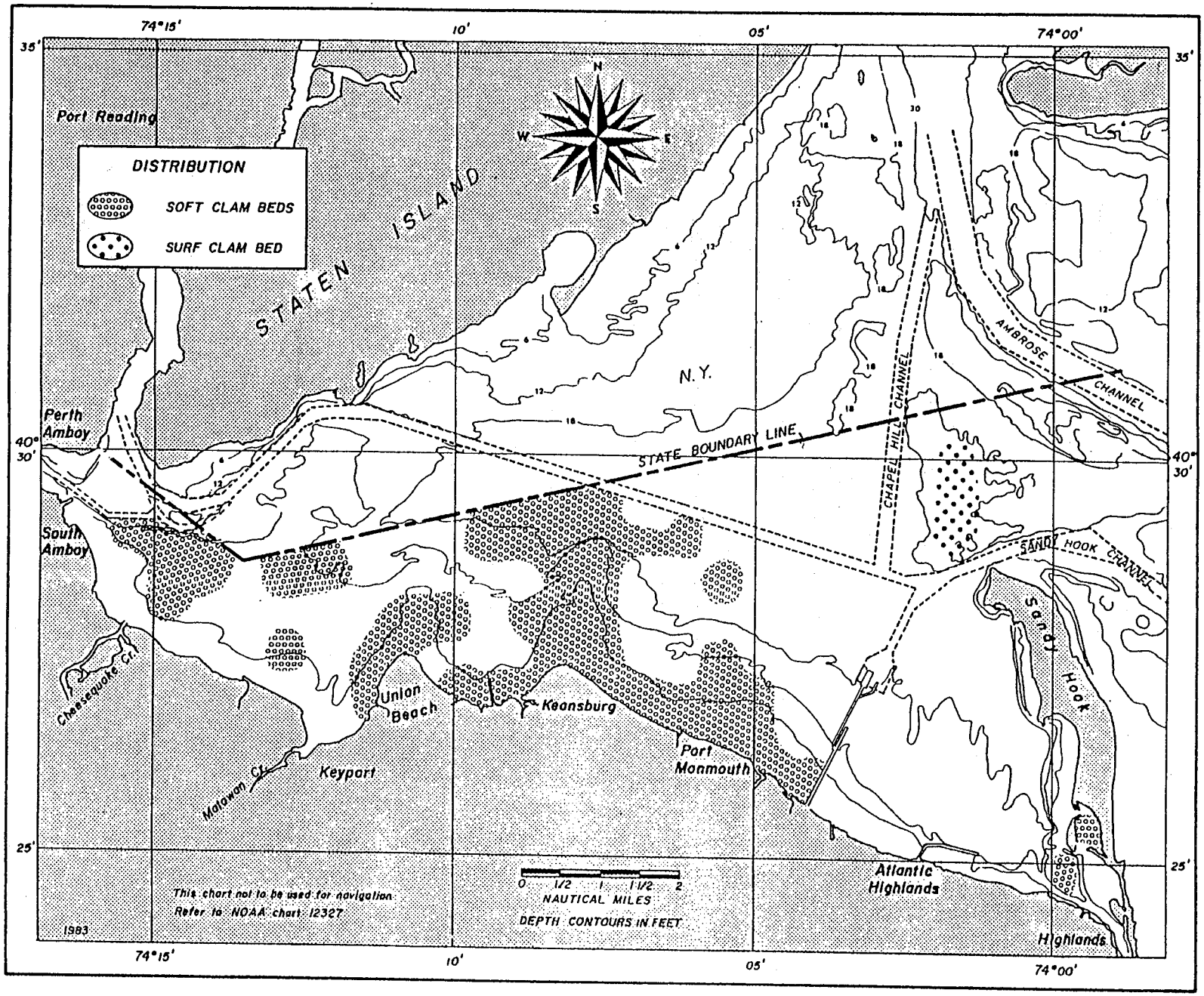

Figure 5. Soft-shelled clam (*Mya arenaria*) and surf clam (*Spisula solidissima*) distributions in the New Jersey portion of Raritan Bay (New Jersey Division of Fish, Game and Wildlife 1988).

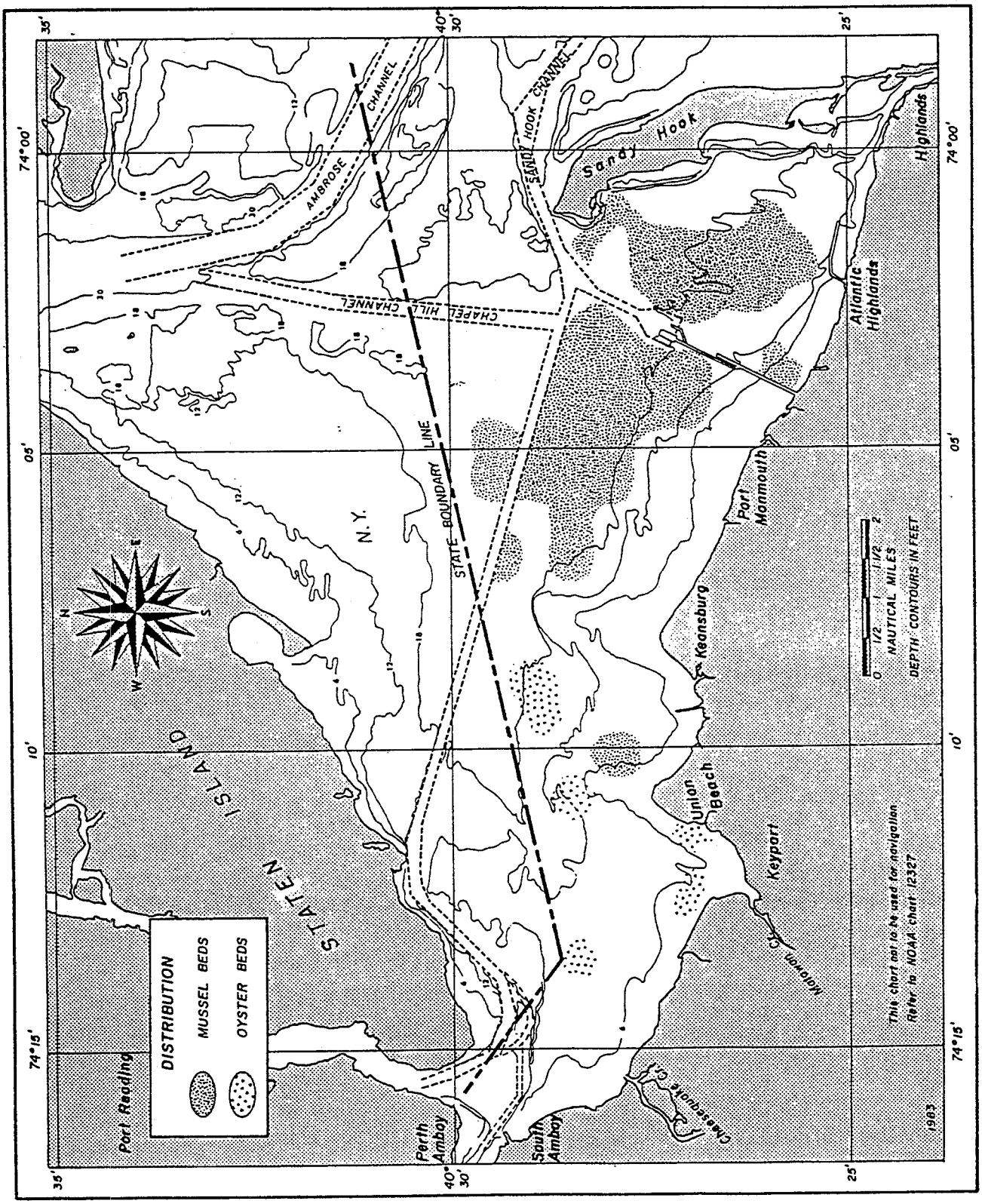

Figure 6. Distribution of blue mussel (*Mytilus edulis*) and common oyster (*Crassostrea virginica*) in the New Jersey portion of Raritan Bay (New Jersey Division of Fish, Game and Wildlife 1988).

Raritan Bay is the only estuary on the east coast of the United States that supports commercial fisheries of both blue crab and American lobster (*Homarus americanus*) (MacKenzie, 1990). A commercially viable blue crab dredge fishery has operated in Raritan Bay since at least 1889 (MacKenzie, 1990). Blue crabs are dredged in Raritan and Sandy Hook Bays from December through March from the Raritan River to the mouth of Raritan Bay in water that generally exceeds 12 feet in depth. Harvesting with pots generally begins in late April or May and lasts until early November (New Jersey Department of Environmental Protection, 1988). Blue crabs may be harvested during the potting season throughout the estuary.

Within Raritan Bay, the American lobster season extends from mid June through October. In Raritan and Sandy Hook Bays, lobstering is concentrated primarily along the edges of channels (New Jersey Department of Environmental Protection, 1988).

The Service understands that the Corps benthic survey of Lower Bay and other selected areas of New York / New Jersey Harbor has been completed. Sampling techniques employed include Sediment Profiling Imagery, which uses a camera mounted on a heavy frame. A metal device on the bottom of the frame penetrates the sediments and the camera takes a cross-sectional profile photograph of the sediments. Also, a Shipek grab sampler, which takes bottom samples for analysis is used. Results from October 1994 and June 1995 surveys indicate that the three most common benthic invertebrates found within the Harbor estuary are *Ampelisca abdita, Streblospio benedict,* and *Mediomastus* sp. (Kurtz, pers. comm., 1998).

Within the Harbor estuary, the benthos of Newark Bay appears to have been relatively well sampled. Cerrato (1986) found that mean abundance of benthic invertebrates in Newark Bay is higher than other nearshore areas such as Raritan Bay, Flushing Bay, Bowery Bay and much of New York Harbor. Cerrato (1986) sampled 30 stations in Newark Bay, including both channel and shoal areas in May (spring) and August (summer) of 1985. During the spring sampling, the spionid polychaete *Streblospio benedicti* was found to be both the most ubiquitous and most abundant species, representing 27 percent of the total fauna in terms of number of individuals collected. Other dominant species included the spionid *Scolecolepides viridis* (21 percent), the soft-shell clam (15 percent), the spionid *Polydora ligni* (12 percent), the colonial polychaete *Sabellaria vulgaris* (7 percent), and the polychaete *Nereis succinea* (6 percent). *Scolecolepides viridis* was restricted to more sandy sites and soft-shell clam was more characteristic of sites with higher percentages of silt and clay.

Summer sampling by Cerrato (1986) identified the bay barnacle (*Balanus improvisus*) as the most numerically dominant species (24 percent of individuals collected) in Newark Bay. Other dominant species included the colonial polychaete *Sabellaria vulgaris* (17 percent), the spionid polychaete *Spio setosa* (15 percent), the soft-shell clam (14 percent), *Streblospio benedicti* (13 percent), and the tunicate *Molgula manhattensis* (5 percent).

Of the nine dominant species found during Cerrato's spring and summer sampling of Newark Bay, five have been identified as characteristic of polluted or organically enriched environments

by other researchers (Cerrato, 1986). These species are *Nereis succinea, Polydora ligni, Scolecolepides viridis, Streblospio benedicti,* and soft-shell clam.

Both abundance and diversity of animals per square meter were lower in the northern portion of Newark Bay than in the southern portion (Cerrato, 1986). Additionally, Cerrato (1986) found that sandy substrates (greater than 50 percent sand and gravel) had significantly higher abundance, species richness, and diversity than areas dominated by silt and clay (greater than 50 percent silt and clay). Cerrato (1986) did not find a statistically significant association between depth and faunal association.

D. NEW YORK BIGHT APEX

Marine areas within the New York Bight Apex also provide valuable habitats for numerous commercially valuable finfish and shellfish. In a study conducted by Wilk *et al.* (1992) from July 1986 to September 1989, 75 species of fish and macroinvertebrates were collected from areas in the vicinity of the now closed 12-mile sewage sludge dump site (located 12 miles east of Sandy Hook). Samples were collected using an otter trawl and were taken year-round during alternating months. The 11 most common fish collected were spiny dogfish (*Squalus acanthias*), little skate (*Raja erinacea*), silver hake (*Merluccius bilinearis*), red hake, ocean pout (*Macrozoarces americanus*), scup, cunner (*Tautogolabrus adspersus*), Atlantic butterfish, fourspot flounder (*Paralichthys oblongus*), windowpane flounder, and winter flounder.

The NJDFG&W conducts stock assessments of nearshore recreational fisheries resources for the purpose of monitoring the abundance or recreational fisheries in New Jersey coastal waters (New Jersey Division of Fish, Game and Wildlife, 1998). Sampling strata 12, 13, and 14 (Figure 7) extend into the New York Bight Apex. Sampling of each stratum has been occurring from five to six times per year since 1988 using a three-in-one trawl. The ten most common fish captured over the entire sampling period by stratum were: stratum 12 - bay anchovy, Atlantic butterfish, silver hake, Atlantic herring (*Clupea harengus*), weakfish, striped anchovy (*Anchoa hepsetus*), blueback herring (*Alosa aestivalis*), winter flounder, windowpane flounder, and little skate; stratum 13 - Atlantic butterfish, bay anchovy, scup (*Stenotomus chrysops*), Atlantic herring, silver hake, winter flounder, little skate, windowpane flounder, striped anchovy, and weakfish; stratum 14 - Atlantic butterfish, bay anchovy, scup, Atlantic herring, silver hake, winter flounder, little skate, cunner, blueback herring, and American sand lance (*Ammodytes americanus*).

As discussed above, the Magnuson - Stevens Fishery Conservation and Management Act of 1996 requires that the essential habitat of any species managed by the Regional Fishery Management Councils be recognized and that attempts should be made to avoid degrading these habitats. In the vicinity of the HARS, EFH has been or will be designated for the following species: Atlantic cod (*Gadus morhua*), whiting (*Merluccius bilinearis*), red hake, witch flounder (*Glyptocephalus cynoglossus*), winter flounder, yellowtail flounder (*Pleuronectes ferruginea*), windowpane flounder, Atlantic sea herring (*Clupea harengus*), monkfish (*Lophius americanus*), bluefish, Atlantic butterfish, summer flounder, scup, black sea bass, ocean quahog (*Arctica islandica*),

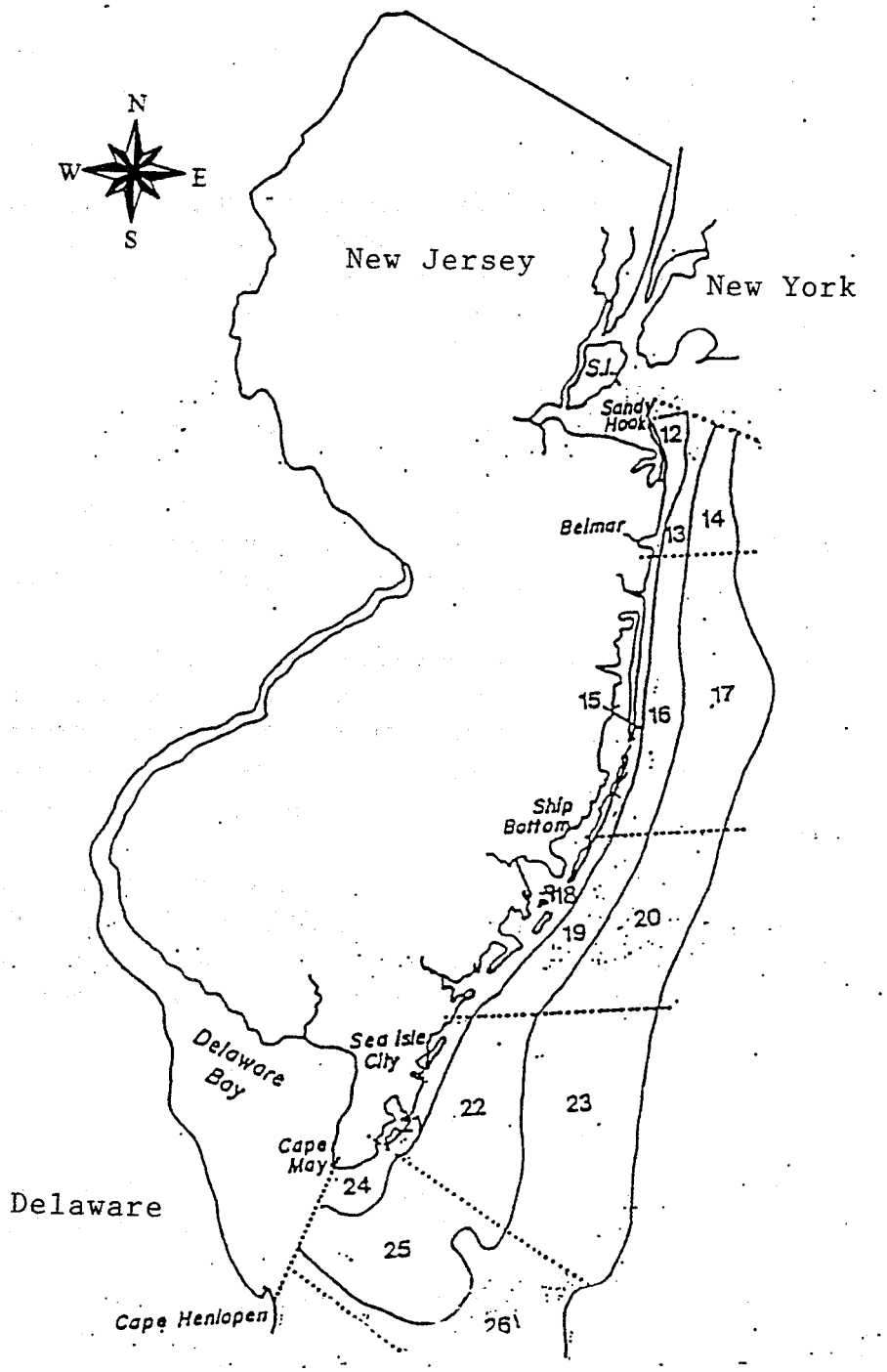

Figure 7. New Jersey nearshore recreational fisheries resources stock assessment sampling locations (New Jersey Division of Fish, Game and Wildlife, 1998).

king mackerel, (*Scomberomorus cavalla*), spanish mackerel, cobia, sand tiger shark, dusky shark, shortfin mako shark (*Isurus oxyrinchus*), sandbar shark, tiger shark (*Galeocerdo cuvieri*), bluefin tuna (*Thunnus thynnus*), and skipjack tuna (*Katsuwonus pelamis*).

The eight most common mega-invertebrates collected by Wilk *et al.* (1992), were longfin squid (*Loligo pealei*), northern shortfin squid (*Illex illecebrosus*), horseshoe crab (*Limulus polyphemus*), American lobster, Jonah crab (Cancer borealis), Atlantic rock crab (Cancer irroratus), lady crab (Ovalipes ocellatus), and starfish (*Asterias sp.*).

The ten most common mega-invertebrates collected by the NJDFG&W by stratum (Figure 7) were: stratum 12 - lobed moon shell (*Polinices duplicatus*), longfin squid, lady crab, sea star (*Stelleroidea*), common spider crab (*Libinia emarginata*), moon snail (*Polinices sp.*), surf clam, horseshoe crab, American lobster, and blue crab; stratum 13 - longfin squid, Atlantic rock crab, sea star, northern moon shell (*Lunatia heros*), lady crab, horseshoe crab, American lobster, sand dollar (*Echinarachnius parma*), common spider crab, and lobed moon shell; stratum 14 - longfin squid, rock crab; sea star; sand dollar, American lobster, northern moon shell, lady crab, sea scallop (*Placopecten magellanicus*), horseshoe crab, and shortfin squid.

E. ENDANGERED AND THREATENED SPECIES

1. Federally Listed Species

Federally listed species (Appendix B) are known to use habitats within and adjacent to the study area. Endangered whales that may occasionally enter the Harbor estuary include blue (*Balaenoptera musculus*), finback (*B. physalus*), humpback (*Megaptera novaeangliae*), right (*Balaena glacialis*), sei (*Balaenoptera borealis*), and sperm (*Physeter macrocephalus*). Juveniles of these species are most likely to enter the Harbor estuary.

Federally listed marine turtles expected to occur within the Harbor estuary include Kemps Ridley (*Lepidochelys kempii*) (endangered), leatherback (*Dermochelys coriacea*) (endangered), green (*Chelonia mydas*) (threatened), and loggerhead (*Caretta caretta*) (threatened). The Kemps Ridley is a relatively abundant sea turtle in the New York Bight. Individuals, usually 2- to 5-year-old juveniles are commonly found in the eastern part of the New York Bight from June to October (U.S. Fish and Wildlife Service, 1996). Kemps Ridleys feed primarily on green crab (*Carcinus maenas*) and spider crabs (*Libinia* spp.) within the Harbor estuary.

The leatherback is a common species in the New York Bight from May through November (U.S. Fish and Wildlife Service, 1996). Adult and large juveniles are both found feeding in the nearcoastal areas, but rarely in bays or lagoons. Leatherback turtles are water-column feeders, feeding predominantly on a variety of soft-bodied invertebrates.

In the New York Bight, green turtle distribution is related to submerged aquatic vegetation such as *Ulva* and *Codium spp.* Green turtles are found in the New York Bight from June through

October. Adult green turtles are benthic feeders, feeding on seagrasses and algae. Most of the green turtle's feeding habitat occurs in relatively shallow, protected waters such as the Harbor estuary.

Loggerhead turtles are known to arrive in the New York Bight as early at late May. Juveniles are found in the Harbor estuary (U.S. Fish and Wildlife Service, 1996). Loggerheads are omnivorous and eat a variety of benthic and pelagic food items, including bivalve mollusks, sponges, gastropods, squids, crabs, shrimp, and a variety of sea grass species.

The federally listed (endangered) shortnose sturgeon (*Acipenser brevirostrum*) is known to occur in the Harbor estuary. Within the Harbor estuary, shortnose sturgeon regularly occur in the Hudson River from Manhattan upriver to the federal dam at Troy, New York. Shortnose sturgeon begin their spawning migration in early spring and spawn in April and May in a freshwater region of the Hudson River below Troy, New York. Newly-hatched sturgeon larvae are bottom-oriented fish that are believed to be swept downriver to the rich estuarine areas.

The federally listed (threatened) piping plover (*Charadrius melodus*) is know to nest within the Harbor estuary. The piping plover, a small sandy colored shorebird, nests on coastal beaches and dunes, and feeds on marine macroinvertebrates in the intertidal beach zone as well as estuarine mudflats. The piping plover is threatened primarily due to loss of habitat to recreational development and increased disturbance of nesting areas.

Piping plovers nest on sandy beaches above the high tide line on mainland coastal beaches, sand flats, and barrier island coastal beaches. Nesting sites are typically located on gently sloping foredunes, blowout areas behind primary dunes, washover areas cut into or between dunes, ends of sandspits, and on sites with deposits of suitable dredged or pumped sand.

Food for adults and chicks consists of invertebrates such as marine worms, fly larvae, beetles, crustaceans, and mollusks. Feeding areas include intertidal portions of ocean beaches, ocean washover areas, mudflats, sandflats, wrack lines (organic ocean material left by high tide), shorelines of coastal ponds, lagoons, and salt marshes. Within the New York Bight Apex, areas with particularly high numbers of nesting plovers include Sandy Hook and Breezy Point.

The federally listed (endangered) roseate tern (*Sterna dougallii dougallii*) is known to occur within the Harbor estuary. The roseate tern is exclusively coastal, breeding on small islands or occasionally on barrier beaches. Within the New York Bight, roseate terns arrive between late April and early May. They often nest in association with common tern colonies. In 1998, eight pairs of roseate terns were confirmed nesting at Breezy Point.

The peregrine falcon (*Falco peregrinus*) has expanded its range and is now found nesting and feeding in urban areas. Peregrines feed on songbirds, gulls, terns, shorebirds, and wading birds. Peregrine falcons are known to nest on bridge structures in the New York / New Jersey metropolitan area and tend to prefer marshes and riparian habitats for feeding as these areas

attract shorebird and passerine prey. Approximately 12 pairs of peregrine falcons are currently nesting on bridges and buildings in the metropolitan New York City area. The New York Bight also provides important wintering and migratory habitat for peregrine falcons that nest in Canada. This previously federally listed (endangered) species was proposed for delisting on August 26, 1998 (FR 63(165): 45446-45463). The removal of the peregrine falcon, effective August 26, 1999, from the list of endangered and threatened species, removes all protections currently provided under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*). However, Section 4 (g)(1) of the Endangered Species Act requires the implementation of a program, in cooperation with the States, to monitor effectively for not less than 5 years the status of all recovered species no longer requiring Endangered Species Act protection.

There are no known nesting sites of the federally listed (threatened) bald eagle within the study area. However, occasional transient bald eagles are expected to occur within the study area.

Although extirpated from the area until recently, the federally listed (threatened) northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*) is now known to occur on Sandy Hook as a result of experimental re-establishments. The Service has worked cooperatively with the National Park Service on the re-establishment project.

The federally listed (threatened) plant Seabeach amaranth (*Amaranthus pumilus*) is known to occur within Kings and Queens Counties, New York. Seabeach amaranth is an annual plant that is endemic to Atlantic coast barrier islands. The plant persists in newly disturbed areas such as overwash flats and accreting ends of islands or spits and is out-competed by other vegetation in stable environments.

2. State-Listed Species

Appendix B contains lists of State-listed species for both New York and New Jersey. The following paragraphs identify the State-listed species known to occur in the project vicinity by Habitat Complex. State-listed species may also occur outside of the identified Habitat Complexes, within the study area.

The Service (1996) has identified numerous State-listed species within the Raritan Bay - Sandy Hook Bay Habitat Complex. State-listed endangered species in New Jersey include Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus*), northern harrier (*Circus cyaneus*), black skimmer (*Rynchops niger*), least tern, meadow horsetail (*Equisetum pratense*), coast flatsedge (*Cyperus polystachyos* var. *taxensis*), and seabeach knotweed (*Polygonum glaucum*). State-listed threatened species in New Jersey include great blue heron (*Ardea herodias*), yellow-crowned night-heron, and osprey (*Pandion haliaetus*). State-listed endangered species in New York include bleeding heart (*Dicentra eximia*) and white boneset (*Eupatorium leucolepis*). Whorled mountain mint (*Pycnanthemum verticillatum* var. *verticillatum*) is State-listed threatened in New York. Common loon (*Gavia immer*) is a State-listed animal of special concern in New York. Finally, State-listed rare plants in New York include hyssop loosestrife

(*Lythrum hyssopifolia*), soapwort gentian (*Gentiana saponaria*), and blackjack oak (*Quercus marilandica*).

The Service (1996) has identified numerous State-listed species within the Arthur Kill Habitat Complex. State-listed endangered species in New Jersey include Cooper's hawk, red-shouldered hawk, northern harrier, least tern, short-eared owl (*Asio flammeus*). State-listed threatened species in New Jersey include American bittern (*Botaurus lentiginosus*) osprey barred owl *(Strix varia),* red-headed woodpecker *(Melanerpes erythrocephalus)* and bobolink *(Dolichonyx oryzivorus)*. State-listed endangered species in New York include least tern, rose pink *(Sabatia angularis),* Virginia pine *(Pinus virginiana)*, and Nantucket Juneberry *(Amelanchier nantucketensis)*. State-listed threatened species in New York include eastern mud turtle *(Kinosternon subrubrum)* northern harrier, American bittern, osprey, and wingstem *(Verbesina alternifolia)*. State-listed animals of special concern in New York include short-eared owl, southern leopard frog *(Rana sphenocephala)*, common barn owl (*Tyto alba*), and common nighthawk *(Chordeiles minor)*. State-listed rare plants in New York include gray-green sedge (*Carex flaccosperma var. glaucodea*), persimmon *(Diospyros virginiana),* Stueve's or tall bush-clover *(Lespedeza stuevei),* and blackjack oak. Additionally, black-crowned night heron has recently been listed as threatened in New Jersey (Jenkins, pers. comm., 1999)

The Service (1996) has identified State-listed species within the Lower Hudson River Habitat Complex. State-listed endangered species in New Jersey include mud sunfish *(Acantharchus pomotis)* and cylindrical-headed bulrush *(Scirpus novae-angliae)*. The osprey is State-listed as threatened in both New Jersey and New York. The banded sunfish *(Enneacanthus obesus)* is a State-listed animal of special concern in New York.

VI. IDENTIFICATION OF PROJECT-RELATED IMPACTS TO FISH AND WILDLIFE AND RECOMMENDED MITIGATIVE MEASURES

Due to the large scope of the project and the above-discussed ecological value of the Harbor estuary, the potential to adversely affect fish and wildlife resources is great. Both direct and indirect adverse impacts may occur from channel dredging, widening, and dredged material disposal.

A. AQUATIC ORGANISMS

Dredging of channels and blasting of bedrock would result in direct mortality of benthic organism and fish and alter habitats in the immediate area. Additionally, the removal of benthic organisms could adversely affect the food base for benthic feeding fish such as winter flounder and hake. Dredging and blasting would also result in relatively short-term impacts to water quality via suspension of solids, which could alter abundance and distribution of aquatic species. The Corps has completed baseline benthic surveys and biological monitoring to determine the use of the project area by fish and macroinvertebrates. It is the Service's understanding that the

Corps will conduct post construction monitoring to assist in evaluating the impacts of the project on fish and wildlife resources.

Should spawning areas be identified for important recreational or commercial species within areas to the dredged, the Service would, in conjunction with the NMFS, NJDFG&W, and the NYDEC, recommend timing restrictions on dredging to reduce project impacts on natural resources. In addition, NJDFG&W data on shellfish beds within the project area are 15 years old (Joseph, pers. comm., 1998). According to Fox (pers. comm., 1998) the location of commercially valuable shellfish beds changes over time. However, the Corps (1999c) states that their aquatic sampling program determined that no commercially significant shellfish beds are located in the vicinity of areas to be dredged. Further, considering the large numbers of benthic-feeding fishes in the study area, maintenance and enhancement of benthic communities is recommended during project planning and as potential compensatory mitigation options, as these communities are a critical component for maintaining a healthy fishery in the Harbor estuary.

As EFH for 26 species managed by Regional Fishery Management Councils has been or will be identified within the project area, the Corps must initiate an EFH consultation with the NMFS to fulfill the requirements of the Magnuson - Stevens Fishery Conservation and Management Act of 1996. Additionally, the Service recommends that the Corps avoid adversely modifying EFH.

In addition to dredging, the disposal of dredged material has the potential to adversely affect aquatic organisms. Such impacts could occur as a result of decreased water quality, the elimination of benthic communities and the resuspension of contaminated sediments. However, it is the Service's understanding that all potential adverse impacts to fish and wildlife resources associated with various dredged material disposal options are being assessed by the Corps as part of the DMMP for the Port of New York and New Jersey. As previously noted, the Service recommends that the Corps continue to coordinate with the Service, NMFS, NJDFG&W, and the NYDEC regarding the DMMP.

B. WATER QUALITY AND HYDRAULIC PARAMETERS

The Service (1998) previously recommended that the Corps implement a long-term monitoring program to assess the impact of dredging on water quality. The Service understands that the Corps is currently undertaking a monitoring program to establish pre-construction conditions for the proposed project. However, the Service recommends that the Corps continue water quality monitoring throughout currently authorized dredging projects (e.g., Arthur Kill and Kill Van Kull). Such data collection would characterize the effects of dredging in areas proposed for deepening pursuant to this project and may assist in the Corps water quality modeling efforts. The Service requests the opportunity to review water quality monitoring results in conjunction with the NMFS and State resource agencies.

Channel deepening could result in decreased water velocity in some portions of the study area and subsequent increases in sedimentation. For example, the Corps (1986) concluded that

channel deepening within the Arthur Kill would likely result in a reduction in current velocity on the order of 10 percent, with a maximum reduction of up to 30 percent in the Elizabeth Port Reach. The Corps concluded that decreased current velocities in the Arthur Kill would cause increased sedimentation. Increased sedimentation rates could affect the distribution and abundance of aquatic organisms. As previously discussed, Cerrato (1986) found that the benthic community in Newark Bay was more diverse, abundant, and stable in areas with coarse-grained substrate (i.e., sand and gravel) than in areas with predominantly fine-grained substrate (i.e., silt and clay). Cerrato (1986) also found that sampling stations with fine-grained substrate were typically located in areas with shoaling rates of greater than 1.0 inch per year.

The Corps recently completed hydrodynamic and water quality modeling regarding the proposed project; however at the time of this writing, the Service has not yet received the finalized modeling effort. The Corps (1999a) concludes in its New York and New Jersey Harbor Navigation Study Environmental Impact Statement that there will be minimal to non-detectable changes in hydraulic conditions and water quality parameters such as water temperature, salinity, and dissolved oxygen as a result of proposed channel deepening throughout the Harbor estuary. The Corps states that the water surface elevation will increase 0.4 inches or less in elevation throughout the study area as a result of project implementation. Additionally, salinity in the Passaic and Hackensack Rivers will increase, on average, by less than 0.1 parts per thousand, with much smaller changes in other areas of the Harbor estuary. According to the Corps, differences in dissolved oxygen would be very small throughout the Harbor estuary with the largest differences predicted for the Arthur Kill, Kill Van Kull, and Newark Bay, where reductions in average dissolved oxygen could reach 0.003 parts per million (U.S. Army Corps of Engineers, 1999a).

The results of the hydraulic modeling effort discussed in the New York and New Jersey Harbor Navigation Study did not address sedimentation rates. Should results indicate that sedimentation rates would increase to greater than 1 inch per year as a result of the proposed project and any currently authorized project in areas with coarse substrate, then potentially significant impacts to benthic communities could occur. The Service requests the opportunity to review and comment on the Corps hydraulic modeling results in conjunction with the NMFS and State resource agencies.

C. WETLANDS, SHALLOW WATERS, MUDFLATS, AND BEACHES

The Corps (1999a) notes that shallow water (0.0 - 15 feet deep) impacts of the proposed project would total nearly 49 acres. The precise location of these impacts has not been identified by the Corps; however, the Corps states that the majority of the littoral zone impacts (0.0 - 6.0 feet deep) would occur in the Arthur Kill / Howland Hook vicinity as well as Newark Bay and the Kill Van Kull.

In addition to direct impacts associated with channel deepening and widening, indirect impacts may affect wetlands, shallow waters, mudflats, and beaches. Such indirect impacts could include

altered water velocities, altered sedimentation rates, increased wave action (due to increased ship traffic comprised of larger vessels), and resuspension and redistribution of environmental contaminants. In particular, wetlands along the Arthur Kill may be vulnerable to erosion due to increased wave action.

The Corps (1999a) determined that wave heights in Lower New York Bay would increase in the vicinity of Ambrose Channel as a result of deepening; however, waves on adjacent shorelines would be virtually unchanged in most areas of Lower New York Bay. The Corps predicts that the impact of ship wakes in the Upper New York Harbor with channel deepening may decrease. According to the Corps, this decrease would be due to deeper channels, which result in smaller waves, and the overall decrease in the number of ship cycles over the life of the project. The Corps (1999a) predicts that an overall reduction in ship cycles would reduce the total amount of wake energy absorbed at the shoreline, thereby reducing the opportunity for bank erosion. However, considering the expected long-term growth in container traffic within the Harbor estuary, the conclusion that the opportunity for bank erosion would be reduced seems questionable.

In addition to wave energy, the Service is concerned about indirect impacts such as altered water velocities, altered sedimentation rates, resuspension and redistribution of environmental contaminants, and slumping of channel side slopes on wetlands, shallow waters, mudflats, and beaches. While this information may be included in the Corps recently completed hydraulic modeling effort, as noted previously, the Service has not received the completed document. We note that these potential indirect impacts did not appear to be addressed in the Corps draft Environmental Impact Statement for the New York and New Jersey Harbor Navigation Study (U.S. Army Corps of Engineers, 1999a). Therefore, the Service recommends that the Corps fully evaluate the potential affect of altered water velocities, altered sedimentation rates, the resuspension and redistribution of environmental contaminants, and slumping of channel side slopes on wetlands, shallow waters, mudflats, and beaches.

While wetlands, shallow waters, mudflats, and beaches are important to aquatic species, they also are important as foraging sites for migratory birds, particularly colonial nesting waterbirds, migratory and wintering waterfowl, and shorebirds. They also contribute to the community and ecosystem diversity of the Harbor estuary. Therefore, the Service recommends that the Corps implement a shoreline erosion monitoring program to assess the long term impacts of the proposed project on sensitive aquatic habitats, such as wetlands, mudflats, and beaches, within the study area.

The Service considers the wetlands, shallow waters, mudflats, and beaches of the project area to be of high value to fish and wildlife resources and represent habitat components that have become scarce in the ecoregion. In accordance with the Service's Mitigation Policy (Federal Register, Vol. 46, No. 15, Jan. 23, 1981), our mitigation goal for this project in no-net-loss of in-kind habitat value. Given the high value of these habitat components in the project area to fish

and wildlife resources, appropriate measures must be implemented to protect these remaining areas from any reduction in quality or quantity.

The Corps proposes to compensate for impacts to fish and wildlife resources by purchasing and enhancing a total of 13 acres of wetlands in Staten Island, New York and Woodbridge, New Jersey. Since direct impacts to shallow water habitats (0-15 feet deep) would total approximately 49 acres, the proposed out-of-kind compensatory mitigation would be insufficient. The Service recommends that the Corp provide additional compensation for the proposed 49 acres of direct impacts to shallow waters. Additionally, the Service recommends that the Corps compensate for any indirect loss of habitat value within wetlands, shallow waters, mudflats, and beaches that may occur as a result of project implementation. Should insufficient opportunities for compensatory mitigation within the Harbor estuary exist, the Service would recommend that the Corps evaluate compensatory mitigation opportunities within the Hackensack Meadowlands.

D. BIRDS

Noise could disturb nesting and feeding birds, particularly wading birds and the federally listed peregrine falcon, piping plover, and roseate tern. A thorough discussion regarding impacts to federally listed species is included below in Section VI. F. Colonial nesting waterbirds could be disturbed by noise associated with blasting and the operation of dredging equipment within close proximity of Shooters Island. The Corps should determine the exact areas of blasting and discuss this issue further with the Service, the NJDFG&W and the NYDEC. The Service recommends that no dredging or blasting occur within 1,000 feet of Shooters Island between March 1 and August 31 of any given year to reduce adverse effects to nesting wading birds. Additionally, should dredging and blasting occur at night, the Corps should avoid illumination of Shooters Island to reduce disturbance to roosting wading birds. The Corps should contact the Service prior to March 1 of any given year where dredging and blasting is proposed to occur within 1,000 feet of Shooters Island to allow the Service to determine if the time and distance restrictions are necessary. Should Shooters Island not continue to be a regionally significant site for colonial nesting wading birds, the suggested time and distance restriction may be rescinded.

Both upland and CAD pit disposal of dredged material could affect migratory birds. Upland sites could represent potentially valuable areas for migratory landbirds as the Harbor estuary is located within the New York Bight Apex, which is a natural funnel for migratory birds. Confined Aquatic Disposal pits could also result in adverse impacts to birds via the uptake of released environmental contaminants. Species that would be particularly susceptible to bioaccumulation of environmental contaminants include piscivorous birds such as herons, egrets, cormorants, and waterfowl.

E. ENVIRONMENTAL CONTAMINANTS

Channel deepening may result in the resuspension and redistribution of environmental contaminants contained in material to be dredged. The Service is particularly concerned about

the potential for bioconcentration and biomagnification of halogenated aromatic hydrocarbons, including 2,3,7,8-TCDD (dioxin), polychlorinated biphenyls (PCBs), 2,2-(p-chlorophenyl)-1,1,1-chloroethane (DDT), and certain metals such as mercury in piscivorous birds (e.g., wading birds, waterfowl, shorebirds). A project-related increase in the bioavailability of dioxin, PCBs and other halogenated organic compounds could represent a substantial threat to these piscivorous birds.

The Corps (1999d) stated that sediment testing has recently been accomplished within the Arthur Kill, Kill Van Kull, and Port Jersey Channels. Additionally, the Corps stated that "...areas likely to require additional testing prior to disposal..." of dredged material will be described within the Feasibility Report. The Service is concerned that contaminant testing should not be used solely to determine appropriate dredged material disposal options. Additionally, the time between completion of currently authorized dredging (e.g., Arthur Kill and Kill Van Kull) and project implementation has not been discussed by the Corps. While sediments below currently authorized depths may be free of significant contamination, surface sediments that accumulate between dredging events are likely contaminated. Therefore, sediment testing should occur prior to dredging to allow for the use of appropriate mitigative dredging measures to minimize the potential exposure of fish and wildlife resources to contaminants. Results should be provided to the Service, NMFS, and the State resource agencies for review. Should pre-construction sediment testing reveal the presence of contaminated sediments, the Service would recommend implementation of best management practices such as closed clam shell buckets, no barge overflow, and silt curtains to reduce the likelihood of contaminant exposure to fish and wildlife resources.

Additionally, the Service may request that the Corps conduct environmental contaminants studies to determine the affect to fish and wildlife resources of contaminants contained in sediments that are dredged. The Service would only recommend such studies if pre-dredging sediment testing revealed the presence of contaminants of concern to the Service and hydrologic modeling indicated that sediment plumes from the dredging of contaminated sediment would travel to environmentally sensitive areas or areas that are relatively uncontaminated at present.

F. FEDERALLY LISTED SPECIES

The proposed project has the potential to affect federally listed species. The proposed project may affect marine turtles and whales via direct physical harm associated with dredging and blasting. Marine turtles and whales may also be struck by ships transporting dredged material. Finally, the shortnose sturgeon could be affected should the proposed project result in altered hydraulic and water quality parameters within the lower Hudson River.

Principal responsibility for marine turtles, whales, and the shortnose sturgeon is vested with the NMFS. Therefore, the NMFS must be contacted to fulfill consultation requirements pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*):

National Marine Fisheries Service
Habitat and Protected Resources Division
Sandy Hook Laboratory
Highlands, New Jersey 07732
(732) 872-3023

With regard to federally listed species under the purview of the Service, direct impacts to federally listed species could occur as a result of noise generated by dredging and blasting. Noise could disturb nesting and feeding activities of roseate terns, and peregrine falcons (delisted, but monitored).

Additionally, even temporary degradation of water quality may adversely impact federally listed species. Degraded water quality could result in the direct mortality of northeastern beach tiger beetle larvae or may cause a decrease in the benthic macroinvertebrate prey base for the tiger beetle and the piping plover.

Any project-related impacts to beaches such as increased erosion or deposition rates, may affect federally listed species including the piping plover, roseate tern, northeastern beach tiger beetle, and seabeach amaranth.

As discussed above, dredging and blasting as well as disposal of sediments in CAD pits could resuspend contaminated sediments, making environmental contaminants available for bioaccumulation through the food chain, which may affect higher level consumers including the roseate tern and peregrine falcon. Additionally, while resuspended, contaminated sediments may be transported into less contaminated shallow water habitats, thereby posing risks of adverse effects for directly exposed benthic organisms such as northeastern beach tiger beetle larvae or other macroinvertebrates that comprise the prey base for the tiger beetle and / or the piping plover.

In addition, upland disposal of dredged material may affect the peregrine falcon. As discussed previously, the peregrine falcon is known to nest and forage within the project area. Dredged material disposal areas have the potential to attract and concentrate prey species (e.g., gulls) that may be exposed to potentially high levels of contaminants associated with dredged material deposited at disposal sites. In turn, concentrations of prey species attract predators such as the peregrine falcon. Due to its high position in the food chain, the peregrine falcon is at risk of dietary exposure to bioaccumulating environmental contaminants.

The Service understands that the Corps is in the process of preparing a Biological Assessment to comply with requirements of the Endangered Species Act for species under Service jurisdiction. The Biological Assessment will address the aforementioned potential impacts and any other potential impacts to federally listed species, as identified by the Corps during project planning. The lead federal agency for a project has the responsibility under Section 7(c) of the Endangered Species Act to prepare a Biological Assessment, if the proposal is a major construction project

that requires an Environmental Impact Statement. The assessment should contain information concerning listed or proposed species that may be present in the action area and an analysis of any potential effects of the proposed action on such species. The following may be considered for inclusion in a Biological Assessment of the proposed project, although actual contents are at the discretion of the federal authorizing agency:

- o results of field surveys to determine if listed species are present or occur seasonally;
- o views of recognized experts on the species;
- o literature review;
- o analysis of direct, indirect, and cumulative effects of the action on the species; and,
- o analysis of alternative actions.

Biological Assessments may be consolidated with documents produced under interagency cooperation procedures required by other statutes such as the Fish and Wildlife Coordination Act (48 Stat. 401; 16 U.S.C. 661 *et seq.*) or the National Environmental Policy Act (83 Stat. 852; 42 U.S.C. 4321 *et seq.*). However, the satisfaction of the requirements of these other statutes does not in itself relieve a federal agency of its obligation to comply with the Biological Assessment procedures of the Endangered Species Act. If the Biological Assessment indicates that no listed or proposed species are present or will be affected, and the Service concurs, in writing, with the assessment, then no formal consultation pursuant to Section 7 will be required.

G. STATE-LISTED SPECIES

As discussed above, numerous State-listed species are known to occur within the project area. The Service has determined that the proposed project may affect a number of these State-listed species. The least tern (listed as endangered in New Jersey and New York) is known to nest in the project area on dredged material disposal sites (Jenkins, pers. comm., 1999). Therefore, the disposal of dredged material at historic dredged material disposal sites may affect the least tern via disturbance during nesting and loss of nesting habitat.

Additionally, the resuspension of contaminated sediments could make environmental contaminants available for bioaccumulation through the food chain, which may affect higher level consumers such as the least tern, black skimmer, black-crowned night heron, yellow-crowned night heron, American bittern, osprey, and great blue heron.

As upland dredged material disposal sites have not been identified, it is not possible for the Service to make an assessment of the likelihood of the proposed project affecting State-listed plants.

As alternative dredged material disposal sites are identified, the Service recommends that the Corps coordinate with the NJDFG&W and the NYDEC to determine adverse impacts to State-listed species.

H. HABITAT IMPROVEMENT OPPORTUNITIES

It is clear that channel deepening will adversely affect fish and wildlife resources throughout the project area. As proposed, rock removed from channels would be used for the creation of off-shore artificial reefs and uncontaminated non-rock material would be used to remediate the HARS. However, neither of these beneficial uses would compensate for the loss of wetlands, shallow waters, mudflats, wetlands, or beaches. Therefore, the Corps should evaluate opportunities to compensate for such impacts to fish and wildlife resources via habitat creation and enhancement within the Harbor estuary.

Should opportunities for habitat restoration not be readily identifiable within the Harbor estuary, the Service would recommend evaluating the feasibility of purchasing and enhancing wetlands within the Hackensack Meadowlands that are under threat of development. Currently nearly 500 acres of wetlands within the Meadowlands are proposed for filling associated with the Special Area Management Plan for the Hackensack Meadowlands. The Hackensack Meadowlands provides important habitat to federal trust resources, especially migratory birds and fish. Although somewhat degraded and fragmented by development, the remaining approximately 8,450 acres of the Hackensack Meadowlands provide important habitats for fish and wildlife resources such as waterfowl, wading birds, shorebirds, raptors, anadromous fish, estuarine fish, and terrapins. The Service notes that the Hackensack Meadowlands is immediately upstream of Newark Bay, Arthur Kill and the Kill Van Kull, where significant impacts to fish and wildlife resources, associated with the subject project are expected to occur. The Service recommends that the Corps work closely with the Service, NMFS, NJDFG&W, and the NYDEC to identify additional sites and develop plans for compensatory mitigation projects.

VII. CONCLUSIONS AND SUMMARY OF RECOMMENDATIONS

The Service concludes that the Harbor estuary and its adjacent marine and upland habitats provides high-quality habitats for fish and wildlife resources and that the proposed dredging project has the potential to adversely impact these resources both directly and indirectly. To minimize the impacts of any project that is proposed by the Corps, the Service provides the following summary of recommendations.

1. Continue to coordinate with the Service and other federal and State resource agencies regarding the Dredged Material Management Plan for the Port of New York and New Jersey.

2. Evaluate the affects port facility expansions will have on the human environment and fish and wildlife resources within the Corps New York and New Jersey Harbor Navigation study Environmental Impact Statement.

3. Conduct post construction benthic surveys and biological monitoring of fish and macroinvertebrates to determine the direct and indirect affects of project implementation. Coordinate with the Service, NMFS, and State resource agencies for recommendations based on results.

4. Consider opportunities for maintenance and enhancement of benthic communities. These opportunities could be incorporated as compensatory mitigation for project impacts to fish and wildlife resources.

5. Initiate essential fish habitat consultation with NMFS.

6. Avoid adversely modifying essential fish habitat within the project area.

7. Establish a long-term water quality monitoring program to assess the impacts of Corps dredging projects on water quality. Provide federal and State resource agencies with review copies of monitoring results.

8. Evaluate the proposed project's potential affect of sedimentation rates within the Harbor estuary. Should results indicate that sedimentation rates would increase to greater than 1 inch per year as a result of the proposed project and any currently authorized project in areas with coarse substrate, then potentially significant impacts to benthic communities could occur. Provide federal and State resource agencies with review copies of modeling results.

9. Evaluate the potential affect of altered water velocities, altered sedimentation rates, the resuspension and redistribution of environmental contaminants, and slumping of channel side slopes on wetlands, shallow waters, mudflats, and beaches.

10. Implement a shoreline erosion monitoring program to assess the long-term impacts of the proposed project on sensitive aquatic habitats, such as wetlands, mudflats, and beaches, within the study area.

11. Provide additional compensation for the proposed 49 acres of direct impacts to shallow waters that would result from project implementation. Additionally, provide compensation for any indirect loss of habitat value within wetlands, shallow waters, mudflats, or beaches that would result from implementation of the proposed project. Should insufficient opportunities for compensatory mitigation within the Harbor estuary exist, the Service would recommend that the Corps

evaluate compensatory mitigation opportunities within the Hackensack Meadowlands.

12. Prohibit dredging and blasting within 1,000 feet of Shooters Island between March 1 and August 31 of any given year and avoid illuminating Shooters Island if dredging and blasting occurs at night. The Corps should contact the Service to determine if these restrictions are necessary prior to each nesting season. Should Shooters Island become abandoned or if its use as a breeding site for wading birds substantially declines, these recommended restrictions may be modified or rescinded.

13. Test sediments to be dredged for the presence of environmental contaminants. Coordinate the results of such testing with the Service, NMFS, NJDFG&W, and the NYDEC.

14. Incorporate the use of protective devices such as silt curtains and sealed buckets to protect wetlands, shallow waters, mudflats, and beaches located in proximity to the proposed dredging from siltation should pre-construction sediment testing reveal the presence of contaminants.

15. Consult with the NMFS pursuant to Section 7(a)(2) of the Endangered Species Act regarding potential affects to federally listed whales and sea turtles as well as the federally listed shortnose sturgeon.

16. Complete preparation of a Biological Assessment for the Service with regard to potential impacts to federally listed species.

17. Consult with the appropriate State agencies regarding potential impacts to State-listed species.

18. Evaluate opportunities to compensate for impacts to shallow waters, mudflats, wetlands, and beaches due to impacts of channel deepening. If opportunities within the Harbor Estuary are unavailable, evaluate the feasibility of purchasing and enhancing / restoring wetlands within the Hackensack Meadowlands that are under threat of development.

19. Coordinate with the Service, NMFS, NJDFG&W, and NYDEC to identify additional sites and to develop plans for compensatory mitigation.

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Appendix A

Species Managed by the Regional Fishery Management Councils for Which Essential Fish Habitat will be Designated

NEW ENGLAND FISHERY MANAGEMENT COUNCIL

NORTHEAST MULTISPECIES FISHERY MANAGEMENT PLAN
- Atlantic cod - *Gadus morhua*
- witch flounder - *Glyptocephalus cynoglossus*
- American plaice - *Hippoglossoides platessoides*
- yellowtail flounder - *Limanda ferruginea*
- ocean pout - *Macrozoarces americanus*
- haddock - *Melanogrammus aeglefinus*
- silver hake - *Merluccius bilinearis*
- pollock - *Pollachius virens*
- winter flounder - *Pseudopleuronectes americanus*
- windowpane flounder - *Scophthalmus aquosus*
- redfish - *Sebastes fasciatus*
- red hake - *Urophycis chuss*
- white hake - *Urophycis tenuis*
- Atlantic halibut - *Hippoglossus hippoglossus*
- offshore hake - *Merluccius alibidus*

ATLANTIC SEA SCALLOP FISHERY MANAGEMENT PLAN
- Atlantic sea scallop - *Placopecten magellanicus*

ATLANTIC HERRING FISHERY MANAGEMENT PLAN
- Atlantic sea herring - *Clupea harengus*

SALMON FISHERY MANAGEMENT PLAN
- Atlantic salmon - *Salmo salar*

MONKFISH FISHERY MANAGEMENT PLAN
- monkfish (goosefish) - *Lophius americanus*

MID-ATLANTIC FISHERY MANAGEMENT COUNCIL

BLUEFISH FISHERY MANAGEMENT PLAN
- bluefish - *Pomatomus saltatrix*

SUMMER FLOUNDER, SCUP AND BLACK SEA BASS FISHERY MANAGEMENT PLAN
- summer flounder - *Paralichthys dentatus*
- scup - *Stenotomus chrysops*
- black sea bass - *Centropristus striata*

SURF CLAM AND OCEAN QUAHOG FISHERY MANAGEMENT PLAN
- surf clam - *Spisula solidissima*
- ocean quahog - *Artica islandica*

DOGFISH FISHERY MANAGEMENT PLAN
- spiny dogfish - *Squalus acanthias*

TILEFISH FISHERY MANAGEMENT PLAN
- tilefish - *Lopholatilus chamaeleonticeps*

SQUID, MACKEREL AND BUTTERFISH FISHERY MANAGEMENT PLAN
- long finned squid - *Loligo pealei*
- Short finned squid - *Illex illecebrosus*
- Atlantic butterfish - *Peprilus triacanthus*
- Atlantic mackerel - *Scomber scombrus*

SOUTH ATLANTIC FISHERY MANAGEMENT COUNCIL

RED DRUM FISHERY MANAGEMENT PLAN
- drum - *Sciaenops ocellatus*

GOLDEN CRAB FISHERY MANAGEMENT PLAN
- golden crab - *Chaeceon fenneri*

COASTAL PELAGICS FISHERY MANAGEMENT PLAN
- king mackerel - *Scomberomorus cavalla*
- Spanish mackerel - *Scomberomorus maculatus*
- cobia - *Rachycentron canadum*

NATIONAL MARINE FISHERIES SERVICE

ATLANTIC HIGHLY MIGRATORY SPECIES FISHERY MANAGEMENT PLAN
- swordfish - *Xiphias gladius*
- bluefin tuna - *Thunnus thynnus*
- bigeye tuna - *Thunnus obesus*
- albacore - *Thunnus alalunga*
- skipjack tuna - *Katsuwonus pelamis*

(SHARKS)
- tiger - *Galeocerdo cuvieri*
- scalloped hammerhead - *Sphyrna lewini*
- sandbar - *Carcharhinus plumbeus*
- sand tiger - *Odontaspis taurus*
- dusky - *Carcharhinus obscurus*
- basking - *Cetorhinus maximus*
- silky - *Carcharhinus falciformis*
- white - *Carcharodon carcharias*
- Atlantic sharpnose - *Rhizoprionodon terraenovae*
- Atlantic angel - *Squatina dumerili*
- shortfin mako - *Isurus oxyrinchus*
- longfin. mako - *Isurus paucus*
- porbeagle - *Lamna nasus*
- thresher - *Alopias vulpinus*
- blue - *Prionace glauca*

ATLANTIC BILLFISHES FISHERY MANAGEMENT PLAN
- blue marlin - *Makaira nigricans*
- white marlin - *Tetrapturus albidus*

Appendix B

Federal and State-Listed Endangered and Threatened Species and Federal Candidate Species in New Jersey and New York

FEDERALLY LISTED ENDANGERED AND THREATENED SPECIES IN NEW JERSEY

An **ENDANGERED** species is any species that is in danger of extinction throughout all or a significant portion of its range.

A **THREATENED** species is any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

	COMMON NAME	SCIENTIFIC NAME	STATUS
FISHES	**Shortnose sturgeon***	*Acipenser brevirostrum*	E
REPTILES	**Bog turtle**	*Clemmys muhlenbergii*	T
	Atlantic Ridley turtle*	*Lepidochelys kempii*	E
	Green turtle*	*Chelonia mydas*	T
	Hawksbill turtle*	*Eretmochelys imbricata*	E
	Leatherback turtle*	*Dermochelys coriacea*	E
	Loggerhead turtle*	*Caretta caretta*	T
BIRDS	**Bald eagle**	*Haliaeetus leucocephalus*	T
	Piping plover	*Charadrius melodus*	T
	Roseate tern	*Sterna dougallii dougallii*	E
MAMMALS	**Eastern cougar**	*Felis concolor couguar*	E+
	Indiana bat	*Myotis sodalis*	E
	Gray wolf	*Canis lupus*	E+
	Delmarva fox squirrel	*Sciurus niger cinereus*	E+
	Blue whale*	*Balaenoptera musculus*	E
	Finback whale*	*Balaenoptera physalus*	E
	Humpback whale*	*Megaptera novaeangliae*	E
	Right whale*	*Balaena glacialis*	E
	Sei whale*	*Balaenoptera borealis*	E
	Sperm whale*	*Physeter macrocephalus*	E

	COMMON NAME	SCIENTIFIC NAME	STATUS
INVERTEBRATES	**Dwarf wedgemussel**	*Alasmidonta heterodon*	E
	Northeastern beach tiger beetle	*Cicindela dorsalis dorsalis*	T
	Mitchell saytr butterfly	*Neonympha m. mitchellii*	E+
	American burying beetle	*Nicrophorus americanus*	E+
PLANTS	**Small whorled pogonia**	*Isotria medeoloides*	T
	Swamp pink	*Helonias bullata*	T
	Eastern prairie fringed orchid	*Platanthera leucophaea*	T+
	Knieskern's beaked-rush	*Rhynchospora knieskernii*	T
	American chaffseed	*Schwalbea americana*	E
	Sensitive joint-vetch	*Aeschynomene virginica*	T
	Sea-beach pigweed	*Amaranthus pumilus*	T+

STATUS:			
E	endangered species	PE	proposed endangered
T	threatened species	PT	proposed threatened
+	presumed extirpated		

* Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service.

Note: for a complete listing of Endangered and Threatened Wildlife and Plants, refer to 50 CFR 17.11 and 17.12.

For further information, please contact:

U.S. Fish and Wildlife Service
New Jersey Field Office
927 N. Main Street, Building D
Pleasantville, New Jersey 08232
Phone: (609) 646-9310
Fax: (609) 646-0352

Revised 08/26/99

FEDERAL CANDIDATE SPECIES IN NEW JERSEY

CANDIDATE SPECIES are species that appear to warrant consideration for addition to the federal List of Endangered and Threatened Wildlife and Plants. Although these species receive no substantive or procedural protection under the Endangered Species Act, the U.S. Fish and Wildlife Service encourages federal agencies and other planners to give consideration to these species in the environmental planning process.

SPECIES	SCIENTIFIC NAME
Bog asphodel	*Narthecium americanum*
Hirst's panic grass	*Panicum hirstii*

Note: For complete listings of taxa under review as candidate species, refer to Federal Register Vol. 64, No. 205, October 25, 1999 (Endangered and Threatened Wildlife and Plants; Review of Plant and Animal Taxa that are Candidates for Listing as Endangered or Threatened Species).

Revised 11/99

ENDANGERED AND THREATENED WILDLIFE OF NEW JERSEY

Endangered Species are those whose prospects for survival in New Jersey are in immediate danger because of a loss or change in habitat, over-exploitation, predation, competition, disease, disturbance, or contamination. Assistance is needed to prevent future extinction in New Jersey.

Threatened Species are those who may become endangered if conditions surrounding them begin to or continue to deteriorate.

BIRDS

Endangered

Pied-billed grebe, *Podilymbus podiceps**
American bittern, *Botaurus lentiginosus**
Bald eagle, *Haliaeetus leucocephalus***
Northern harrier, *Circus cyaneus**
Northern goshawk, *Accipiter gentilis*
Red-shouldered hawk, *Buteo lineatus*[BR]
Peregrine falcon, *Falco peregrinus*
Piping plover, *Charadrius melodus***
Upland sandpiper, *Bartramia longicauda*
Roseate tern, *Sterna dougallii*
Least tern, *Sterna antillarum*
Black skimmer, *Rynchops niger*
Short-eared owl, *Asio flammeus**
Sedge wren, *Cistothorus platensis*
Loggerhead shrike, *Lanius ludovicianus*
Vesper sparrow, *Pooecetes gramineus*
Henslow's sparrow, *Ammodramus henslowii*

Threatened

Black-crowned night heron, *Nycticorax nycticorax*
Yellow-crowned night heron, *Nyctanassa violaceus*
Red knot, *Calidris canutus*
Osprey, *Pandion haliaetus*
Cooper's hawk, *Accipiter cooperii*
Red-shouldered hawk, *Buteo lineatus*[NB]
Black rail, *Laterallus jamaicensis*
Long-eared owl, *Asio otus*
Barred owl, *Strix varia*
Red-headed woodpecker, *Melanerpes erythrocephalus*
Savannah sparrow, *Passerculus sandwichensis*
Grasshopper sparrow, *Ammodramus savannarum*
Bobolink, *Dolichonyx oryzivorus*

* Only breeding population considered endangered or threatened.
** Federally endangered or threatened.
[BR] Breeding population only.
[NB] Non-breeding population only.

REPTILES

Endangered

Bog turtle, *Clemmys muhlenbergi*
Atlantic hawksbill, *Eretmochelys imbricata***
Atlantic loggerhead, *Caretta caretta***
Atlantic ridley, *Lepidochelys kempi***
Atlantic leatherback, *Dermochelys coriacea***
Corn snake, *Elaphe g. guttata*
Timber rattlesnake, *Crotalus h. horridus*

Threatened

Wood turtle, *Clemmys insculpta*
Atlantic green turtle, *Chelonia mydas***
Northern pine snake, *Pituophis m. melanoleucus*

**Federally endangered or threatened

AMPHIBIANS

Endangered

Tremblay's salamander, *Ambystoma tremblayi*
Blue-spotted salamander, *Ambystoma laterale*
Eastern tiger salamander, *Ambystoma t. tigrinum*
Pine Barrens treefrog, *Hyla andersonii*
Southern gray treefrog, *Hyla chrysoscelis*

Threatened

Long-tailed salamander, *Eurycea longicauda*
Eastern mud salamander, *Pseudotriton montanus*

MAMMALS

Endangered

Bobcat, *Lynx rufus*
Eastern woodrat, *Neotoma floridana*
Sperm whale, *Physeter macrocephalus***
Fin whale, *Balaenoptera physalus***
Sei whale, *Balaenoptera borealis***
Blue whale, *Balaenoptera musculus***
Humpback whale, *Megaptera novaeangliae***
Black right whale, *Balaena glacialis***

INVERTEBRATES

Threatened

Mitchell's satyr, *Neonympha m. mitchellii***
Northeastern beach tiger beetle, *Cicindela d. dorsalis*
American burying beetle, *Nicrophorus americanus***
Dwarf wedge mussel, *Alasmidonta heterodon***

**Federally endangered

FISH

Endangered

Shortnose sturgeon, *Acipenser brevirostrum***

List revisions:	March 29, 1979
	January 17, 1984
	May 6, 1985
	July 20, 1987
	June 3, 1991
	July 19, 1999

The lists of New Jersey's endangered and nongame wildlife species are maintained by the DEP's Division of Fish, Game, and Wildlife's Endangered and Nongame Species Program. These lists are used to determine protection and management actions necessary to ensure the survival of the state's endangered and nongame wildlife. This work is made possible through voluntary contributions received through Check-off donations to the Endangered Wildlife Conservation Fund on the New Jersey State Income Tax Form, the sale of Conserve Wildlife License Plates, and donations. For more information about the Endangered and Nongame Species Program or to report a sighting of endangered or threatened wildlife, contact: Endangered and Nongame Species Program, Northern District Office, Box 383, R.D. 1, Hampton, NJ 08827, or call (908) 735-8975.

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES IN NEW YORK

Common Name	Scientific Name	Status	Distribution
FISHES			
Sturgeon, shortnose*	*Acipenser brevirostrum*	E	Hudson River & other Atlantic coastal rivers
REPTILES			
Turtle, bog	*Clemmys muhlenbergii*	T	Albany, Columbia, Dutchess, Genesee, Orange, Oswego, Putnam, Seneca, Ulster, Wayne, and Westchester Counties
Turtle, green*	*Chelonia mydas*	T	Oceanic summer visitor coastal waters
Turtle, hawksbill*	*Eretmochelys imbricata*	E	Oceanic summer visitor coastal waters
Turtle, leatherback*	*Dermochelys coriacea*	E	Oceanic summer resident coastal waters
Turtle, loggerhead*	*Caretta caretta*	T	Oceanic summer resident coastal waters
Turtle, Atlantic ridley*	*Lepidochelys kempii*	E	Oceanic summer resident coastal waters
BIRDS			
Eagle, bald	*Haliaeetus leucocephalus*	T	Entire state
Plover, piping	*Charadrius melodus*	E T	Great Lakes Watershed Remainder of coastal New York
Tern, roseate	*Sterna dougallii dougallii*	E	Southeastern coastal portions of state
MAMMALS			
Bat, Indiana	*Myotis sodalis*	E	Entire state
Cougar, eastern	*Felis concolor couguar*	E	Entire state - probably extinct
Whale, blue*	*Balaenoptera musculus*	E	Oceanic
Whale, finback*	*Balaenoptera physalus*	E	Oceanic
Whale, humpback*	*Megaptera novaeangliae*	E	Oceanic
Whale, right*	*Eubalaena glacialis*	E	Oceanic
Whale, sei*	*Balaenoptera borealis*	E	Oceanic
Whale, sperm*	*Physeter catodon*	E	Oceanic
MOLLUSKS			
Snail, Chittenango ovate amber	*Succinea chittenangoensis*	T	Madison County
Mussel, dwarf wedge	*Alasmidonta heterodon*	E	Orange County - lower Neversink River

* Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service.

Region 5 - 11/04/97 - 2 pp.

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES IN NEW YORK (Cont'd)

Common Name	Scientific Name	Status	Distribution
BUTTERFLIES			
Butterfly, Karner blue	*Lycaeides melissa samuelis*	E	Albany, Saratoga, Warren, and Schenectady Counties
PLANTS			
Monkshood, northern wild	*Aconitum noveboracense*	T	Ulster, Sullivan, and Delaware Counties
Pogonia, small whorled	*Isotria medeoloides*	T	Entire state
Swamp pink	*Helonias bullata*	T	Staten Island - presumed extirpated
Gerardia, sandplain	*Agalinis acuta*	E	Nassau and Suffolk Counties
Fern, American hart's-tongue	*Asplenium scolopendrium* var. *americana*	T	Onondaga and Madison Counties
Orchid, eastern prairie fringed	*Platanthera leucophea*	T	Not relocated in New York
Bulrush, northeastern	*Scirpus ancistrochaetus*	E	Not relocated in New York
Roseroot, Leedy's	*Sedum integrifolium* ssp. *Leedyi*	T	West shore of Seneca Lake
Amaranth, seabeach	*Amaranthus pumilus*	T	Atlantic coastal plain beaches
Goldenrod, Houghton's	*Solidago houghtonii*.	T	Genesee County

E=endangered T=threatened P=proposed

Region 5 - 11/04/97 - 2 pp.

Endangered, Threatened and Special Concern Fish & Wildlife Species of New York State

(List currently in effect, changes were proposed May 11, 1999)

Endangered

• Chittenango Ovate Amber Snail	*Succinea chittenangoensis*
♦ Dwarf Wedge Mussel	*Alasmidonta heterodon*
♦ Karner Blue Butterfly	*Lycaeides melissa samuelis*
*♦ American Burying Beetle	*Nicrophorus americanus*
♦ Shortnose Sturgeon	*Acipenser brevirostrum*
Round Whitefish	*Prosopium cylindraceum*
Pugnose Shiner	*Notropis anogenus*
Eastern Sand Darter	*Ammocrypta pellucida*
Bluebreast Darter	*Etheostoma camurum*
Gilt Darter	*Percina evides*
* Spoonhead Sculpin	*Cottus ricei*
* Deepwater Sculpin	*Myoxocephalus thompsoni*
Tiger Salamander	*Ambystoma tigrinum*
•Bog Turtle	*Clemmys muhlenbergii*
♦ Leatherback Sea Turtle	*Dermochelys coriacea*
♦ Hawksbill Sea Turtle	*Eretmochelys imbricata*
♦ Kemp's Ridley Sea Turtle	*Lepidochelys kempii*
Massasauga	*Sistrurus catenatus*
* Golden Eagle	*Aquila chrysaetos*
• Bald Eagle	*Haliaeetus leucocephalus*
♦ Peregrine Falcon	*Falco peregrinus*
*♦ Eskimo Curlew	*Numenius borealis*
•♦ Piping Plover1	*Charadrius melodus*
Least Tern	*Sterna antillarum*
♦ Roseate Tern	*Sterna dougallii*
Loggerhead Shrike	*Lanius ludovicianus*
♦ Indiana Bat	*Myotis sodalis*
♦ Sperm Whale	*Physeter catodon*
♦ Sei Whale	*Balaenoptera borealis*
♦ Blue Whale	*Balaenoptera musculus*
♦ Finback Whale	*Balaenoptera physalus*
♦ Humpback Whale	*Megaptera novaeangliae*
♦ Right Whale	*Eubalaena glacialis*
*♦ Gray Wolf	*Canis lupus*
*♦ Cougar	*Felis concolor*
* Allegheny Woodrat	*Neotoma magister*

Threatened

*• Northeastern Beach Tiger Beetle	*Cicindela dorsalis dorsalis*
Lake Sturgeon	*Acipenser fulvescens*
Mooneye	*Hiodon tergisus*
Lake Chubsucker	*Erimyzon sucetta*
Mud Sunfish	*Acantharchus pomotis*
Longear Sunfish	*Lepomis megalotis*
Northern Cricket Frog	*Acris crepitans*

Northern Cricket Frog	*Acris crepitans*
Eastern Mud Turtle	*Kinosternon subrubrum*
Blanding's Turtle	*Emydoidea blandingii*
• Loggerhead Sea Turtle	*Caretta caretta*
• Green Sea Turtle	*Chelonia mydas*
Timber Rattlesnake	*Crotalus horridus*
Osprey	*Pandion haliaetus*
Red-shouldered Hawk	*Buteo lineatus*
Northern Harrier	*Circus cyaneus*
Spruce Grouse	*Dendragapus canadensis*
Common Tern	*Sterna hirundo*

Special Concern

Barrens Buckmoth	*Hemileuca maia*
Silver Chub	*Macrhybopsis storeriana*
Gravel Chub	*Erimystax x-punctata*
Blackchin Shiner	*Notropis heterodon*
Black Redhorse	*Moxostoma duquesnei*
Banded Sunfish	*Enneacanthus obesus*
Longhead Darter	*Percina macrocephala*
Southern Leopard Frog	*Rana utricularia*
Hellbender	*Cryptobranchus alleganiensis*
Jefferson Salamander	*Ambystoma jeffersonianum*
Blue-spotted Salamander	*Ambystoma laterale*
Spotted Salamander	*Ambystoma maculatum*
Spotted Turtle	*Clemmys guttata*
Wood Turtle	*Clemmys insculpta*
Diamondback Terrapin	*Malaclemys terrapin*
Worm Snake	*Carphophis amoenus*
Eastern Hognose Snake	*Heterodon platyrhinos*
Common Loon	*Gavia immer*
Least Bittern	*Ixobrychus exilis*
Cooper's Hawk	*Accipiter cooperii*
Black Rail	*Laterallus jamaicensis*
Upland Sandpiper	*Bartramia longicauda*
Black Tern	*Chlidonias niger*
Common Barn Owl	*Tyto alba*
Short-eared Owl	*Asio flammeus*
Common Nighthawk	*Chordeiles minor*
Common Raven	*Corvus corax*
Sedge Wren	*Cistothorus platensis*
Eastern Bluebird	*Sialia sialis*
Henslow's Sparrow	*Ammodramus henslowii*
Grasshopper Sparrow	*Ammodramus savannarum*
Vesper Sparrow	*Pooecetes gramineus*
Eastern Small-footed Bat	*Myotis leibii*

Eastern Small-footed Bat	*Myotis leibii*
New England Cottontail	*Sylvilagus transitionalis*
Harbor Porpoise	*Phocoena phocoena*

◆ Currently listed as "endangered" by the U.S. Department of the Interior.

• Currently listed as "threatened" by the U.S. Department of the Interior.

* Species is extirpated from New York State.

1. Piping Plover is listed as federally endangered in the Great Lakes Region, and as federally threatened in the Atlantic Coastal Region.

Definitions
Extinct - Species is no longer living or existing.
Extirpated - Species is not extinct, but no longer occurring in a wild state within New York, or no longer exhibiting patterns of use traditional for that species in New York (e.g. historical breeders no longer breeding here).
Endangered - Any native species in imminent danger of extirpation or extinction in New York State.
Threatened - Any native species likely to become an endangered species within the foreseeable future in New York State.
Special Concern - Any native species for which a welfare concern or risk of endangerment has been documented in New York State.

Authority: Environmental Conservation Law of New York, Section 11-0535 and 6 NYCRR (New York Code of Rules and Regulations) Part 182 effective (last promulgated in state regulation) August 3, 1987.

This page was last modified Tuesday, November 23, 1998 10:30

Appendix C

Interagency Coordination

State of New Jersey
Department of Environmental Protection
Division of Fish, Game and Wildlife
P.O. Box 400
Trenton, NJ 08625-0400
Robert McDowell, Director

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

September 14, 1999

Clifford G. Day, Supervisor
New Jersey Field Office
US Fish and Wildlife Service
927 N. Main St., Bldg. D1
Pleasantville, NJ 08232

Dear Mr. Day:

This serves to inform you that the Division of Fish, Game and Wildlife [DFGW] concurs with the information and Conclusions and Summary of Recommendations as found in the USFWS's Draft 2(b) Coordination Act Report entitled *New York and New Jersey Harbor Navigation Study*. The report constitutes the Service's assessment of fish and wildlife impacts that can be expected to result from the US Army Corps of Engineers' proposed channel deepening plan and includes recommendations for the protection of fish and wildlife resources.

Our Bureau of Shellfisheries [BSF] requests that additional information be included in the report. That is, relative to the Depuration and Relay Harvest Program for Raritan and Sandy Hook Bays, the BSF estimates that approximately 50% of New Jersey's hard clam landings come from this area.

We hope this information is of service to you.

Sincerely,

Robert McDowell

Robert McDowell, Director
Division of Fish, Game and Wildlife

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TELEPHONE CONVERSATION RECORD

U.S. Department of the Interior, Fish and Wildlife Service
New Jersey Field Office (609)646-9310

Routing		Date: 12/16/99
1. Project file	4.	File Reference: New York Harbor Navigation Study
2.	5.	
3.	6.	

R e c o r d	
Received from: Stephen Zahn	Phone No.: (718) 482-6461
Organization: New York Dept. of Environmental Conservation	Received by: Thomas McDowell USFWS, NJFO
Subject: NYDEC comments on Service draft FWCA report, NY Harbor Navigation	

Conversation:

Stephen Zahn reported to me that the New York Department of Environmental Conservation (NYDEC) had reviewed the U.S. Fish and Wildlife Service's (Service) draft Fish and Wildlife Coordination Act (FWCA), Section 2(b) report regarding the U.S. Army Corps of Engineers' (Corps) proposed New York and New Jersey Harbor Navigation Study. Stephen said that the NYDEC was generally in concurrence with the Service's findings as expressed in the draft FWCA report with regard to potential impacts to fish and wildlife resources associated with the Corps proposed project. Steve noted that a letter stating NYDEC concurrence was forthcoming.

FEIS APPENDIX B-1.5

DREDGED MATERIAL DISPOSAL OPTIONS

APPENDIX B-1.5: DREDGED MATERIAL DISPOSAL OPTIONS

1. DREDGED MATERIAL MANAGEMENT PLAN FOR THE NEW YORK AND NEW JERSEY HARBOR

U.S. Army Corps of Engineers (USACE) guidance (EC 1165-200-2) directs that a Dredged Material Management Plan (DMMP) be prepared for all USACE navigation projects, the purpose being to allow for unimpeded maintenance for a period of at least 20 years. The DMMP for the Port of New York and New Jersey has been under development for several years. The DMMP Implementation Report for the Port of New York and New Jersey, along with its draft Programmatic Environmental Impact Statement (PEIS) and Technical Appendix, was released in September 1999 for public review and comment. The document released for review is the culmination of several years of studies, evaluations of alternative dredged material management options, and public comment. The DMMP identifies the preferred options and current status of these options with regard to design, NEPA evaluation, and permitting. Specific sites are identified, where possible, for selected options; general areas are identified when additional study is needed before an option can be implemented.

The Recommended Course of Action emphasizes beneficial use and provides options for material that are suitable for ocean placement (HARS-suitable material) and options for material unsuitable for the ocean (HARS-unsuitable material). The Recommended Course of Action identifies two planning periods: (1) 2000-2010, the period during which major New York/New Jersey Harbor navigation channel improvements are expected to be implemented, with maintenance continuing on existing channels and berths; and (2) 2011-2040, the period during which the bulk of dredged material will originate from maintenance of both existing and improved channels and berths.

Because of the variety of materials to be dredged, because of the need to manage contaminated (HARS-unsuitable) sediments separately from clean (HARS-suitable) material, and because of the limited capacity of all options, efficient management of dredged material will require a combination of methods.

For HARS suitable material and rock, the following options were presented in the DMMP and discussed with resource agencies:

- Ocean remediation (HARS)
- Habitat creation, enhancement, and restoration
- Land remediation
- Beach nourishment
- Artificial (fish) reefs
- Shoreline erosion protection

Glacial till, sand, silt, and clay would be the most likely materials selected for ocean remediation. Depending on the habitat development plan chosen, any of several materials might prove suitable for habitat creation, enhancement, and restoration. Sand (at a quarry site) and clay (for landfill caps) would be useful for land remediation options. Large volumes of sand would most likely be required for beach nourishment, and large volumes of rock for artificial reefs or breakwaters.

For HARS unsuitable material, the DMMP recommends the following options:

- Land remediation: landfills, brownfields and mine reclamation
- Habitat creation and restoration
- Sediment processing for beneficial use (New Jersey facility)
- Decontamination

Land remediation would utilize dredged material that has been stabilized with binding agents such as Portland cement, fly ash, or kiln dust to create an impermeable material, effective for capping brownfields (contaminated upland sites suitable for development after remediation) or for mine reclamation (including surface and deep-shaft mines). Habitat creation and restoration would involve the use of HARS-unsuitable material as a sublayer, which would then be capped by HARS-suitable material. Decontamination might entail a variety of techniques for washing, or chemically or thermally treating dredged material, with beneficial use of the end product. [The DMMP Implementation Report provides a description of the options for HARS-suitable and HARS-unsuitable material.]

2. DREDGED MATERIAL VOLUME ESTIMATES: IMPROVED NAVIGATION CHANNELS, AND OPERATIONS AND MAINTENANCE ACTIVITIES

The proposed improvement plan for New York and New Jersey Harbor navigation channels calls for the staged deepening of the following channels: the Ambrose Channel located in Lower New York Bay; the Bay Ridge, Port Jersey and Anchorage Channels located in Upper New York Bay; and the Kill Van Kull, Arthur Kill (to Howland Hook) and Newark Bay (to Port Newark/Port Elizabeth Marine Terminal) Channels. The volume of dredged material by category associated with the proposed navigation channel improvement plan is detailed in the following table. Volumes given in the table include an allowable 2-ft overdredge, and therefore represent the maximum volume of material that would be removed from the navigation channels included in the Recommended Plan.

Estimated Volume (CY) of Dredged Material by Category					
Navigation Channel	Proposed Dredge Depth[1] (ft)	HARS Suitable	HARS Unsuitable	Rock	Total
Ambrose	53	13,370,800			13,370,800
Anchorage[2]	50	4,158,994	716,706		4,875,700
Port Jersey	52	3,663,752	311,048		3,974,800
Kill Van Kull	52	4,135,337	2,142,034	3,193,129	9,470,500
Newark Bay[3]	52	6,590,950	2,355,966	1,249,584	10,196,500
Arthur Kill (Howland Hook)	52	456,529	788,836	3,218,935	4,464,300
Bay Ridge	50	3,130,819	1,853,581		4,984,400
TOTAL		35,507,181	8,168,171	7,661,648	51,337,000

[1]50-ft in soft sediments and 52-ft in rock and hard sediments – with the exception of the Ambrose Channel, navigation channels will be maintained at a depth of 50-ft MLW
[2]Southern terminus to the Port Jersey Channel
[3]Includes Elizabeth and South Elizabeth Channels

Estimated Operations and Maintenance (O&M) dredged material for the improved navigation channels is presented in the following table:

Estimated Annual Dredged Material Operations and Maintenance Volume (CY) Existing, Authorized and Improved Navigation Channel Depths			
Navigation Channel	Base Year (Existing or Authorized Channel Depth)	Improved Channel (50 ft Depth)	Increase (Decrease)
Ambrose	400,000	432,000	32,000
Anchorage[1]	0	0	0
Port Jersey	58,000	51,500	(6,500)
Kill Van Kull	24,800	28,000	3,200
Newark Bay[2]	558,000	581,300	23,300
Arthur Kill (Howland Hook)	122,000	160,200	38,200
Bay Ridge[3]	520,000	464,700	(55,300)
TOTAL	1,682,800	1,717,700	34,900

[1]Southern terminus to the Port Jersey Channel
[2]Includes Elizabeth and South Elizabeth Channels
[3]Includes Red Hook Channel although this channel will not be deepened it is included in the O&M program

3. DREDGED MATERIAL DISPOSAL OPTIONS FOR NAVIGATION CHANNEL IMPROVEMENTS

3.1 Rock

It is estimated that a total of 7,661,648 CY of rock will have to be removed from the Kill Van Kull, Newark Bay, and Arthur Kill Channels as a part of the navigation channel improvement plan. Rock has considerable potential for beneficial use, primarily for construction of artificial reefs. As discussed below, reef construction is planned for all of rock removed for navigation improvements, but it could be used for other applications as well, such as shoreline protection/stabilization.

New York and New Jersey each have an artificial reef under construction, with other sites planned for the future. In both state programs, material is added to the site as rock becomes available. Both programs call for construction of a single site until design capacity is reached, prior to development of new sites. It may, however, be desirable to place rock at several sites simultaneously to hasten the benefits to anglers along the New York and New Jersey coast.

New Jersey's reef construction project, currently 15% completed, is near Sandy Hook. The state has identified a site near Sea Girt for future reef development. New Jersey's reef program coordinator has stated that the New Jersey program could make use of all rock produced during the navigation improvement work (NJDEP 1999). New York's artificial reef project, nearing completion, is near Atlantic Beach. Because several other sites are also to be developed, New York authorities are open to accepting virtually all rock produced during the navigation improvement project (NYSDEC 1999). Rock produced from shared channels would likely be distributed evenly between the two states' reef development programs.

The coordinators of the reef programs in New York and New Jersey are the points of contact for rock placement and other information needed to coordinate placement operations.

3.2 Sand

Up to 13.4 MCY of sand would be produced in the deepening of the Ambrose Channel and during maintenance dredging of this channel. Sand has a number of beneficial uses. Since sand from the Ambrose Channel is expected be relatively free of contaminants, application without treatment is likely. Depending on the proposed application, grain size could be a limiting factor. Options for sand placement range from those that are permitted and currently available to others that are under study. The following placement options were considered for sand:

- HARS
- Construction material
- Beach nourishment
- Hunterdon Quarry
- Habitat restoration at existing borrow pits

The HARS would provide a permitted, low-cost option for disposal of all sand from the Ambrose Channel (estimated HARS capacity: 39 MCY), which is located relatively close to the HARS (USACE-NYD 1999). Sand would be effective for remediation at this site.

Ambrose Channel sand could also be used for construction material under existing permits. The use of Ambrose Channel sand for upland construction would relieve the need for upland or underwater sand mining, and its adverse effects. [Sand was formerly mined from Lower New York Bay, creating pits in the bay floor, some of which have caused degradation of water quality and habitat.] Approximately 0.5 MCY/yr of sand could be used for construction material.

Beach nourishment is a low-cost beneficial use option for sand; many potential sites are found along the New York and New Jersey ocean shore, relatively close to Ambrose Channel. A permit application is pending for this option. The volume of sand usable for beach nourishment is unknown at this time, but it would probably be considerable. Grain size could be a limiting factor.

The Hunterdon Quarry in New Jersey could be remediated with clean sand (washed prior to placement to remove salts). Evaluation and design are needed before permitting could take place, but this site—which could accept on the order of 30 MCY of sand—is in fact the non-Federal partners' preferred option for sand disposal (letter dated 25 August 1999, from the partners to Frank Santomauro, USACE).

Habitat restoration at existing pits with degraded environmental conditions is also a potential beneficial use option for sand, but this option would not be available until a series of small-scale tests confirmed that the concept was environmentally acceptable. The testing program (at sites in Jamaica Bay) could use on the order of 2 MCY of sand.

3.3 HARS -suitable Material

HARS-suitable material (other than sand) from navigation channel deepening would amount to approximately 22 MCY. This non-sand material would consist of glacial till, silty mud, and clay from deepening, and primarily silty mud from maintenance work. The HARS is permitted and currently available for the placement of this category of dredged material. Glacial tills, silty muds, and clays are appropriate for remediation in that they would provide a cap for existing contaminated sediments at HARS and would be a suitable substrate for benthic life.

Other potential beneficial uses for HARS-suitable material exist, but they are currently under evaluation and for that reason unavailable. These include creation of marsh, oyster, shellfish, and bird habitat at selected locations where a significant gain in habitat value could be achieved. Habitat restoration at existing pits with degraded conditions is also a potential beneficial use option for this material. This option would not, however, be available until a series of small-scale tests confirmed the concept to be environmentally acceptable. The testing program (at sites on Jamaica Bay) could use on the order of 2 MCY of material.

Clay could also be used for capping landfills such as those in the Hackensack Meadowlands. These sites might in fact become available while navigation improvements are underway, providing alternative disposal locations.

3.4 HARS unsuitable Material

An estimated 8.2 MCY of material from channel deepening and 1.7 MCY (annually) from maintenance of existing and improved channels will be unsuitable for use at the HARS. This material will be silty mud with relatively low levels of contaminants. Most of this material will be from recent deposition in existing channels, but also included will be surficial material from off-channel areas that have not been subject to maintenance dredging recently.

The DMMP and the non-Federal partners have identified beneficial use as the preferred option for HARS-unsuitable material, with sub-channel placement cells (SPC) as a back-up contingency in the event that the potential beneficial use options are not available as needed. Among the beneficial use options that could accept HARS-unsuitable material, only the upland remediation sites in Bayonne (OENJ) and Kearny (SK Services) and the Bark Camp, Pennsylvania, mine demonstration site are currently permitted. These sites provide more than 5 MCY of capacity. Land remediation at these sites requires sediment stabilization with additives such as Portland cement, fly ash, or kiln dust. The treated sediments are transported to the remediation area and spread on the ground to create an impermeable base layer. Ultimately, the site is capped with clean material to create usable habitat or to permit future commercial development.

Several upland remediation sites are being developed. Full-scale remediation of mine sites in Pennsylvania could provide a large capacity for HARS-unsuitable material. The NJDIG program has identified 40.7 MCY of capacity for such material, including the permitted sites at Bayonne and Kearny. The use of processed dredged material for land remediation has environmental benefits. The low permeability of a dredged material cap placed on landfill sites would reduce the amount of precipitation infiltrating contaminated historic fill on the property. This would result in a substantial reduction of contaminants leaching out of the soil that would otherwise contaminate both groundwater and surface water in the region.

Decontamination is another option identified in the DMMP and by non-Federal partners. Decontamination technologies reduce the harmful effects of contaminants in dredged material by physical, chemical, thermal, and/or biological treatment. Through these treatments, contaminants are destroyed, removed, or immobilized. Not all HARS-unsuitable dredged material needs to be treated for beneficial use. However, if treated, the material could be used in wider and less restricted applications and more types of placement sites. Decontamination is advancing from the demonstration stage to larger-capacity operations that could process up to 0.95 MCY/yr.

NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF
CENAN

10 MAY 1999

MEMORANDUM FOR RECORD

SUBJECT: Summary of Alternative Analysis for Placement of Dredged Material for Construction Contracts of the Kill Van Kull (KVK) and Newark Bay Federal Channels

I. BACKGROUND:

a. This project considers the proposed use of 1,268,000 cubic yards of dredged material generated from the deepening of the Kill Van Kull federal channel. About 410,000 cubic yards of this material is classified as rock anticipated to be used in the creation of fish reefs in the coastal waters of New York and New Jersey. The remaining material has been evaluated and determined to be acceptable for use as remediation material at the ocean site designated the "Historic Area Remediation Site" (HARS).

b. Alternative analyses performed as part of previous NEPA documentation (FEIS, 1980; SEIS, 1986; FSFEIS, 1987; FEA/FONSI, 1997; FEA/FONSI, 1999) concluded that the HARS was the preferred option for placement of suitable material dredged during construction of the project. This summary describes the process and rationale that has been used in making this determination.

II. ALTERNATIVE ANALYSIS SUMMARY: As the KVK project has developed, the status and availability of a number of options has changed such that some past analyses have become outdated. Further, several options are now under consideration but have not yet been fully implemented such that their use, at this time, in this project is precluded. For purposes of this summary, all options that have, at some point, been considered or that are now under consideration for implementation are included in this summary along with the alternatives that are currently available for use.

a. Upland Placement
Upland Confined Disposal Facilities (CDF) – Several preliminary sites were identified and evaluated as part of the New York District (NYD) Dredged Material Management Plan (DMMP) effort for the Port of New York and New Jersey (DMMP Interim Report, 1996). Numerous concerns were raised by interested parties regarding the use of the potential sites identified as part of the DMMP. Based on these concerns the options to use these sites were removed from further consideration or development with the exception of a small upland CDF, which was historically used for dredged material disposal. Use of the site, which is located in Belford, NJ and referred to as site N61, has been restricted to

material dredged from Monmouth County waters. Also, this site has insufficient capacity for the material under consideration in the KVK Public Notice (PN).

b. Treatment Options with Upland Placement

- Dewatering and/or Solidification/Stabilization with Upland Placement – Several treatment options considering stabilization followed by upland placement have been considered, are under consideration or are being used for dredged material placement from the Port. Disposition of material resulting in these options has been targeted towards a variety of upland beneficial uses including landfill/brownfield remediation, abandoned mine reclamation, and creation of wetlands to control landfill leachate.

  To date, four sites, each with a capacity of over 100,000 cubic yards, have been implemented: Orion/OENJ (AKA Jersey Gardens Mall), NJ; Koppers Coke Site (Seaboard), NJ; Bayonne Landfill, NJ; and Bark Camp Mine Site, PA. All of these sites were developed for beneficial use of dredged material, using material that is unsuitable for use in remediating the HARS. Given the added costs of rehandling, processing and transportation to the sites, all the options have dredging and disposal costs in excess of $ 40 per cubic yard. Of these sites, only the Bayonne Landfill, NJ is currently permitted with an available capacity sufficient to meet the needs of the KVK project.

- Decontamination with Upland Placement/Beneficial Reuse – Several different physical, chemical and biological treatment methods are being evaluated and tested on scales of less than 10,000 cubic yards for material that is unsuitable for ocean remediation at the HARS site. These decontamination processes are designed to either isolate or remove contaminants contained within this type of dredged material. Since the material proposed for use in remediating the HARS has been tested and found to be free from sediment contamination, the application of decontamination technologies to the project material is inappropriate.

c. Shore/Nearshore Placement

- Habitat Creation/Restoration – Dredged material has been successfully used in other regions of the country in a wide variety of habitat creation/restoration applications. The applications considered potentially feasible in this region include 1) restoring bathymetry/habitat in existing degraded borrow pits, 2) creating/restoring wetlands, 3) creating/restoring oyster and/or shellfish habitats, 4) creating/restoring bird habitat, and 5) creating/restoring mud flats. Despite development and urbanization of the region, several of these potential applications may be possible on a site-by-site basis. However, at this time, none of these applications has been implemented or is available for use for the material dredged in this project.

- Treatment Wetlands – Wetlands are able to treat effluent or leachate high in nutrients, organic and pathogenic constituents. In this region, a number of landfill sites (e.g., Pelham Bay) have been tentatively identified for potential construction

of wetlands designed for the purpose of treating effluent or leachate being released from the sites. However, to date, none of these sites have been permitted for construction using dredged material.

- Beach Nourishment – When possible, the placement of dredged material that is primarily sand on adjacent beaches for nourishment purposes has been extensively used in the region. However, the use of the material produced in this project is not possible given the fine-grained nature of the material.

- Nearshore Confined Disposal Facilities (CDFs) – Nearshore CDFs have been considered in the region for both dredged material placement and expansion of landside, Port-related facilities. To date, though, no sites have been developed or permitted to allow for placement of dredged material. Consequently, this option is not available for use for material proposed in this project.

d. Offshore/Ocean Placement

- Mud Dump Site – The Mud Dump site was used extensively in the region for disposal of dredged material, for decades prior to its interim designation in 1973 and final designation in 1984. In 1997, the U.S. Environmental Protection Agency de-designated (closed) the Mud Dump site concurrent with designation of the Historic Area Remediation Site. The Mud Dump site, as designated in 1984, is no longer available for disposal of dredged material.

- Historic Area Remediation Site (HARS) – The U.S. Environmental Protection Agency designated the HARS in 1997 for remediation "with uncontaminated dredged material (i.e., dredged material that meets current Category I standards and will not cause significant undesirable effects including through bioaccumulation)" (as described in the July 24, 1996 3-Party Letter). The Environmental Impact Statement (EIS) that designated the HARS identified a need for placement of at least 40.6 million cubic yards of suitable remediation material to isolate existing, exposed contaminated sediment. The site is designated in accordance with the Ocean Dumping Regulations and the EIS explicitly states that the HARS needs suitable remediation material to stem the impacts resulting from the contaminated material in the site. Use of the site provides environmental remediation benefit and has a relatively low cost ($ 5-7 per cubic yard including dredging costs).

- Additional Ocean Placement Sites – No other local ocean placement sites (for remediation or disposal purposes) currently exist given the need of the HARS site for large volumes of remediation material.

- Fish Reefs – Fish reefs have been designated in waters of both states for purposes of habitat creation sites. The use of the sites is restricted to rock material exclusively, and the other dredged material proposed by this project cannot be used at designated reef sites.

- Contained Aquatic Disposal (CAD) Pits – Several existing borrow pits and new constructed CAD pits have been considered within the region for disposal of dredged material that is unsuitable for remediation of the HARS site. One CAD pit (the Newark Bay Confined Disposal Facility) has been constructed by the Port Authority of New York and New Jersey and accepts only dredged material that cannot be used to remediate the HARS. Currently, the NBCDF has a remaining capacity of approximately 700,000 cubic yards with a placement cost, including a tipping fee, of $29 per cubic yard. The site only accepts dredged material that cannot readily be used beneficially and that the capacity of such sites in the region is limited. Thus, the use of the site for material produced by this project is not practicable given the cost of the site and loss of the disposal site resource.

- Island Confined Disposal Facilities (CDFs) – Island CDFs have been considered within the region for the cost-effective disposal of material that cannot be readily used beneficially. Currently, no island CDF sites have been permitted for construction or are available for use for material produced by this project.

e. Other Options – Several other options (e.g., storage of material, well injection, incineration, spread of material over open ground, and additional biological, chemical or physical treatment) have been considered, but due to a variety of reasons, are not applicable for the material produced by the project. These reasons include either limited placement capacity, limited available areas (given the intense urbanization of the area), or loss of a limited resource (e.g., upland or aquatic sites permitted but accepting dredged material unsuitable for HARS use).

III. RESULTS: Only two sites are currently permitted with a sufficient capacity that could accept the dredged material generated from this project: the Historic Area Remediation Site which is currently available and the Bayonne Landfill, NJ site which is permitted but not yet operational. Using the material to remediate the HARS meets an established environmental need at a cost of approximately $5-7 per cubic yard. Using the material to remediate the Bayonne Landfill also meets an environmental need but it depletes the capacity of the site for using dredged material that is unsuitable for the HARS, which capacity is a limited resource within the region. Also, the cost for placement of material at the Bayonne Landfill exceeds $40 per cubic yard. The only practicable use of the dredged material produced by this project is for remediating the HARS.

IV. OTHER FACTORS CONSIDERED: The dredged material produced by this project is suitable as HARS remediation material, and is so uncontaminated that treatment before disposal is not useful, feasible or necessary. The dredged material is the essential result of dredging that is necessary to maintain economic viability of the harbor, and no less polluting materials or processes of dredging could be used. The relative environmental risk and impact of disposal at the HARS is no greater than the other feasible alternatives, and the other alternatives are of much greater cost. The consequences of the use of alternatives to ocean disposal are generally irreversible or irretrievable.

V. DETERMINATION OF NEED: Based upon evaluation of factors as shown above, New York District has determined that there are no practicable improvements which can be made to process technology or overall treatment of material to reduce adverse impacts of the dredged material produced by this project on the total environment. Further, there are no practicable alternative locations and methods of disposal or recycling available, including storage until treatment facilities are completed, which have less adverse environmental impact or potential risk to other parts of the environment than placement of the material to remediate the HARS.

Date:

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10 May 99

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FEIS APPENDIX B-1.6

SECTION 404 (b) (1) GUIDELINES EVALUATION

APPENDIX B-1.6: SECTION 404(b)(1) GUIDELINES EVALUATION

Introduction

This appendix of the New York and New Jersey Harbor Navigation Study presents a Section 404(b)(1) Guideline evaluation for the comprehensive evaluation of navigation improvements to the New York and New Jersey Harbor including deepening of existing channels and berthing areas, to meet current and future navigation needs. The evaluation is based on the regulations found at 40 CFR 230, Section 404(b)(1): Guidelines for Specification of Disposal Sites for Dredged or Fill Material. The regulations implement Sections 404(b) and 501(a) of the Clean Water Act, which govern the disposal of dredged and fill material inside the territorial sea baseline (§230.2(b)).

Draft Generic 404 (b)(1) Evaluation

The following Section 404(b)(1) evaluation is presented in a format consistent with typical evaluations in the New York and New Jersey Harbor area and addresses all required elements of the evaluation.

Project Description

a. Location: All channels proposed for deepening exist in the New York and New Jersey Harbor.

b. General Description: The proposed project plan is to deepen various Federal navigation channels from their authorized depths to 50 ft MLW or greater. The plan is as follows:

- Deepening the Ambrose Channel to 53 ft
- Deepening the Anchorage Channel to 50 ft
- Deepening the Kill Van Kull, Newark Bay and Port Jersey Channels to 52 ft – Note: channels maintained at 50 ft.
- Deepening the Bay Ridge Channel to 50 ft
- Deepening the Arthur Kill Channel to Howland Hook to 52 ft – Note: Channel maintained at 50 ft.

Some channel realignment will result from the channel deepening, and from proposed modifications to facilitate waterway navigation.

c. Authority and Purpose: The authority to conduct the New York and New Jersey Harbor Navigation Study is granted in §435 of the Water Resources Development Act (WRDA) of 1996.

d. General Description of Dredged Material: Approximately 51 million cubic yards of dredged material would be removed by the proposed action. This includes about 7.7 million cubic yards of rock.

e. Proposed Discharge Site: Discharge sites vary depending on dredged material type. Rock is proposed for discharge in designated artificial reef sites. Discharge sites of other sediments will be identified in the New York and New Jersey Harbor Dredged Material Management Plan (DMMP).

f. Disposal Method: Overflow of barges being filled with dredged material during dredging activities and movement to disposal area(s).

Factual Determinations

a. Physical Substrate Determinations

(1) Substrate Elevation and Slope: There will be changes to substrate elevation and side slopes due to the deepening. The current authorized channel depths (baseline Harbor Navigation Study depths) are as follows:

- Ambrose 45 ft
- Anchorage 45 ft
- Bay Ridge 40 ft
- Kill Van Kull 45 ft
- Newark Bay 45 ft
- Arthur Kill to Howland Hook 41 ft
- Arthur Kill from Howland Hook to Gulfport 40 ft
- Port Jersey 41 ft

All channels are proposed to be dredged to 50 ft or greater, with an allowable 2-ft overdredge for soft material. An additional 2-ft is provided in the authorized depth as an underkeel clearance safety factor in hard material and rock. Channel side slopes are 1 vertical (V):3 horizontal (H) in non-rock, and 1V:1H in rock and hard material.

(2) Sediment Type: Temporary change from fine silt and mud to either clay or rock in the Arthur Kill, Kill Van Kull and Newark Bay. No long-term impact.

(3) Dredged Material Movement: Minor short-term movement.

(4) Physical Effects on Benthos: Minor short-term disruption. No long-term impact.

(5) Other Effects: None identified

(6) Action to Minimize Impacts: Not applicable

b. Water Circulation, Fluctuations, and Salinity Determinations

(1) Water

(a) Salinity: Proposed project is not expected to affect salinity because channel deepening does not govern the overall water mass movements (tidal flow and river discharge) that control salinity.

(b) Water Chemistry: The proposed project will have small, localized effects on water chemistry during the dredging operations. The effects are associated with sediment resuspension from dredging activities and barge overflow from dredged material suitable for HARS remediation. The localized effects will be limited to the period of time that the dredging activities take place.

(c) Clarity: Temporary increase in turbidity will occur from sediment resuspension during dredging activities and barge overflow.

(d) Color: Minor temporary changes possible

(e) Odor: Odors typical of dredging operations will be created in the project area during dredging operations. Because the site is remote from residential areas, potential odors will have minimal to no impact.

(f) Taste: Not applicable

(g) Dissolved Gas Levels: Turbulence created by barge overflow may cause temporary, primarily surface variations in dissolved gas levels.

(h) Nutrients: Temporary and localized nutrient increases may occur due to sediment resuspension during dredging activities and barge overflow. No long-term increase in nutrients and eutrophication will result from the proposed project.

(i) Eutrophication: A short-term, localized increase in nutrients could contribute to an increase in algal growth. However, the limited quantity of disturbed sediments will result in minimal short-term nutrient releases, which will not result in project area eutrophication.

(j) Other: None identified

(2) Current Patterns and Circulation: No impacts identified

(3) Normal Water Level Fluctuations: No impacts identified

(4) Salinity Gradients: No impacts expected

(5) Actions to Minimize Impacts: Not applicable

c. Suspended Particulate/Turbidity Determination

(1) Change at Disposal Site: Short-term, localized increases in suspended particulates/turbidity as a result of barge overflow and placement of material at ocean remediation (HARS)/ artificial reef sites, but no long-term changes.

(2) Effects on Chemical and Physical Properties of the Water Column: Impact should be minimal since dredging activities would cause prior disturbance.

(3) Effects on Biota: Short-term exposure due to localized sediment resuspension during dredging activities and barge overflow. No long-term effects are projected.

(4) Action to Minimize Impacts: Where appropriate, dredging activities will adhere to mechanical dredging conditions (e.g., hoist-rates) proscribed by state water quality certifications and dredging permits.

d. Contaminant Determination: As noted in the Code of Federal Regulations, 40 CFR §227.13 (b) dredged material which meets the criteria set forth in the following paragraphs (b) (1), (2), or (3) of this section is environmentally acceptable for ocean dumping without further testing under this section *(if)*:

(1) Dredged material is composed predominantly of sand, gravel, rock, or any other naturally occurring bottom material with particle sizes larger than silt, and the material is found in areas of high current or wave energy such as streams with large bed loads or coastal areas with shifting bars and channels; or

(2) Dredged material is for beach nourishment or restoration and is composed predominantly of sand, gravel or shell with particle sizes compatible with material on the receiving beaches; or

(3) *When* (ii) The site from which the material proposed for dumping is to be taken is far removed from known existing and historical sources of pollution so as to provide reasonable assurance that such material has not been contaminated by such pollution.

Since the navigation channel sediments in the project area is predominantly undisturbed, and a large percentage of clean material consists of rock and clay, the dredged material to be removed below the existing authorized channel depth meets the criteria listed above under (b) (1) and (b) (3) (ii) for ocean disposal without testing. Barge overflow related to

sediments from the channel area should not contain any contaminants and therefore will have no adverse environmental impacts. In addition, rock material removed from the project area could be used in the construction of artificial reefs.

e. Aquatic Ecosystems and Organisms Determination: No impact

f. Proposed Disposal Site Determination: Appropriate disposal sites as identified in the DMMP will be used.

g. Determination of Cumulative Effects on the Aquatic Ecosystem: None identified

h. Determination of Secondary Effects on the Aquatic Ecosystem: None identified

Findings of Compliance or Noncompliance

a. There are no practicable alternatives for the proposed action under the jurisdiction of Section 404(b)(1) Guidelines.

b. The proposed action does not appear to violate applicable state water quality standards or effluent standards

c. The U.S. Fish and Wildlife Service (USFWS) is concerned that channel deepening may cause resuspension of contaminated sediments and that the contaminants could be transported through the food chain and result in adverse impacts to peregrine falcons. Pursuant to the Endangered Species Act, the U.S. Army Corps of Engineers - New York District (USACE-NYD) is currently preparing a Biological Assessment to evaluate the potential impacts of resuspension of contaminants during dredging. The USACE-NYD will consult with the USFWS to evaluate the need for and design of a monitoring program, which will fully evaluate the nature and extent of any outstanding concerns.

   The proposed action would result in moving the channel away from the colonial wading bird rookery on Shooters Island. Minimal short-term impacts and no long-term impacts are expected.

d. The proposed action will not result in significant adverse impacts on human health or welfare, including municipal and private water supplies, recreational and commercial fishing, plankton, fish, shellfish, wildlife and special aquatic sites.

e. All appropriate steps to minimize adverse environmental impacts have been taken.

f. No significant adaptations of the guidelines were made relative to this evaluation.

Conclusions

Based on all of the above, the proposed action is determined to be in compliance with the Section 404(b)(1) Guidelines, subject to appropriate and reasonable conditions, to be determined on a case-by-case basis, to protect the public interest.

FEIS APPENDIX B-1.7

STATES OF NEW YORK AND NEW JERSEY COASTAL ZONE MANAGEMENT ACT POLICIES

AND

NEW YORK CITY WATERFRONT REVITALIZATION PROGRAM

APPENDIX B-1.7a: NEW YORK STATE COASTAL ZONE MANAGEMENT POLICY

The Coastal Zone Management Act of 1972 (16 U.S.C. 1451 *et seq.*) was enacted by Congress to balance the competing demands of growth and development with the need to protect coastal resources. Its stated purpose is to ". . . preserve, protect, develop, and, where possible to restore or enhance, the resources of the nation's coastal zone . . ." The primary means of achieving this balance is through coastal zone management programs adopted by the states and designed to regulate land use activities that could affect coastal waters. The act offers incentives to encourage the coastal states and territories to exercise their full authority over coastal areas through development of coastal zone management programs, consistent with the minimum Federal standards. The Coastal Zone Act Reauthorization Act Amendments of 1990 strengthened the Act by requiring the state programs to focus on controlling land use activities, and on the cumulative effect of activities in coastal zones.

The State of New York currently administers its Federally approved coastal zone program (N.Y. Executive Law §910 *et seq.* [Consol. 1996]) through the New York State Department of State (NYSDOS). Pursuant to the Federal Coastal Zone Management Act, New York State has defined its coastal zone boundaries and the policies to be utilized to evaluate projects occurring within the designated zones. In 1981, New York State adopted the Waterfront Revitalization and Coastal Resources Act, creating the New York State Coastal Management Program (CMP). The CMP embodies 44 policy statements supportive of the Act's intent to promote a balance between economic development and coastal resource preservation and optimization.

The proposed project is within the coastal zone boundary of New York State. The following assessment identifies the coastal zone policies and evaluates the project's consistency with the applicable policies. This consistency evaluation is being provided in order to: (1) support the USACE consistency determination, pursuant to 15 CFR Part 930 Subpart C, regarding the consistency of the activity with the NYS CMP; (2) enable New York State to consider the effects of the proposed project on the land and water uses and natural resources of its coastal area; and (3) to provide information permitting New York State to agree or disagree with the USACE consistency determination pursuant to 15 CFR Part 930 Subpart C.

Evaluation of Proposed Project's Consistency with CMP's 44 Policy Statements

(1) Restore, revitalize and redevelop deteriorated and underutilized waterfront areas for commercial, industrial, cultural, recreational and other compatible uses.

Construction of the proposed project would enhance the revitalization of the waterfront area by improving commercial vessel access to existing container and oil refinery/storage facilities. The proposed navigation channel improvements will likely spur the development of additional water-dependent uses of the Staten Island and South Brooklyn waterfronts, especially commercial uses, which would otherwise not occur without the proposed project. The proposed project would therefore be consistent with this policy.

(2) Facilitate the siting of water-dependent uses and facilities on or adjacent to coastal waters.

The proposed project involves the deepening of existing navigation channels within the Port of New York and New Jersey to permit larger ocean going vessels efficient and economical access to existing Port facilities. The proposed navigation channel improvements will facilitate the siting of water-dependent uses, primarily at existing Port facilities, since the proposed navigation channel improvements will permit unrestricted access to the Port's facilities. The proposed project would therefore be consistent with this policy.

(3) Promote the development and use of the state's major ports as centers of commerce and industry, emphasizing the siting, in these port areas, including those under the jurisdiction of state public authorities, of land use and development which is essential to, or in support of, the waterborne transportation of cargo and people.

Construction of the proposed project would improve commercial navigation and access to existing centers of commerce and industry in the Port of New York and New Jersey, and thereby help to prevent the loss of port business to competing East Coast ports. The proposed navigation channel improvements will allow for more efficient movement of cargo to the South Brooklyn and Howland Hook Marine Terminals. The more efficient and economical delivery of container goods to Port facilities located in New York will help to continue the development of the New York and New Jersey Harbor as a major center of commerce and therefore the proposed project is in compliance with this policy.

The projected landside impacts identified relative to the projected increase in port commerce will occur with or without the proposed project and would therefore be consistent with this policy.

(4) Strengthen the economic base of smaller harbor areas by encouraging the development and enhancement of those traditional uses and activities, which have provided such areas with their unique maritime identity.

Construction of the proposed project would not involve development of a small harbor area. The Port of New York and New Jersey is defined as a major port of New York State under the NYS CMP. Development and use of the New York State's major ports as centers of commerce and industry are considered under NYS CMP Policy 3. Therefore, this policy does not apply.

(5) Encourage the location of development in areas where public services and facilities essential to such development are adequate.

Several studies and projects are currently underway to evaluate area infrastructure related to cargo movement patterns into and out of the Harbor. The New York City Economic Development Corporation (NYCEDC) and the Federal Highway Administration (FHWA) are conducting a study evaluating cross-harbor freight movement patterns, which is a follow up to a 1997 study on Intermodal Goods Movements in the Harbor. The objective of the study is to

determine effective cross-harbor freight movement alternatives (e.g., increased cross-harbor rail-barge service) with regard to engineering, environmental, economic, and financial factors. The potential for building a second bridge at the site of the Goethals Bridge and updating the Arthur Kill rail bridge is currently being evaluated. The Comprehensive Port Improvement Plan (CPIP), which addresses the potential increase in maritime commerce at the different port facilities, including South Brooklyn and Howland Hook, will evaluate the infrastructure requirements to ensure the efficient and economical movement of cargo in the Harbor.

The efficient and economical movement of cargo into and out of the New York and New Jersey Harbor is the subject of ongoing studies, which will result in recommendations to sustain and improve cargo movement. The proposed project is therefore in compliance with this policy.

(6) Expedite permit procedures in order to facilitate the siting of development activities at suitable locations.

Since construction of the proposed project would not involve the siting of development activities; this policy does not apply.

(7) Significant coastal fish and wildlife habitats will be protected, preserved, and where practical, restored so as to maintain their viability as habitats.

Potential impacts to significant coastal fish and wildlife habitats are described in FEIS Section 6. Adherence to schedule, to dredging (environmental) windows (if imposed), and to proximity limits for dredging and blasting set forth by USFWS and cooperating state agencies will ensure that no direct impacts occur to significant coastal fish habitat. Potential impacts to wetlands and intertidal and shoal areas are addressed in FEIS Section 6. Measures to protect resources and mitigate unavoidable adverse effects are described in FEIS Section 7. All mitigation needs were explored via interagency coordination, which includes both state and Federal agencies and documented in the mitigation plan report. The mitigation plan is described in Section 7 of the final environmental impact statement.. By avoiding or mitigating potential environmental impacts, the proposed project would be consistent with this policy.

(8) Protect fish and wildlife resources in the coastal area from the introduction of hazardous wastes and other pollutants which bio-accumulate in the food chain or which cause significant sub-lethal or lethal effect on those resources.

Potential impacts to fish and wildlife resources may include exposure to contaminants released from sediments during dredging and disposal operations. Such potential impacts will be minimized by employing Best Management Practices (BMPs) during dredging operations in areas where the sediments have been determined to be contaminated. (See FEIS Section 8) Potential measures to mitigate this impact include closed-bucket dredging and silt curtains where determined to be appropriate. By employing these management measures, the proposed project would be consistent with this policy.

(9) Expand recreational use of fish and wildlife resources in coastal areas by increasing access to existing resources, supplementing existing stocks, and developing new resources. Recreational uses include: (1) consumptive uses such as fishing and hunting; and (2) non-consumptive uses such as wildlife photography, bird watching, and nature study.

Construction of the proposed project could expand recreational use of fish resources in coastal areas. Rock excavated during project construction could be used to create/restore permitted artificial reef structures. Sediment suitable for ocean disposal would be used to remediate the HARS and would therefore create/restore fish and shellfish habitat in that area (see FEIS Appendix B-1.2). The proposed project would therefore be consistent with this policy.

(10) Further develop commercial finfish, shellfish and crustacean resources in the coastal area by encouraging the construction of new, or improvement of existing on-shore commercial fishing facilities, increasing marketing of the state's seafood products, maintaining adequate stocks, and expanding aquaculture facilities.

Construction of the proposed project would not directly develop commercial fishing resources, construct or improve onshore-fishing facilities, or expand aquaculture facilities. Therefore, this policy does not apply.

(11) Buildings and other structures will be sited in the coastal area so as to minimize damage to property and the endangering of human lives caused by flooding and erosion.

The proposed project does not include the siting of buildings or other structures in the coastal area. This policy therefore does not apply.

(12) Activities or development in the coastal area will be undertaken so as to minimize damage to natural resources and property from flooding and erosion by protecting natural protective features including beaches, dunes, barrier islands and bluffs.

Construction of the proposed project would not involve beaches, dunes, barrier islands, or bluffs. The proposed project would, however, impact littoral zone wetland resources. Proposed project impacts on wetlands are discussed in FEIS Section 6, Assessment of Effects Attributable to the Recommended Plan.

In accordance with the Council on Environmental Quality (CEQ) Regulations for Implementing NEPA (40 C.F.R. §1500-1508) and with paragraph 7-35 of USACE Planning Guidance Notebook [(ER) 1105-2-100], the planning of USACE projects must ensure that project-caused adverse environmental impacts have been avoided or minimized to the extent practicable, and that remaining unavoidable significant adverse impacts are compensated to the extent justified. USACE regulations provide that the Recommended Plan must contain sufficient mitigation measures to ensure that the plan selected will have no more than negligible net adverse impacts on fish and wildlife resources, including impacts of the mitigation measures themselves.

Possible methods of mitigation for unavoidable wetland impacts are discussed in FEIS Section 7, Mitigation of Navigation Improvement Impacts. A mitigation plan, following Federal and state wetland avoidance, minimization, and compensation guidelines, is fully described in the Feasibility Report and FEIS . By avoiding or mitigating unavoidable environmental impacts, the proposed project would be consistent with this policy.

(13) The construction or reconstruction of erosion protection structures shall be undertaken only if they have a reasonable probability of controlling erosion for at least thirty years as demonstrated in design and construction standards and/or assured maintenance or replacement programs.

Since the proposed project does not include the construction or reconstruction of erosion protection structures, this policy does not apply.

(14) Activities and development, including the construction or reconstruction of erosion protection structures, shall be undertaken so that there will be no measurable increase in erosion or flooding at the site of such activities or development, or at other locations.

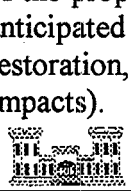
No measurable increase in erosion or flooding is expected due to construction of the proposed project. Potential coastal erosion impacts as a result of channel deepening were evaluated in FEIS Section 6, Assessment of Effects Attributable to the Recommended Plan.

Analytical models of wind-, offshore-, and ship-generated waves indicated that bank/wetland erosion is not expected to increase. Under future with-project conditions the impact of ship wakes may, in fact, decrease due to the overall decrease in the number of ship calls over the life of the project (See FEIS Appendix B-1.1, Hydrodynamic, Water Quality and Coastal Zone Erosion Modeling). Since bank/wetland erosion is not expected to increase as a result of the proposed project, the proposed project is consistent with this policy.

(15) Mining, excavation or dredging in coastal waters shall not significantly 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 land.

Dredging and excavation associated with the proposed project would not affect natural coastal processes or increase the potential of erosion from adjacent land. Erosion of land adjacent to the navigation channels proposed for deepening will be avoided by constructing the deeper channels with stable slope angles and by developing structural solutions in areas where shoreline facilities are involved (see Engineering Appendix).

Given the large volume of dredged material (including sand and rock) to be removed as a result of the proposed navigation channel improvements, a number of beneficial-use opportunities are anticipated for the dredged material. This includes habitat creation or enhancement, beach restoration, and shoreline protection (See Section 7, Mitigation of Navigation Improvement Impacts). Mitigation and beneficial use of dredged material in beach nourishment and/or



shoreline stabilization would follow USACE Engineer Manual 1110-2-5026 for planning, design and development of beneficial-use applications. The proposed project would therefore be consistent with this policy.

(16) Public funds shall only be used for erosion protective structures where necessary to protect human life, and new development which requires a location within or adjacent to an erosion hazard area to be able to function, or existing development; and only where the public benefits outweigh the long-term monetary and other costs including the potential for increasing erosion and adverse effects on natural protective features.

Since the proposed project does not require the construction of erosion protection structures, this policy does not apply.

(17) Nonstructural measures to minimize damage to natural resources and property from flooding and erosion shall be used whenever possible.

The proposed project does not include nonstructural flooding or erosion control measures. No measurable increase in erosion or flooding is expected due to construction of the proposed project. Potential coastal erosion impacts as a result of channel deepening were evaluated in FEIS Section 6, Assessment of Effects Attributable to the Recommended Plan.

Analytical models of wind- and vessel-generated waves indicated that bank/wetland erosion is not expected to increase. Under future with-project conditions the impact of ship wakes may, in fact, decrease due to the overall decrease in the number of ship calls over the life of the project (See FEIS Appendix B-1.1, Hydrodynamic, Water Quality and Coastal Zone Erosion Modeling). Bank/wetland erosion is not expected to increase as a result of the proposed project. Therefore, the proposed project is in compliance with this policy.

(18) To safeguard the vital economic, social and environmental interests of the state and of its citizens, proposed major actions in the coastal area must give full consideration to those interests, and to the safeguards which the state has established to protect valuable coastal resource areas.

Construction of the proposed project would improve the safety and efficiency of commercial navigation and access to the Port of New York and New Jersey, thereby safeguarding the vital economic interests of the state and its citizens. Safeguarding of social and environmental interests of the state and its citizens is being given full consideration by virtue of compliance with the Federal NEPA process and with New York State's Protection of Waters Regulatory Program and State Environmental Quality Review Act (SEQRA). Compliance includes issuance of draft and final EIS and SEIS documents, along with a mandate for dialogue on each of these between USACE-NYD, the New York State Department of State, the Department of Environmental Conservation, other state and Federal agencies, and all interested businesses, special-interest groups and individuals via public meetings and opportunities for written commentary (See FEIS Section 1.2). Potential impacts to valuable coastal resources (e.g., colonial wading bird rookery, wetlands) and measures to mitigate adverse effects (i.e.,

safeguards), are described in FEIS Sections 6 and 7, respectively. The proposed project would be consistent with this policy.

(19) Protect, maintain, and increase the level and types of access to public water related recreation resources and facilities.

The proposed Harbor navigation improvement plan recommends deepening of existing channels; no new channels are proposed. Recreational opportunities are limited to the vicinity of existing channels. Construction of the proposed navigation channel improvements would not prevent access to public water-related recreation resources or facilities, but would maintain it, without proposing new facilities or recreational resources as part of the project. The project would therefore be consistent with this policy.

(20) Access to the publicly-owned foreshore and to lands immediately adjacent to the foreshore or the water's edge that are publicly-owned shall be provided and it shall be provided in a manner compatible with adjoining uses.

No publicly owned foreshore is located in the project area. Construction of the proposed project would not prevent public access to waterfront land in the project vicinity. This policy therefore does not apply.

(21) Water-dependent and water-enhanced recreation will be encouraged and facilitated, and will be given priority over non-water related use along the coast.

Construction of the proposed project would not prevent access to public water-related recreation resources or facilities, but would maintain it.. The project would therefore be consistent with this policy.

(22) Development, when located adjacent to the shore, will provide for water related recreation, whenever such use is compatible with reasonably anticipated demand for such activities, and is compatible with the primary purpose of the development.

Since the proposed project does not include shoreline development; this policy does not apply.

(23) Protect, enhance and restore structures, districts, areas or sites that are of significance in history, architecture, archaeology or culture of the state, its communities, or the nation.

Dredging and blasting associated with the proposed project should not have an impact on significant historic vessel hulks eligible or potentially eligible for the National Register of Historic Places located throughout the project area (See FEIS Sections 5 and 7). The effects of blasting will be monitored to ensure that this activity does not adversely impact historic properties on land. Coordination with the New York and New Jersey State Historic Preservation Officers (SHPOs) will be undertaken to determine specific monitoring requirements during blasting (See FEIS Section 6). Core samples were collected in order to characterize layering of intact pre-estuarine Holocene and Pleistocene sediments located within and adjacent to the

project area for the purpose of documentation prior to removal (See FEIS Section 5). The proposed project would therefore be consistent with this policy.

(24) Prevent impairment of scenic resources of statewide significance. This impairment would include: (a) the irreversible modification of geologic forms, the destruction or removal of structures, whenever the geologic forms, vegetation or structures are significant to the scenic quality of an identified resource; and (b) the addition of structure which, because of siting or scale will reduce identified views or which because of scale, form, or materials, will diminish the scenic quality of an identified source.

The New York and New Jersey Harbor possesses no designated Scenic Areas of Statewide Significance (SASS). Therefore, this policy does not apply.

(25) Protect, restore or enhance natural and man-made resources which are not identified as being of statewide significance but which contribute to the overall scenic quality of the coastal area.

Although several natural and manmade resources are found in the project area (See FEIS Section 5, Affected Environment), construction of the proposed project should not impair these scenic resources nor adversely impact the overall scenic quality of the coastal area. The proposed project would therefore be consistent with this policy.

(26) Conserve and protect agricultural lands in the state's coastal area.

Since the project study area is not located adjacent to agricultural lands, this policy does not apply.

(27) Decisions on the siting and construction of major energy facilities in the coastal area will be based on public energy needs, compatibility of such facilities with the environment, and the facility's need for a shorefront location.

Since construction of the proposed project would not involve siting of an energy facility, this policy does not apply.

(28) Ice management practices shall not interfere with the production of hydroelectric power, damage significant fish and wildlife and their habitats, or increase shoreline erosion or flooding.

This policy is not applicable to the project area.

(29) Encourage the development of energy resources on the outer continental shelf in Lake Erie and in other water bodies, and ensure the environmental safety of such activities.

Since construction of the proposed project does not involve development of energy resources, this policy does not apply.

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

All reasonable measures will be undertaken to prevent or minimize any impacts from the loss of contaminated dredged material during dredging and disposal activities (See FEIS Section 8.4.) In addition, the project would comply with applicable permitting requirements. The proposed project would therefore be consistent with this policy.

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

Since construction of the proposed project would not affect the water classification or water quality standards in the proposed project area, the proposed project is in compliance with this policy.

(32) Encourage the use of alternative or innovative sanitary waste systems in small communities where the costs of conventional facilities are unreasonably high, given the size of the existing tax base of these communities.

Since construction of the proposed project would not involve sanitary waste systems, this policy does not apply.

(33) Best management practices will be used to ensure the control of stormwater runoff and combined sewer overflows draining into coastal waters.

Since the proposed project would not involve stormwater runoff or construction of combined sewer overflows, this policy does not apply.

(34) Discharge of waste materials into coastal waters from vessels subject to state jurisdiction will be limited so as to protect significant fish and wildlife habitats, recreational areas and water supply areas.

Commercial and recreational vessels using the New York and New Jersey Harbor must comply with Federal and state requirements concerning wastewater discharges and ballast and bilge maintenance operations. Construction of the proposed project would not affect discharges from vessels into waters of the Port of New York and New Jersey. Therefore, the proposed project would be in compliance with this policy.

(35) Dredging and dredge spoil disposal in coastal waters will be undertaken in a manner that meets existing state dredging permit requirements, and protects significant fish and

wildlife habitats, scenic resources, natural protective features, important agricultural lands, and wetlands.

Potential impacts from release of contaminants from sediments during dredging or placement operations will be minimized by employing Best Management Practices (BMPs) during dredging and dredged material placement operations, as required by Water Quality Certification permits. Based upon testing prior to dredging, material suitable for placement at the HARS will be designated for disposal at that site in accordance with procedures established by USEPA. Material not suitable for the HARS will be designated for disposal according to the guidelines of the DMMP (See FEIS Appendix B-1.9) and guidelines from the states of New York and New Jersey. The proposed project would therefore be consistent with this policy.

(36) Activities related to the shipment and storage of petroleum and other hazardous materials will be conducted in a manner that will prevent or at least minimize spills into coastal waters; all practicable efforts will be undertaken to expedite the cleanup of such discharges, and restitution for damages will be required when these spills occur.

Construction of the proposed project would provide safer and more efficient transportation of petroleum products into and out of the port. In addition, the deeper channels will reduce the need to lighter tankers in the Harbor's anchorages, thus reducing the potential for accidental spills. The proposed project would therefore be consistent with this policy.

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

Construction of the proposed project does not involve the non-point discharge of nutrients, organics, or eroded soils. Therefore, this policy does not apply.

(38) The quality and quantity of surface water and groundwater supplies will be conserved and protected, particularly where such waters constitute the primary or sole source of water supply.

Since the proposed project would not affect the surface water or groundwater supply in the area, this policy does not apply.

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

Since the proposed project does not involve the transport, storage, treatment and disposal of solid wastes, this policy does not apply.

(40) Effluent discharged from major steam electric generating and industrial facilities into coastal waters will not be unduly injurious to fish and wildlife and shall conform to state water quality standards.

The proposed project would not affect any effluent discharge from generating and industrial facilities into the waters of the Port of New York and New Jersey. This policy therefore does not apply.

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

The proposed project would not contravene regional air quality standards. Reduction in marine traffic and congestion would benefit overall air quality in the project area. A Clean Air Act (CAA) Statement of Conformity is presented in FEIS Appendix B-1.10. The proposed project would therefore be consistent with this policy.

(42) Coastal management policies will be considered if the state reclassifies land areas pursuant to the prevention of significant deterioration regulations of the Federal Clean Air Act.

Since the proposed project would not affect state classifications of land areas, this policy does not apply.

(43) Land use or development in the coastal area must not cause the generation of significant amounts of acid rain precursors nitrates and sulfates.

Since the proposed project would not cause the generation of significant amounts of acid rain precursors, namely, nitrates and sulfates, this policy does not apply.

(44) Preserve and protect tidal and freshwater wetlands and preserve the benefits derived from these areas.

The proposed project will result in channel construction impacts to a total of approximately 277,000 square feet (6.4 acres) of tidal wetland along the Kill Van Kull, Arthur Kill, Newark Bay, and Port Elizabeth Channels. There are no viable structural or procedural means by which this disruption can be avoided. To compensate for this loss, a mitigation plan is being prepared in cooperation with city, state, and Federal agencies. This plan will be included in the ROD that will be issued as the NEPA process proceeds. The proposed project is therefore consistent with this policy.

APPENDIX B-1.7b: NEW JERSEY COASTAL ZONE MANAGEMENT POLICY

The State of New Jersey administers its Federally approved coastal zone program (N.J.A.C. 7:7, 7:7E) through the Department of Environmental Protection (NJDEP). Pursuant to the Federal Coastal Zone Management Act, New Jersey has defined its coastal zone boundaries and the policies to be used to evaluate projects occurring within the designated zones. The Waterfront Development Law (N.J.S.A. 12:5-3) and related requirements (N.J.A.C. 7:7-23) provide the authority for issuance of permits for, among other activities, the placement or construction of structures, pilings, or other obstructions in any tidal waterway. New Jersey's Rules on Coastal Zone Management are employed by the State's Land Use Regulation Program in the review of permit applications and coastal decision making; they address issues of location, use, and resources. New Jersey's rules provide for balancing economic development against coastal resource protection, recognizing that coastal management involves explicit consideration of a broad range of concerns, in contrast to other resource management programs with more limited concerns.

The proposed project is within the coastal zone boundaries of New Jersey. The following describes the state's coastal zone policies and evaluates the project's consistency with applicable policies. This consistency evaluation is provided to enable New Jersey environmental authorities to consider the effect of the proposed project on the state's coastal zone resources.

SUBCHAPTER 3 - SPECIAL AREAS

7:7E-3.2 Shellfish Habitat.

This policy generally limits disturbance of shellfish habitat. Shellfish habitat is found within the project area, but will not be impacted by the proposed project. A complete discussion of shellfish habitat may be found in FEIS Section 5.

7:7E-3.3 Surfclam Areas.

This policy prohibits development that would destroy or contaminate surfclam areas. Although surfclams are commercially harvested in the study area, surfclams and surfclam areas will not be impacted by dredging activities related to the proposed navigation channel improvements (See FEIS Section 6). The project is therefore consistent with this policy.

7:7E-3.4 Prime Fishing Areas.

This policy prohibits submarine mining of sand or gravel in prime fishing areas. Since the project does not involve submarine mining, this is not applicable.

7:7E-3.5 Finfish Migratory Pathways.

This policy prohibits developments, such as dams or dikes that would create physical barriers to migratory fish. Developments that would lower water quality so as to interfere with fish movement patterns are also prohibited. In order to meet the construction schedule for completion of the proposed navigation channel improvements, it is possible that more than one dredge will be operated simultaneously in the same channel area (although the number of dredges working at one time would be limited by availability and channel dimensions). Operating two or more dredges simultaneously in the same area, however, has the potential of increasing environmental impacts (especially water quality impacts). But, as indicated in Section 8 of the FEIS, dredging in areas with fine or contaminated sediments will be carried out using an environmental bucket and a slow lift rate. The use of the environmental bucket and slow lift rate by each dredge ought to reduce significantly the overall potential for sediment loss and creation of a large sediment plume. This in turn will reduce to a minimum the likelihood that channel deepening, even by more than one dredge, will create an impediment to fish movement or have a negative impact upon water quality.

Seasonal restrictions to in-water work (namely, observance of dredging or environmental windows) provide another means of preventing the creation of potential impediments to migratory routes of aquatic organisms. Seasonal dredging windows, if considered necessary by regulatory agencies, will be prescribed under Special Conditions by the NJDEP State Water Quality Certifications/CZM concurrence. It should be noted, however, that dredging operations are not projected to have an adverse impact on fish migration in the study area.

While it is known that aquatic organisms do migrate through the project area, the proposed project will not interfere with fish movement patterns, and therefore the proposed project is in compliance with this policy.

7:7E-3.6 Submerged Vegetation Habitat.

This policy prohibits or restricts dredging so as to protect water areas that support submerged vegetation. Since this project area is not a submerged vegetation habitat area, this policy is not applicable.

7:7E-3.7 Navigation Channels.

This policy prohibits construction that would extend into a navigation channel and restrict dredging in navigation channels.

The proposed project would deepen and realign navigation channels in the project area. Dredging standards (e.g., channel side-slopes and stability) would meet all applicable conditions for new or maintenance dredging in navigation channels and therefore the proposed project would be consistent with this policy.

7:7E-3.8 Canals.

This policy prohibits actions that would interfere with boat traffic in canals used for navigation. The project area is not a canal as defined by NJDEP, and therefore this policy is not applicable.

7:7E-3.9 Inlets.

This policy prohibits filling and discourages submerged infrastructure in coastal inlets. The project area is not an inlet as defined by NJDEP, and therefore this policy is not applicable.

7:7E-3.10 Marina Moorings.

This policy prohibits non-water-dependent development in marina mooring areas. Construction of the proposed project would not involve development in any marina mooring areas, and therefore the policy is not applicable.

7:7E -3.11 Ports.

This policy prohibits actions that would interfere with port uses. The proposed project would not interfere with port uses. By deepening the project area navigation channels, the proposed project would benefit port-related activities (e.g., improve navigation, and efficiency of cargo delivery). The project is therefore consistent with this policy.

7:7E-3.12 Submerged Infrastructure Routes.

This policy prohibits any activity that would increase the likelihood of damaging submerged infrastructure (pipelines, cables) or interfering with maintenance operations. Several submerged pipelines and underwater utilities are found within the project area. According to Federal policy, all buried pipelines and cables must be at least 7 ft below the authorized navigation channel project depth. Exceptions may be made provided that the plans indicating less top cover are found to be technically sound and the infrastructure owners guarantee that the Government and its contractors would be held free of any liability for damage during construction and maintenance. Buried utilities and pipelines in the channels proposed for deepening are identified in Appendix E (Channel Design) and Appendix H (Costs). Construction of the project would meet all applicable Federal and state guidelines, and the project is therefore consistent with this policy.

7:7E-3.13 Shipwrecks and Artificial Reefs.

This policy restricts the use of special areas with shipwrecks and artificial reefs that would adversely affect the usefulness of this special area as a fisheries resource. Since the project area contains no known shipwrecks or artificial reefs, this policy is not applicable.

7:7E -3.14 Wet Borrow Pits.

This policy restricts the use and filling of underwater borrow pits. Since the project area contains no known wet borrow pits, this policy is not applicable. It should be noted, however, that the

placement of dredged material in Harbor borrow pits is indicated as a contingency option in the New York and New Jersey Harbor DMMP.

7:7E-3.15 Intertidal and Subtidal Shallows.

This policy discourages disturbance of shallow-water areas (i.e., permanently or twice daily submerged areas from the spring high tide to a depth of 4 ft MLW). Construction of the proposed project would disturb shallow-water areas. [See FEIS Sections 5.4 and 6 for a discussion of impacts to intertidal and subtidal shallows.] Methods to minimize and mitigate unavoidable impacts are discussed in Section 7, Mitigation of Navigation Improvement Projects. By mitigating potential impacts to shallow-water areas, the proposed project would be consistent with this policy.

7:7E-3.16 Dunes.

This policy protects and preserves ocean and bayfront dunes. Since the project area contains no dunes, the policy is not applicable.

7:7E-3.17 Overwash Areas.

This policy restricts development in overwash areas, due to their sensitive nature. Since the project area contains no overwash areas, the policy is not applicable.

7:7E-3.18 Coastal High-Hazard Areas.

This policy restricts development in coastal high-hazard (i.e., flood-prone) areas. Since the project area is not a coastal high-hazard area, the policy is not applicable.

7:7E-3.19 Erosion Hazard Areas.

This policy prohibits development under most circumstances to protect public safety. The project area is not an erosion hazard area, and therefore this policy is not applicable.

7:7E-3.20 Barrier Island Corridor.

This policy restricts new development on barrier islands. The project area is not a barrier island corridor, and therefore this policy is not applicable.

7:7E-3.21 Bay Islands.

This policy restricts development on bay islands. The project area does not contain any bay islands, and therefore this policy is not applicable.

7:7E-3.22 Beaches.

This policy restricts development on beaches. The project area does contain beaches, but no direct impacts to beaches are anticipated (see FEIS Section 6). No reduction in use of presently accessible public areas will occur. The project is therefore consistent with this policy.

7:7E-3.23 Filled Water's Edge.

This policy seeks to promote water-dependent uses at waterfront areas that have been previously filled or modified for commercial activity. The proposed project is not a waterfront development, and therefore this policy is not applicable.

7:7E-3.24 Existing Lagoon Edges.

This policy restricts development at lagoon edges because of potential water quality problems. Since the project area contains no lagoon edges, this policy is not applicable.

7:7E-3.25 Flood Hazard Areas.

This policy is designed to restrict development in flood hazard areas and to ensure that the waterfront is not pre-empted by uses that could function equally well at inland locations. The project involves no development of areas subject to tidal or fluvial flooding, and therefore this policy is not applicable.

7:7E-3.26 (Reserved) NOT APPLICABLE

7:7E-3.27 Wetlands.

This policy restricts disturbance in wetland areas and requires mitigation if wetlands are destroyed or disturbed.

The proposed project will result in the disturbance of approximately 6.3 acres of tidal wetland (littoral zone: area between mean low water [MLW] and a depth of 6 ft below MLW) along the Kill Van Kull, Arthur Kill, Newark Bay and Port Elizabeth Channels. This habitat disturbance cannot be avoided by structural or procedural means. To mitigate this projected habitat disturbance, a mitigation plan has been prepared in cooperation with city, state, and Federal agencies. It will be included in the ROD to be issued as the NEPA process proceeds. The mitigation plan for the Harbor Navigation Study is summarized in FEIS Section 7. Since construction of the project will meet all applicable agency guidelines or permit requirements (e.g., mitigation), the project is consistent with this policy.

7:7E-3.28 Wetland Buffers.

This policy restricts development in wetland buffer areas in order to protect wetlands. The proposed project will not affect upland buffers or areas adjacent to wetlands, and therefore the project is consistent with this policy.

7:7E-3.29 (Reserved) NOT APPLICABLE

7:7E-3.30 (Reserved) NOT APPLICABLE

7:7E-3.31 Coastal Bluffs.

This policy restricts development on coastal bluffs. Since the project area does not contain coastal bluffs, this policy is not applicable.

7:7E-3.32 Intermittent Stream Corridors.

This policy restricts action in intermittent stream corridors. Intermittent streams in the project area are not tidally influenced, and will not be impacted. [See FEIS Section 6.1 for a discussion of impacts to wetland areas.]

7:7E-3.33 Farmland Conservation Areas

This policy seeks to preserve large parcels of land used for farming. The project area does not contain farmland conservation areas, and therefore this policy is not applicable.

7:7E-3.34 Steep Slopes

This policy seeks to preserve steep slopes by restricting development in such areas. Steep slopes help to control erosion and reduce flooding. Since there are no steep slopes in the project area, this policy is not applicable.

7:7E -3.35 Dry Borrow Pits

This policy restricts the excavation and filling of upland or dry borrow pits. The project area does not contain nor is it proposed to contain dry borrow pits. The policy is therefore not applicable. It should, however, be noted that the filling and grading of upland borrow pits and quarries is an option in the New York and New Jersey Harbor DMMP.

7:7E-3.36 Historic and Archaeological Resources.

This policy protects the value of historic and archaeological resources and may result in a need for cultural resource surveys and other protective measures. A harborwide survey was conducted as part of the background data collection for the Harbor Navigation Study. Review of the initial survey data indicates that no impacts related to the proposed navigation channel improvements will occur on known historic or archaeological resources.

Future actions associated with the project may impact areas with a demonstrated high potential for inundated prehistoric resources. [see FEIS Section 5.6 Cultural Resources.] Since a potential exists for adverse effects on cultural resources due to future actions associated with the proposed project, such as blasting, and given that additional archaeological and historic architectural inventories may

be required based on these actions and on the results of ongoing cultural resource investigations, USACE-NYD has entered into a Memorandum of Agreement (MOA) with the New Jersey State Historic Preservation Office (NJSHPO). [See FEIS Appendix B-1.3, Cultural Resources.] The MOA outlines the responsibilities of USACE-NYD to avoid, minimize or mitigate any adverse impacts upon cultural resources that may occur as a result of the project, and stipulates the scope and scheduling of any additional cultural resource investigations that may be required. A copy of the MOA is presented in FEIS Appendix B-1.3.

7:7E-3.37 Specimen Trees

This policy seeks to protect specimen trees as defined by NJDEP. The project area does not contain specimen trees, and therefore this policy is not applicable.

7:7E-3.38 Endangered or Threatened Wildlife or Vegetation Species Habitats.

This policy restricts development in areas known to harbor endangered or threatened wildlife or vegetation species. Several species of birds, fish, and marine mammals have been identified by USFWS as residents of the project area. [See FEIS Section 6 for a discussion of impacts to threatened and endangered species.] Any project impacts would, however, be temporary, and most likely avoidable by many organisms in the area.

7:7E-3.39 Critical Wildlife Habitats

This policy has been removed from the current Rules on Coastal Zone Management.

7:7E-3.40 Public Open Space

This policy encourages the development of new public open spaces and discourages development that might adversely affect existing public open space. The proposed project would not affect any public open space; the policy is therefore not applicable.

7:7E-3.41 Special Hazard Areas

This policy discourages development in Special Hazard Areas. Since the proposed project does not include any Special Hazard Areas, the policy is not applicable.

7:7E-3.42 Excluded Federal Lands

Federal lands are beyond the jurisdiction of the New Jersey Coastal Zone. New Jersey has the authority to review activities on Federal lands if there may be spillover impacts on New Jersey's Coastal Zone. There are, however, no excluded Federal lands in the project area, and this policy is therefore not applicable.

7:7E-3.43 Special Urban Areas

This policy seeks to encourage waterfront development that would benefit certain municipalities that receive state aid. Special urban areas located within the project area include Bayonne, Elizabeth, Jersey City, and Newark. Construction of the proposed project would provide indirect economic benefits to these areas as a result of improved shipping efficiencies. The proposed project would therefore be consistent with this policy.

7:7E-3.44 Pinelands National Reserve and Pinelands Protection Area

This policy allows the Pinelands Commission to serve as the reviewing agency for actions within the Pinelands National Reserve. Since the proposed project is not located within the Pinelands, this policy is not applicable.

7:7E-3.45 Hackensack Meadowlands District

This policy allows the Hackensack Meadowlands District Commission to serve as the reviewing agency for actions within the Hackensack Meadowlands District. The proposed project is not located within the Hackensack Meadowlands District, and therefore this policy is not applicable.

7:7E-3.46 Wild and Scenic River Corridors

This policy recognizes the outstanding value of certain rivers in New Jersey by restricting development to compatible uses. The proposed project is not located within a New Jersey wild and scenic river corridor, and therefore this policy is not applicable.

7:7E-3.47 Geodetic Control Reference Marks

This policy discourages disturbance of geodetic control reference marks. No construction is projected for areas that could contain geodetic control reference marks. Therefore the proposed project will be in compliance with this policy.

7:7E-3.48 Hudson River Waterfront Area

This policy sets forth non-industrial and industrial development standards for public access and open space along the Hudson River Waterfront Area, and requires development, maintenance, and management of a section of the Hudson Waterfront Walkway coincident with the shoreline of the development property. Since the proposed project is not a waterfront development, this policy is not applicable.

SUBCHAPTER 3A - STANDARDS FOR BEACH AND DUNE ACTIVITIES

These standards apply to routine beach maintenance, emergency post-storm beach restoration, dune creation and maintenance, and construction of boardwalks. The proposed project is not located within a beach or dune area, and therefore these standards are not applicable.

SUBCHAPTER 3B - WETLAND MITIGATION PROPOSALS

This section details the requirements of a wetland mitigation proposal. Construction of the project will meet all applicable guidelines, as well as agency or permit requirements, and therefore the project is consistent with this section.

SUBCHAPTER 3C - IMPACT ASSESSMENT FOR ENDANGERED AND THREATENED WILDLIFE SPECIES.

This section details the performance and reporting standards for impact assessments for endangered and threatened wildlife species. Potential adverse impacts were identified for threatened or endangered herons, terns, sea turtles, plovers, osprey, and peregrine falcon that may forage in the Harbor area. The impact assessment for endangered and threatened wildlife species is described in Sections 6.4 and 6.5, Threatened and Endangered Species. These sections are consistent with the standards provided with this policy.

SUBCHAPTER 4 - GENERAL WATER AREAS

This section defines general water areas. General water areas within the project area are as follows: Large tidal river – Hudson River; Open bay – Raritan Bay, Sandy Hook Bay, and Upper New York Bay; Tidal gut – Arthur Kill and the Kill Van Kull.

7:7E-4.2 Acceptability Conditions for Uses.

This section defines the important uses of general water areas and sets conditions or standards of acceptability for certain uses. Only those standards applicable to the proposed project area are listed:

(g) Standards relevant to new dredging
(h) Standards relevant to dredged material disposal

Dredging and dredged material disposal would meet the acceptability conditions for both of these applicable standards in accordance with the New York and New Jersey Harbor DMMP. The proposed project is therefore consistent with this policy.

SUBCHAPTER 5 - GENERAL LAND AREAS.

This section defines general land areas (including coastal zones) and the appropriate level of growth and development allowed within each region. No development is directly or indirectly associated with the proposed project, and therefore this policy is not applicable.

SUBCHAPTER 6 - GENERAL LOCATION RULES.

7:7E-6.1 Rule on Location of Linear Development

This rule sets conditions for acceptability of linear development (e.g., roads, walkways, pipelines). The proposed project does not include linear development, and therefore this policy is not applicable.

7:7E-6.2 Basic Location Rule.

This rule states that NJDEP may reject or conditionally approve a project for safety, protection of certain property, or preservation of the environment. The proposed project is consistent with the location rule, since the remediation will protect public health and protect fish and wildlife resources by closing a hazardous waste site.

7:7E-6.3 Secondary Impacts.

This rule sets the requirements for secondary impact analysis. Impacts associated with traffic, noise, and air quality as a result of landside changes in port facility operations and efficiencies (which will permit the economical and efficient handling of cargo at the terminals) is addressed in FEIS Section 4. The proposed project would be consistent with the requirements for secondary impact analysis. [See FEIS Section 6 for a discussion of secondary impacts.]

SUBCHAPTER 7 - USE RULES.

7:7E-7.2 Housing Use Rules

These rules set standards for housing construction in the coastal area. The proposed project does not involve housing construction, and therefore this policy is not applicable.

7:7E-7.3 Resort Recreational Use

This rule sets standards for resort and recreational uses in the coastal area. The proposed project does not involve resort recreational uses, and therefore this policy is not applicable.

7:7E-7.3A Marina Development

This rule sets standards for marina development in the coastal area. The proposed project does not involve marina development, and therefore this policy not applicable.

7:7E-7.4 Energy Use Rule

This rule sets standards for energy uses in the coastal area. The proposed project will not create a need for increased energy production or major offsite energy conveyance systems. Therefore this policy is not applicable.

7:7E-7.5 Transportation Use Rule

This rule sets standards for roads, public transportation, footpaths, and parking facilities in the coastal area. The proposed project does not involve construction of offsite roads, public transportation, foot paths, or parking facilities, and therefore this policy is not applicable.

7:7E-7.6 Public Facility Use Rule

This rule sets standards for public facilities (e.g., solid waste facilities) in the coastal area. The proposed project does not involve construction of a public facility, and therefore this policy is not applicable.

7:7E-7.7 Industry Use Rule

This rule sets standards for industrial uses in the coastal area. Since all activity for the proposed project takes place in the water, there are no zoning regulations, and this policy is not applicable.

7:7E-7.8 Mining Use Rule

This rule sets standards for mining in the coastal area. The proposed project does not involve mining, and therefore this policy is not applicable.

7:7E-7.9 Port Use Rule

This rule sets standards for port uses and port-related development. The standards are designed to ensure that port facilities retain their economic vitality. Since the project will ensure the vitality of the port for future years, the proposed project is consistent with this policy.

7:7E-7.10 Commercial Facility Use Rule

This rule sets standards for commercial facilities such as hotels, casinos, retail trade, and convention centers in the coastal zone. The proposed project does not involve construction of these types of commercial facilities, and therefore this policy is not applicable.

7:7E-7.11 Coastal Engineering

This rule sets standards for the protection of shoreline and the maintenance of dunes, and provides for beach nourishment. Standards applicable to structural shore protection are included. Any impacts to the coastal portion of the study area will be addressed in the mitigation plan. The potential use of sand dredged from the Ambrose Channel for beach nourishment is discussed in detail in the mitigation plan, and is summarized in FEIS Section 7.

7:7E-7.12 Dredged Material Disposal on Land

This rule sets standards for disposal of dredged materials. Dredging operations and disposal of dredged materials would be done in accordance with the USACE-NYD's New York and New Jersey Harbor DMMP, and would comply with project-specific state and Federal permit regulations and special conditions.

7:7E-7.13 National Defense Facility Use Rule

This rule sets standards for the location of defense facilities in the coastal zone. The Howland Hook Marine Terminal is the designated terminal for the Rapid Deployment Force. Proposed navigation channel improvements may make activities related to the Rapid Deployment Force more efficient. The proposed project is therefore in compliance with this policy.

7:7E-7.14 High-rise Structures

This rule sets standards for high-rise structures in the coastal zone. The proposed project may qualify as construction of high-rise structures when the depth of stabilized fill is added to the potential height of the proposed structures. Since, however, the development will take place in an area with existing multi-story structures (oil tanks, power plants, railroad bridges), this policy is not applicable.

SUBCHAPTER 8 - RESOURCE RULES.

7:7E-8.2 Marine Fish and Fisheries.

This rule sets standards of acceptability so as to cause minimal interference with the reproductive and migratory patterns of estuarine and marine species of finfish and shellfish. Although the proposed project area is frequented by migratory estuarine and marine species of fish and shellfish, the proposed project would not interfere with their reproductive or migratory patterns (see FEIS Section 6). Potential impacts to reproductive patterns of estuarine and marine finfish associated with the loss of littoral zone habitat will be mitigated as described in the Mitigation Alternatives Report, summarized in Section 7. The project is therefore consistent with this policy.

7:7E-8.3 (Reserved) NOT APPLICABLE

7:7E-8.4 Water Quality

This rule sets standards for coastal development so as to limit effects on water quality. Construction of the project will meet all applicable Federal and state guidelines or permit requirements and regulations for water quality as specified in the dredge permits. The project is therefore consistent with this policy.

7:7E-8.5 Surface Water Use

This rule sets standards for coastal development so as to limit effects on surface water. The proposed project will not cause unacceptable surface water disturbances. There will be no use or consumption of surface waters, and the project is therefore consistent with this policy.

7:7E-8.6 Groundwater Use

This rule sets standards for coastal development so as to limit effects on groundwater supplies. The proposed project will not place a demand on groundwater supplies nor will construction activities associated with the proposed navigation channel improvements impact area groundwater, therefore the proposed project is consistent with this policy.

7:7E-8.7 Stormwater Management

This rule sets standards for coastal development so as to limit effects of stormwater runoff. No land-based work is associated with the proposed project. Any land-based activity designed to make port facilities more efficient in handling cargo will be implemented in conformity with stormwater management requirements and erosion control measure. The project is therefore consistent with this policy.

7:7E-8.8 Vegetation

This rule sets standards for coastal development to protect vegetation. The results of hydrodynamic modeling and site surveys indicate that the proposed project will not influence any vegetated areas, and therefore the proposed project is consistent with this policy.

7:7E-8.9 (Reserved) NOT APPLICABLE

7:7E-8.10 Air Quality

This rule sets standards for coastal development with requirements that projects meet applicable air quality standards. Since the proposed project will not contravene Federal or state air quality standards (see FEIS Sections 4 and 6), it would be consistent with this policy.

7:7E-8.11 Public Access to the Waterfront

This rule requires that coastal development adjacent to the waterfront provide perpendicular and linear access to the waterfront to the extent practicable, including both visual and physical access. The proposed project will not affect access to the waterfront, and therefore this policy is not applicable.

7:7E-8.12 Scenic Resources and Design

This rule sets standards for new coastal development to be visually compatible with its surroundings. The project does not involve coastal development, and therefore this policy is not applicable.

7:7E-8.13 Buffers and Compatibility of Uses

This rule sets standards for adequate buffers between uses found to be incompatible. Because the proposed project is compatible with existing land uses in its vicinity, the project would be consistent with this policy.

7:7E-8.14 Traffic

This rule sets standards for coastal development so as not to disturb traffic systems. The proposed project involves no improvements to existing traffic systems, and therefore this policy is not applicable (see FEIS Section 3).

7:7E-8.15 through 8.20 (Reserved) NOT APPLICABLE

7:7E-8.21 Subsurface Sewage Disposal Systems

This rule sets standards for subsurface sewage disposal systems in the coastal zone. Since the proposed project does not involve onsite sewage disposal, but will rather employ the existing municipal disposal system, this policy is not applicable.

APPENDIX B-1.7c: THE NEW YORK CITY LOCAL WATERFRONT REVITALIZATION PROGRAM (LWRP)

The twelve New York City Local Waterfront Revitalization Program (LWRP) policies and their applicability to the proposed navigation channel improvements are discussed below.

Policy A – Improve Urban Shorelines by Maintaining, Removing, or Recycling Waterfront Structures (Piers, Docks, Wharves, etc.) in Accordance with Waterfront Development Policies and Plans. Identify Alternative Uses for Underutilized Waterfront Structures.

The project does not directly involve the maintenance or alteration of piers, docks, wharves, or other waterfront structures. To this extent, this policy does not apply to the proposed project. Indirect benefits may accrue as a result of improved shipping access to maritime industries along the shoreline of Staten Island and Brooklyn, and elsewhere in New York and New Jersey Harbor.

Policy B – Improve Channels as Necessary to Maintain and Stimulate Economic Development.

The proposed project directly supports this policy by maintaining and promoting economic growth for the Port of New York and New Jersey. Construction of the proposed project would improve commercial navigation and access to existing centers of commerce and industry in the Port of New York and New Jersey, thereby helping to prevent the loss of port business to competing East Coast ports. The proposed navigation channel improvements will allow for more efficient movement of cargo to the South Brooklyn and Howland Hook Marine Terminals. It should be noted that no specific land use and development projects are associated with the proposed channel improvements. The proposed project would therefore be consistent with this policy.

No direct or indirect upland impacts have been identified with the proposed navigation channel improvements. New York and New Jersey Harbor commerce is projected to increase at a rate of 2 to 3% per year, with the port facilities projecting to meet this cargo increase through modifications to facility operations and increases in efficiencies. The port facility changes associated with the projected increase in cargo are addressed in detail in FEIS Section 4, Without-project Conditions.

Policy C – Provide Shoreline Protection Against Coastal Erosion Hazards Where There is Public Benefit and Public Use Along Non-Public Shores.

The proposed project will not include the siting of buildings or other structures in the coastal area and does not include erosion control structures. Coastal zone erosion is not

expected to increase as a result of the proposed project. Therefore, the proposed project is consistent with this policy.

Policy D – Provide Technical Assistance for the Identification and Evaluation of Erosion Problems, as well as the Development of Erosion Control Plans along Privately Owned Eroding Shores.

The proposed project will not include the siting of buildings or other structures in the coastal area and therefore will not include erosion control structures or contribute to coastal zone erosion. Therefore, this policy does not apply to the proposed project.

Policy E – Implement Public and Private Structural Flood and Erosion Projects.

The proposed project is not a structural flood or erosion control project. Therefore, this policy does not apply to the proposed project.

Policy F – Priority shall be given to the Development of Mapped Parklands and Appropriate Open Space Where the Opportunity Exists to Meet the Recreational Needs of Immobile User Groups and to Communities without Adequate Waterfront Park Space and/or Facilities.

The proposed channel deepening does not directly affect existing or required access to facilities along the coastal waters, public access points, public parks, or open spaces. The proposed work will not limit or prevent waterfront access, now or in the future. One of the goals of the wetland mitigation program may be the incorporation, where possible, of a public access component. The project therefore supports this policy.

Policy G – Maintain and Protect New York City Beaches to the Fullest Extent Possible.

The proposed project will not affect any New York City public beaches. The proposed project would therefore be consistent with this policy

Policy H – Insure Ongoing Maintenance of all Waterfront Parks and Beaches to Promote Full Use of Secure, Clean Areas with Fully Operable Facilities.

The proposed project will not affect the use, enjoyment or operation of any New York City-public or private beaches or waterfront parks. The proposed project would therefore be consistent with this policy.

Policy I – Siting of Liquified and Substitute Natural Gas Facilities, Including Those Associated with the Tinkering of such Gas, Shall Take Into Consideration State and National Energy Needs, Public Safety Concerns, and the Necessity for a Shorefront Location.

Since the proposed project does not involve placement of natural gas facilities, this policy is not applicable.

Policy J – Adopt End-Use Plans for Landfill Areas.

Since the proposed project will not affect landfill areas, this policy is not applicable.

Policy K – Curtail Illegal Dumping Throughout the Coastal Zone and Restore Areas Scarred by this Practice.

The proposed project will follow all agency-specified Best Management Practices and special permit conditions during dredging, blasting, placement, and transport of removed material. All requisite permits for the work will be obtained. Illegal dumping will not occur. The proposed project is therefore consistent with this policy.

Policy L – Encourage Energy Development from Waste and Waste Landfills.

The purpose of this policy is to assist in achieving the national objective of energy independence through the recovery or production of energy from waste. The proposed project does not involve energy development from waste or waste landfills, and the policy is therefore not applicable.

FEIS APPENDIX B-1.8

MEMORANDUM OF UNDERSTANDING

MEMORANDUM OF UNDERSTANDING
for a
COMPREHENSIVE PORT IMPROVEMENT PLAN
for the
PORT OF NEW YORK AND NEW JERSEY

STATEMENT OF INTENT

The purpose of this Memorandum of Understanding (MOU) is to set forth a cooperative approach, among port project sponsors, regulatory agencies, resource agencies, and regional stakeholders, for implementing environmental improvement and economic development decisions for the Port of New York and New Jersey.

I. BACKGROUND

A. Introduction

In its early history, before deepening of the Port of New York and New Jersey (Port) by constructing channels, the Port was a relatively shallow estuary with depths of approximately 25 feet or less throughout almost the whole New York/New Jersey area. Since before the beginning of the nineteenth century, maritime activities, cargo demand, and the population of the local and regional area have increased steadily. While historic port development has been justified because of economic and transportation needs, the ecological functions and flora and fauna populations of the Port have been under ever increasing stress without the benefit of a comprehensive assessment of the environmental impacts associated with such Port development. Consistent with applicable laws, the Comprehensive Port Improvement Plan (CPIP), and its requisite environmental impact statement (CPIP-EIS), will seek to avoid such environmental impacts when possible, and otherwise minimize them. The CPIP will also look to ensure, consistent with applicable laws, that any adverse impacts associated with its implementation are compensated for on at least a value-for-value basis. Moreover, in recognition of the goals of the Harbor Estuary Program, the CPIP will endeavor, to the maximum extent possible, to advance the restoration of the Harbor and its environment.

Today, the Port plays a vital part in the economy of the New York/New Jersey metropolitan area. The Port provides same day access as well as savings in transportation costs to more than 18 million consumers in the New York/New Jersey metropolitan area, and second-day access to another 80 million consumers in the Midwestern United States and Eastern Canada. It is presently the third largest container port in North America and the largest container center on the East Coast. It is also the largest auto port and the largest petroleum port in the United States. The ocean carrier Maersk-SeaLand recently selected the Port of New York and New Jersey as its northeast load center for the 21st century. Maersk-SeaLand and other ocean carriers are deploying new "post-Panamax" vessels which would require, when fully loaded, channel and berth depths of 50 feet.

A 45 foot channel deepening project is underway at the Kill van Kull and Newark Bay Channels in the Port to meet the immediate demand for improved access to the Port Newark/Elizabeth Terminal. Two other channels, Port Jersey Channel and Arthur Kill Channel, are authorized to be deepened to 41 feet.

B. The New York and New Jersey Harbor Navigation Feasibility Study

The U.S. Army Corps of Engineers (USACE) is currently considering future navigation improvements, including deepening existing channels to 50 feet in its New York and New Jersey Harbor Navigation Study (HNS). The primary purpose of the HNS is to evaluate the potential national benefits that could be derived from future federal investment in the construction of deeper channels in the Port to accommodate the larger container vessels joining the international fleet.

According to the HNS, the projected year 2060 cargo demands for the metropolitan region exceed 19 million Twenty-foot Equivalent Units (TEUs) of cargo based upon Port capture of the maximum market share possible. However, the USACE's HNS (based on the projected capacity of existing port facilities meeting a theoretical productivity efficiency of 3,500 lifts per acre per year by 2040) indicates that the capacity of the Port facilities could only be about 9.6 million TEUs. Filling this projected gap of approximately 9.4 million TEUs without further expansion of the Port's capacity would likely require transporting cargo from other ports via long distance truck or rail. Deepening channels allows deeper draft vessels to enter the Port and therefore gives existing Port facilities the ability to operate in an economically efficient manner. Under this scenario, the projected gap could be closed by phasing in landside improvements to Port facilities and transportation infrastructure.

The environmental resources/issues of concern associated with development at the Port include, among other things, air quality, traffic flow, noise levels, public access, aesthetic values, natural resources, economic factors, community character, and water quality issues. While the HNS will include upland development issues in its cumulative impacts assessment, it will not fully address the issues associated with the maximum cargo demands noted above. The CPIP will be the mechanism through which to comprehensively address the issue of how to proceed with development at the Port in the most economically efficient and environmentally protective manner possible.

C. Other On-Going Studies

There are several key resources available for use during the development of the CPIP and the accompanying CPIP-EIS:

1. Strategic Port Investment Analysis – The Port Authority of New York and New Jersey (Port Authority), in cooperation with the States of New York and New Jersey, has undertaken a study to determine the investments in marine terminals and related infrastructure that would be required to accommodate the growing

volume of international cargo shipped through the Port. The study focused on six major planning objectives: (1) maintain market share; (2) expand market share; (3) sustain current customers; (4) add new customers; (5) improve financial performance; and (6) expand regional economic benefits. The study identified possible sites for development of up to 800 acres of new container terminal space (which could include filling waters of the U.S. adjacent to existing port facilities) and possible strategic business initiatives that could be used to increase port capacity and reduce the need for new container space.

2. Strategic Plan for Redevelopment of the Port of New York – The New York City Economic Development Corporation has prepared a plan identifying a series of targeted investments to develop cargo terminals, as well as to improve highway and rail access, public access and environmental mitigation in New York over the period from 1999 to 2020. The plan calls for developing or improving 1,200 acres of container, auto, break bulk, rail and public open space facilities.

3. NewYork/NewJersey Harbor Comprehensive Conservation and Management Plan (CCMP) – In 1997, the U.S. Environmental Protection Agency (USEPA) Regional Administrator and the Governors of New York and New Jersey signed the CCMP which had been prepared for the New York/New Jersey Harbor Estuary Program, pursuant to Section 320 of the Federal Clean Water Act of 1987. The CCMP addresses a number of environmental issues of concern to the Port including habitat, toxic contamination, dredged material, pathogens, nutrients and organic enrichment, floatables, and rainfall induced discharges. The CCMP was created with participation from federal, state, and local governments, universities, industry, environmental groups and citizens. With commitments and recommendations on most actions and well-developed modules for toxics reduction and habitat restoration, the program has already realized some environmental benefits to the estuary. One area the program is currently focusing considerable attention on is the development of Total Maximum Daily Loads (TMDLs) for toxics, pathogens and nutrients.

4. Cross Harbor Freight Movement Study - Because freight movement in New York City and the surrounding region is confronted with congestion due, in part, to the ever increasing use of trucks and their impact on the highway network, the federally-funded Cross Harbor Freight Movement Study was undertaken to identify alternative modal strategies to improve the movement of goods across New York Harbor, including Transportation Systems Management (TSM), rail carfloats, a rail freight tunnel, and a rail/truck tunnel.

5. Dredged Material Management Plan (DMMP) - USACE policy (EC-1165-2-200) requires each of its Districts to prepare a DMMP for maintaining Federal Navigation channels for at least 20 years at a time. A DMMP must identify how much material has to be dredged to maintain Federal channels and how the dredged material will be managed in an economically sound and environmentally

acceptable manner. The plan is intended to ensure that projects can be maintained, thereby justifying continued investment of Federal funds. The DMMP for the Port goes beyond this goal of maintaining Federal navigation projects; it includes private and/or local dredging needs as well. The DMMP strives to develop a regionally supported comprehensive plan to meet all dredged material management needs for the Port.

6. New York City Local Waterfront Revitalization Program (LWRP) - The New York City Department of City Planning administers the City's LWRP. The program is a response to local, State, and Federal concerns about the deterioration and inappropriate use of the waterfront. The program, approved by and part of the State's Coastal Zone Management program, consists of 44 statewide policies for protection and improvement of the waterfront, and 12 policies specifically applicable to the City of New York. These policies establish a framework for determining an action's consistency with public policy goals for waterfront development.

7. New York City Freight Synthesis Study - In October 1999, the New York City Department of Transportation developed a Freight Synthesis Study that provides a comprehensive overview of the studies produced within the past decade on regional freight transportation, using the information contained in those documents to identify key issues, conclusions and recommendations regarding future waterborne, rail, and truck freight movement. A multi-modal approach to freight movement that will address the growing highway congestion problems is recommended by the report.

These resources may be augmented by other sources including federal, state, and local planning documents, transportation studies, environmental investigations, and financial analyses.

D. Port Expansion Overview

In light of the projected growth of commerce, the Port Authority, the States of New York and New Jersey, and the City of New York have recently evaluated opportunities for expanding the Port's capacity and enhancing the Port region's cargo transportation system. Port project sponsors wish to maximize the Port's market share and to achieve greater cargo throughput capacity to service local and regional demands which would in turn produce significant regional economic benefits.

Enhancing landside productivity, expanding existing facilities, and developing new terminals are three means to provide additional throughput capacity. Increasing capacity by enhancing landside productivity and reducing traffic congestion by avoiding unnecessary reliance on trucks allows for Port growth with the least impact on the environment. Reduced impacts on water quality, aquatic and upland habitats, and air quality are the most noticeable benefits of this approach. Currently, the port community

is aggressively seeking ways to increase terminal throughput capacity by enhancing landside productivity. However, it is unlikely that productivity improvements alone will allow the Port to meet all of the anticipated capacity demand. Consequently, options for expansion of existing terminals and creation of new terminals may be required. Federal, state, and local permits, which would include the development and implementation of requisite mitigation, may need to be obtained for terminal construction.

II. PREPARATION OF THE CPIP AND CPIP-EIS

A. Introduction

As discussed above, because the Port is expected to experience significant capacity demand over the next 60 years, and because in the past most Port improvement projects have been evaluated individually, development of the CPIP, considering the Port as a system, including terminal operations, intermodal services, landside logistical operations, and environmental parameters, presents an opportunity to consider economically efficient development hand in hand with a comprehensive environmental protection strategy. In contemplation of this demand, the parties to this MOU agree to prepare the CPIP for Port improvement activities.

The CPIP has the potential to identify the need for several major federal, state, or local actions (e.g., actions to permit fill for expansion of port facilities, modification and/or expansion of existing transportation networks, channel improvements, and habitat enhancement and/or restoration projects, and wetland mitigation banks). Where these actions would be major actions that could cause significant environmental effects, the decision making process associated with these actions would require the preparation of an EIS pursuant to the National Environmental Policy Act (NEPA) and applicable state and local environmental law. In an effort to consolidate and effectively use limited resources, the parties to this MOU agree that the most effective approach would be to prepare an EIS on anticipated port improvement activities that may require Federal regulatory or other consideration. The Consortium (identified below), through the Port Authority, has requested the USACE's participation in the CPIP and CPIP-EIS because it expects that the CPIP will likely propose actions requiring Department of Army permits.

B. Parties Responsible for the Preparation of the CPIP and CPIP-EIS

Associated infrastructure project sponsors, including the Port Authority, the States of New York and New Jersey, and the City of New York, will form a Consortium to advance and/or support future Port economic development and environmental restoration proposals. By mutual agreement, the Consortium will direct, manage, and provide funds for the CPIP preparation, and provide funds and data to support the preparation of the requisite CPIP-EIS. The federal Co-lead agencies, as defined in Section II.B.ii, below, in coordination with the parties to this MOU, will select the contractor responsible for preparing the CPIP-EIS pursuant to 40 CFR 1506.5(c). The contractor will develop preliminary drafts of the CPIP-EIS documents, subject to approval by the Co-lead

agencies, and will be responsive to input provided by cooperating agencies. In addition, the Consortium will play an active role in all public participation activities.

The following agencies and organizations have expressed an interest in participating in the CPIP and CPIP-EIS processes. Upon signature, the agencies/organizations agree to participate according to the responsibility structures described below:

i) CPIP Responsibility Structure:

Consortium: Port Authority, New Jersey Maritime Resources, Empire State Development Corporation, and New York City Economic Development Corporation.

Responsibilities include: cooperatively analyzing Port efficiency, expansion, and development proposals; formulating these proposals into the CPIP; making recommendations on permit requests submitted by individual Consortium members; conducting appropriate public participation activities; reviewing, and preparing CPIP and coastal consistency documents; coordinating with Cooperating and Participating agencies; and additional activities as defined in other sections of this MOU.

Participating Agencies: USACE, USEPA, U.S. Maritime Administration, U.S. Surface Transportation Board, Federal Highway Administration, U.S. Coast Guard, U.S. Fish and Wildlife Service, Federal Railroad Administration, Federal Transit Administration, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, New Jersey Department of Environmental Protection, New Jersey Department of Transportation, New York State Department of Environmental Conservation, New York State Department of State, New York State Department of Transportation, New York Metropolitan Transportation Council, and the North Jersey Transportation Planning Authority, New York City Department of City Planning, New York City Department of Environmental Protection, New York City Department of Transportation, and interested local Port municipalities that apply for Consortium membership.

Responsibilities include: reviewing materials, participating in regular meetings, and providing guidance and advice in areas of special expertise.

ii) CPIP-EIS Responsibility Structure:

Co-lead Agencies: USEPA, USACE, New Jersey Maritime Resources, and the Empire State Development Corporation.

Responsibilities include: independently evaluating and reviewing all NEPA documents; conducting appropriate public participation activities required under NEPA and other statutes and regulations; and exercising authority consistent with

applicable law. The federal Co-lead agencies, in coordination with the parties to this MOU, will select the contractor responsible for preparing the CPIP-EIS pursuant to 40 CFR 1506.5(c).

Cooperating Agencies: U.S. Maritime Administration, U.S. Surface Transportation Board, U.S. Coast Guard, U.S. Fish and Wildlife Service, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, Federal Highway Administration, Federal Railroad Administration, Federal Transit Administration, Port Authority, New Jersey Department of Environmental Protection, New Jersey Department of Transportation, New York State Department of Environmental Conservation, New York State Department of State, New York State Department of Transportation, New York City Economic Development Corporation, New York City Department of Environmental Protection, New York City Department of City Planning, New York City Department of Transportation, New York Metropolitan Transportation Council, and the North Jersey Transportation Planning Authority.

Responsibilities include: reviewing materials, participating in regular meetings, and providing guidance and advice in areas of special expertise.

The responsibilities outlined for Consortium, co-lead, and the cooperating and participating agencies for both the CPIP and CPIP-EIS are not exhaustive and not all listed agencies and municipalities shall be required to participate in all listed activities. Contractor costs of the preparation of the CPIP-EIS shall be borne by the members of the Consortium and paid by a designated Consortium member.

C. Scope of the CPIP

The CPIP will be developed to support the goals defined by the President's Council for Sustainable Development (PCSD) (June 1993). These goals include sufficient growth to ensure economic prosperity while conserving natural resources and ensuring the benefits of clean air, water, and a healthy environment. The development of the CPIP and its EIS is an example of good stewardship with Port stakeholders taking "full responsibility for the economic, environmental, and social consequences of their actions." Moreover, one of the objectives of the CPIP will be to apply "green port" planning principles to the Port.

Similarly, the CPIP will look to further the objectives of the Joint Dredging Plan for the Port of New York and New Jersey, agreed to by Governors Pataki and Whitman in October 1996. Among the Plan's objectives is maintaining and strengthening the economic vitality of the Port region. The Plan recognizes that successful economic development of the Port must ensure that the Harbor is preserved as a vital natural resource that can be enjoyed by all of its constituents. To this end, the CPIP will consider and provide a plan for both port facilities enhancements and improvements to the natural resources of the Harbor.

The CPIP shall evaluate future cargo handling capacity needs and alternatives for the Port, including cargo handling capacity: (1) at the Port facilities proper; (2) immediately off the Port facility's premises; and (3) throughout the "Port District", which is defined, in bi-state legislation, as roughly the area encompassed by a 25 mile radius centered around the Statue of Liberty.

The CPIP will look to ensure that future development planning to the year 2060 is adequately evaluated for compliance with all applicable federal, state, and local laws and regulations, including, at a minimum, NEPA, Coastal Zone Management Act, Clean Water Act, Rivers and Harbors Act, Clean Air Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, Endangered Species Act, Transportation Equity Act for the 21st Century, and applicable state and local laws. To the maximum extent possible, the CPIP will make use of existing data that have resulted from other plans, studies, and environmental analyses.

In particular, the CPIP shall define the specific water and landside infrastructure development initiatives that individual Consortium members believe to be necessary to meet the region's capacity demand of 19 million TEU (which includes the unsatisfied capacity demand of 9.4 million TEU) by the year 2060. The plan shall also consider environmental issues, including impact avoidance, minimization and mitigation, air quality, habitat/harbor preservation and restoration opportunities, public access, and sediment contaminant reduction.

The public participation process associated with the environmental analysis of the CPIP shall meet the goal of "Civic Engagement" offering "opportunity for citizens, businesses, and communities to participate in and influence the natural resource, environmental, and economic decisions that affect them." (PCSD June 1993)

D. Scope of the CPIP-EIS

The CPIP shall be accompanied by a thorough analysis of reasonable viable alternatives for development of the Port, as a complex regional system, through the CPIP-EIS. Particular attention will be given to the potential impacts of any proposed fills, new pier or berthing facilities, dredging and disposal operations, waterway and land side traffic congestion, air pollution, and other issues identified during the scoping process.

At a minimum, the geographic scope of the CPIP-EIS will be the "Port District", which is defined, in bi-state legislation, as roughly the area encompassed by a 25 mile radius centered around the Statue of Liberty. This geographic scope may be expanded based on the scoping process.

The CPIP-EIS shall project scenarios to the year 2060 (50 years beyond the 2010 baseline used previously by the USACE for cargo projections) with particular detail and focus on the 2010 and 2015 milestones.

Pursuant to 40 CFR Section 1502.14, the types of alternatives to be rigorously explored and objectively evaluated shall include all reasonable alternatives including those alternatives that are not within the jurisdiction of the Co-lead agencies. For alternatives that are eliminated from detailed study, there shall be a discussion of the reasons for their having been eliminated. The four types of alternatives below are not exhaustive but are illustrative, for the CPIP-EIS:

(1) The No Action alternative.

(2) Port expansion/enhancement/improvement alternatives that increase productivity or cargo handling efficiency at existing terminals.

(3) New terminal alternatives developed in either upland or with fills into the water.

(4) Combinations of the above.

The consideration of these alternatives shall include the evaluation of the development and improvement of other ancillary infrastructure that may be necessary to accommodate changes at the port facilities.

The CPIP-EIS shall also include analysis of the direct, indirect, and cumulative impacts associated with each alternative discussed in the CPIP-EIS. At a minimum, the CPIP-EIS would evaluate proposed port-related fills, alternatives to fills, associated transportation infrastructure and projects, waterway and land side traffic congestion, socioeconomic issues, air quality, and other development-induced environmental impacts. To the maximum extent possible, the CPIP-EIS will make use of existing data that has resulted from other plans, studies, and environmental analyses.

E. Stakeholder Outreach Process

Stakeholder outreach shall be an integral part of the CPIP-EIS process. The requirements of the stakeholder outreach process, including the frequency and kind of public, business, and local government involvement, is outlined in Section III.B., below, and shall be further developed at the first meetings of the CPIP-EIS Management Committee and Stakeholder Committee.

F. Permits/Approvals and New Projects

To the maximum extent possible, given uncertainties intrinsic to future Port development actions, the appropriate level of discussion and analysis will be included in the CPIP-EIS such that agency decisions on permit applications and new projects associated with Port activities can be facilitated using the final CPIP and CPIP-EIS, which look to reflect the comprehensive plan for the future of the Port. Permits and approvals include, among others, Department of the Army permits, Coastal Zone Management Act consistency

determinations, Water Quality Certification Determinations, and other applicable state permits/approvals.

III. IMPLEMENTATION PROCEDURES

A. Agency Representatives and Designees

Each Consortium member and co-lead agency will appoint a senior level manager to serve as a CPIP and CPIP-EIS "Representative," as appropriate, on a Steering Committee for the purpose of implementing their respective responsibilities under this MOU. The Representatives, consistent with the authority provided by their respective enabling statutes, regulations, and by-laws, shall speak definitively on behalf of their organizations. In turn, Representatives may appoint Designees to represent their organization on a regular basis throughout the CPIP and CPIP-EIS processes through a Management Committee. The members of the Management Committee will be responsible for overseeing and coordinating the day to day activities, consistent with each organization's role as defined in II.B. above, for the preparation of the CPIP and CPIP-EIS.

B. Meetings and Committees

The Steering Committee shall consist of the Representatives (as specified in Section III.A above) and at least one non-governmental member of the Stakeholder Committee (defined below) who represents environmental interests. The Steering Committee may expand its membership as it deems necessary. The Steering Committee shall meet at least on a quarterly basis to jointly review the progress of the CPIP and CPIP-EIS processes, and discuss resolution of any issues or concerns that have arisen and cannot be resolved at a lower level.

The Steering Committee will establish the Management Committee that will be responsible for ensuring the completion of the work and the coordination among the involved agencies. The Management Committee shall meet regularly to ensure that progress is being made, and to establish and dissolve ad-hoc and regular Working Groups as deemed necessary throughout the CPIP and CPIP-EIS processes. To the maximum extent practicable, the Management Committee will draw from or utilize existing committees and working groups from other related studies, such as the HNS, the CCMP, and New York City Economic Development Corporation committees augmented and modified as appropriate. The Representatives shall participate in the first meeting of the Management Committee; their participation in future meetings is encouraged but optional.

The Steering Committee will establish, and select members for, a Stakeholder Committee to aid in meeting the public outreach requirements of NEPA and other applicable state and local environmental laws, and to allow stakeholders the opportunity to share information and ideas for consideration by the Steering and Management Committees.

To the maximum extent practicable, the Stakeholder Committee will be drawn from or utilize existing committees and working groups from other related studies, such as the HNS, the CCMP, and New York City Economic Development Corporation committees augmented and modified as appropriate. To ensure that all interested stakeholders are represented while still maintaining a manageable number of Stakeholder Committee Members, participation in the Stakeholder Committee meetings will be open to all interested parties, but only Members will serve in an official capacity. In addition to open access to meetings, a mailing list will be established whereby all interested parties can be kept informed of discussions taking place during the Stakeholder Committee meetings. The Harbor Estuary Program (HEP) infrastructure and authority will be instrumental in developing mailing lists and supporting the development of the Stakeholder Committee. The Stakeholder Committee shall meet quarterly starting from the effective date of this MOU. The selected Designees shall hold the first Stakeholder Committee meeting specifically for the purpose of establishing a process for selecting non-governmental committee members.

All Committees and Working Groups will also elect a Chair. If a Chair is unable to fulfill her or his responsibilities, a new Chair will be elected. Working Group Chairs shall report to the Management Committee Chair on a regular basis, but not less then bi-weekly.

C. Information and Schedule for MOU-Related Actions

The Representatives and/or Designees shall agree on methods for generating information, processes, and documentation needed to support recommendations regarding actions to be addressed through the implementation of this MOU, taking into account the specific procedural requirements of the applicable programs. In no event shall recommendations delay the completion schedule of the CPIP-EIS found under Section V. below.

D. Coordinator

The Consortium, with the concurrence of the other parties to this MOU, shall designate a CPIP Coordinator. The CPIP Coordinator's duties shall include: (1) keeping minutes of meetings and circulating those minutes to all Representatives and/or Designees for review, with finalization at the following meeting, (2) preparing lists of attendees and agendas for meetings and circulating these to all Representatives and Designees at least one week prior to each meeting, and (3) other responsibilities that may be jointly agreed upon by the parties. The Consortium shall pay all costs of the CPIP Coordinator.

IV. INTERIM APPLICATION/PROJECTS PROCESSING PROCEDURES

A. Pending Applications and Projects

The USACE shall provide a list of the current status of federal permit applications proposing expansions of port facilities in the New York and New Jersey Harbor area it

has received that are pending on the effective date of this MOU ("pending applications/projects"). The list is due within thirty (30) days of the effective date of this MOU. A new list will be generated and provided anytime there are proposed projects added or deleted from regulatory consideration.

The parties to this MOU agree that the processing of independently justified applications/projects shall proceed separate from the process set forth in Sections II. And III. of this MOU.

The potential impacts of the projects or permits that are pending shall be discussed in the CPIP-EIS.

B. Interim Applications and Projects

While the standard project application review process will continue, within sixty (60) days after the effective date of this MOU, the USACE shall look to formulate processing procedures that maximize the involvement of CPIP members in federal permit applications and federal projects identified as related to the subject matter of this MOU that are submitted after the effective date of this MOU, but before the date of publication of the CPIP-EIS ("interim applications and projects").

C. CPIP Limitations

The parties to this MOU acknowledge that some components of the HNS (as identified in Paragraph 362, Page 131 of the HNS draft EIS) have not been fully evaluated in that study and, therefore, are not proposed in the HNS for construction until the requisite studies are completed. Accordingly, supplemental environmental documentation will be required before construction of those components can be considered for authorization. Such supplemental environmental documentation can be included in the CPIP-EIS directly or by reference, if completed separately. Moreover, the cumulative impacts of all past, present, and reasonably foreseeable future port improvement projects, including those authorized upon completion of the HNS, shall be evaluated in the CPIP-EIS.

Transfers and changes in usage of property currently owned by Consortium members may proceed without regard to completion of the CPIP and CPIP-EIS. Any transfers and/or changes shall be subject to independent review under federal, state, and local requirements; including environmental requirements. Any impacts associated with such activities can be included in the cumulative impacts analysis in the CPIP-EIS.

V. GENERAL PROVISIONS

A. Effective Date of the MOU

This MOU is effective immediately upon being signed by the USACE, the USEPA, the Consortium members, and the Senior Executive Review Group members. Other agencies may become signatories to this MOU at any time. However, the participation of any parties signing this MOU after the effective date shall be prospective only; decisions, agreements or other actions accomplished prior to the date that such parties sign this MOU shall be deemed final with regard to them and shall not be reopened. This MOU shall continue in effect until modified or terminated by all Consortium and Co-Lead parties in the manner prescribed in Section V.D. below.

B. Time Frame for Completion

Completion schedule of the CPIP-EIS shall be held to a time frame of no more than five (5) years from the effective date of this MOU.

C. Non-Delegation of Authority

It is understood by the parties that this MOU is neither a delegation nor modification of their respective authorities and responsibilities under applicable provisions of federal, state, or local law.

D. Modification of and Termination of Participation in the MOU

The parties agree to work together to modify this MOU should such modification become necessary as a result of changed circumstances. Any party may, upon written notification to the other parties, withdraw from the MOU.

E. No Personal Liability

No Commissioner, officer, or employee of any of the signatory agencies/organizations shall be personally held liable on account of the terms of this MOU or any breach or attempted or alleged breach thereof.

VI. SIGNATURES

U.S. Army Corps of Engineers — Date

William J. Hansen

U.S. Environmental Protection Agency — Date 12/23/99

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VI. SIGNATURES

William L. Leduc — 17 Dec 99

U.S. Army Corps of Engineers — Date

U.S. Environmental Protection Agency — Date

U.S. Maritime Administration _____ Date _____

U.S. Coast Guard _____ Date _____

Port Authority of New York and New Jersey _____ Date 12/16/99

APPROVED TERMS FORM

New Jersey Maritime Resources _____ Date _____

Empire State Development Corporation _____ Date 12/20/99

New York City Economic Development Corporation _____ Date _____

Additional Signatories

Federal Highway Administration _____ Date _____

Federal Railroad Administration _____ Date _____

U.S. Surface Transportation Board _____ Date _____

Federal Transit Administration _____ Date _____

U.S. Fish and Wildlife Service _____ Date _____

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U.S. Army Corps of Engineers — Date

U.S. Environmental Protection Agency — Date

U.S. Maritime Administration — Date

U.S. Coast Guard — Date

Port Authority of New York and New Jersey — Date

New Jersey Maritime Resources — Date 12/22/99

Empire State Development Corporation — Date

New York City Economic Development Corporation — Date

FEIS APPENDIX B-1.9

TRAFFIC

APPENDIX

TRAFFIC

Section 1 - Introduction

This technical appendix presents the results of traffic analyses which were conducted to assess the impact of the proposed project and the no action alternative. This analysis considers the four sites at which cargo will be received and off-loaded onto trucks for transport to cargo destinations. At each of the four terminal sites, evaluations have been made to determine the impact of projected increases in traffic on critical nearby intersections. This analysis considers the impacts which will result from the increased transportation of cargo and commutation to the site by employees through the year 2060.

The four sites include Port Newark/Elizabeth, Port Jersey/MOTBY, Howland Hook, and South Brooklyn. The proposed project includes deepening the shipping channels used to access these sites to allow fully loaded deeper draft container vessels to call at these terminals. Independent of the implementation of further channel deepening, a program of improvements will be carried out at the existing terminal sites. These actions will include the deployment of more efficient cranes; development of a modern container terminal at South Brooklyn; enhancement of the cross harbor movement of cargo; reconfiguration of terminal operations at Port Newark/Elizabeth, including the conversion of 100 acres of warehouse space to container terminal; and at Port Jersey, the conversion of the 80 acre NEAT facility and the development of 130 acres at MOTBY into container terminal. The result of these non-project dependent actions will be increased terminal throughput capacity from a present level of 3.0 million TEUs/year to 9.6 million TEUs/year by the year 2060. As discussed above, in order to accomplish this increase in throughput, the present acreage of container terminals will be increased from 1197 to 1607 acres, and productivity, currently estimated at 1500 lifts/acre is assumed to increase to a level of 3500 lifts/acre by 2040.

The "no action" alternative assumes that the shipping channels will not be deepened. As a result, cargo passing through the container terminals will be carried by a greater number of shallower draft vessels. It is expected that the actual cargo throughput will expand to 9.6 million TEUs as described above. Thus, the primary difference between the "no action" alternative and the "Proposed Action" or "With Project" alternative is the number and size vessels anticipated to pass through the Harbor.

In order to meaningfully assess the proposed project and no action alternatives, a benchmark is needed for comparison. This benchmark is defined as the current throughput level at each site imposed upon future traffic and air quality conditions in the analysis years (2030 and 2060). That is to say, no expansion in the acreage of the container terminals is assumed, and no increases in productivity are assumed. This is defined as the "benchmark" scenario.

The current and future container acreage and throughput capacities for each site are shown below, representing both the "proposed action" and "no action" alternatives:

Acreage and Throughput Capacities for Container Terminal Sites				
Site	**Existing Area**	**Existing Throughput Capacity (M TEU/year**	**Area - 2060**	**Throughput 2060 (M TEU/year)**
Port Newark/ Elizabeth	950	2.42	1050	6.25
Port Jersey/ MOTBY	100	.26	310	1.84
Howland Hook	147	.38	147	.87
South Brooklyn	0	0	100	.60
Total	1197	3.06	1607	9.56

This Appendix is organized into five sections. Following this Introduction are sections which describe existing conditions, assess local microscale impacts, assess regional cumulative impacts, and present technical back-up information.

Section 2 – Existing Conditions at Terminal Sites

This section describes the existing traffic conditions in the vicinity of the existing terminal sites. The existing traffic conditions for each site area are described separately.

Port Newark/Elizabeth Site

The major access highways to the Port Newark/Elizabeth site include the NJ Turnpike and Routes 1&9 from the north and south and I-78 and Route 22 from the east and west. The local access routes to the ports are along North Avenue, Dowd Avenue, Doremus Avenue, Kapkowski Road and Port Street. These access routes have been studied on numerous occasions over the years with many improvements recommended or proposed to the network of streets and intersections leading to and interconnecting with these primary access roads. The intersection traffic data available for this study area (see Table 1 at the end of this section) was obtained from the PANYNJ study of North Avenue East at Kapkowski Road (Urbitran Associates, Oct.1994) and the Metro Mall Study (Raymond Keyes Associates, 1995). The Urbitran study indicated overall Levels-of-Service (LOS) for intersections along North Avenue were acceptable in the year 2000, operating between LOS B and LOS D with recommended intersection improvements. This traffic data was similar to the projected volumes for the project provided in Section 4 - Supplemental Information, and therefore, was assumed to be representative of Existing LOS conditions for the study area. The Metro Mall study addressed the new Brewster Road Extension/New Boulevard connection to the Turnpike at Exit 13A and the Trumbull Street access to the port area indicating that diversion of trucks to these roadways to access the Turnpike would not be significant, however, no traffic volumes were provided to document this conclusion.

Rail access to the site is from a line running parallel to the NJ Turnpike serving the Expressrail and Port-side facilities with many sidings at the warehouses and transit sheds. The Expressrail lead track currently crosses Corbin Street at-grade and disrupts vehicular traffic to the port, and is being replaced with a grade-separation on McLester Street.

Port Jersey/MOTBY Site

The primary access routes to the Port Jersey/MOTBY project site are from the NJ Turnpike at Exit 14A to the north and the Bayonne Bridge to the South. Local access roads connecting to the site off Route 169 include Port Terminal Road, Avenue E, and Prospect Avenue. These access routes have been studied on numerous occasions over the years with many improvements recommended or proposed to the network of streets and intersections leading to and interconnecting with the primary access routes. Although the NJ Turnpike connects to the Port Jersey/MOTBY Peninsula at Exit 14A and tolls are relatively expensive, the local alternative routes to Newark and Elizabeth are congested with traffic. An analysis of traffic for the site (Section 4 - Supplemental Information) provides traffic volumes, and available LOS traffic data for this study area was obtained from the Bayonne Extension Supplemental Draft EIS study (New Jersey Transit, 1995), which included traffic data and a LOS analysis at key intersections. The NJ Transit traffic data supplemented the project traffic study (Section 4 - Supplemental Information) and the LOS analyses during the peak hours are presented in Table 2 (at the end of this section) are assumed to be representative of Existing (1999) conditions in the study area. According to this data, most intersections operated at a LOS B or better, except for Route 169 at the site entrance that had a LOS of F for the PM period.

Conrail and the Port Jersey Railroad, which deliver rail cars from the Conrail Claremont Yard or from track beyond the rail bridge at Newark Bay, provide rail access to the site.

Howland Hook Site

The primary access routes to the Howland Hook Marine Terminal project site are from the Staten Island Expressway (I-278) via Goethals Road North and Western Avenue from the south, Richmond Terrace from the north (Bayonne), and the Verrazano Narrows Bridge/Gowanus Expressway/Belt Parkway from the east. Other interconnecting streets include Gulf Avenue and Forest Avenue and the local access streets to the Howland Hook waterfront which serve mixed industrial, commercial and residential land uses. Many of these intersections on the primary access routes are stop sign controlled and would require traffic operational improvements such as traffic signals and intersection modifications to accommodate the proposed port expansion. The most recent studies of the proposed bridge crossing improvements (United States Coast Guard, 1997) and the strategic plan for the Port of New York (NYCEDC, 1999) provided Level of Service (LOS) traffic data projected to the year 2000 and count information for 1999, respectively, to supplement the project traffic analysis (Section 4 - Supplemental Information) which addressed traffic volumes along affected access routes representative of existing conditions. The LOS data from the NYCEDC report and for the AM and PM periods (USCG, 1997) for the bridge and tunnel crossings representative of Existing conditions are provided in the Tables 3 through 6 at the end of this section.

The capacity of the Goethals Bridge (two narrow lanes in each direction/no shoulders) is a significant traffic constraint to this study region. The operating Levels-of-Service (LOS) for the

primary bridge crossings (USCG,1997) affecting the Howland Hook area (e.g. Goethals, Verrazano-Narrows, Bayonne) were evaluated and found to operate in the range of a LOS C/E during the peak traffic hours in 1999 (see Table 3 at the of this section). The LOS traffic data from the USCG study was used to address future year LOS traffic conditions for this project. The portion of the SIE near Howland Hook generally operates under free-flow conditions without congestion problems. The critical intersections along key local access routes to the waterfront (e.g. Western Avenue, Goethals Road North) were addressed in the project traffic study (Section 4 - Supplemental Information) and both the USCG and the NYCEDC studies. Several local intersections both signalized (Table 4) and unsignalized (Tables 5 and 6) were analyzed and many of them operated primarily at a LOS A-C during the peak hour periods, indicating no access problems to this site under existing conditions. The project traffic study provided traffic volumes which supported the LOS analysis and conclusions of these other studies.

Rail access to the site is currently not available but will soon be provided through the reactivation of the Staten Island Railroad (SIRR) CSX line via a rail bridge connection located just south of the site.

South Brooklyn Site

The primary access routes to the South Brooklyn Marine Terminal project site are from the Brooklyn Queens Expressway (BQE) and the Gowanus Expressway using off-ramps in the vicinity of 39th and 65th Streets, with Third and First Avenues as the designated truck routes. As a principal route to Manhattan, the BQE and Gowanus Expressways operate at capacity during the morning and afternoon peak travel periods, and often during the early afternoon and evening hours as well. The study of the proposed Gowanus Expressway improvements (U.S. Department of Transportation, 1995) provided LOS traffic data for the study area for 1990 and projected to the year 2030. The NYCEDC study of the port improvements provided LOS data for affected roadways for existing conditions (1998) and future year (2020) conditions and identified some intersection improvements that were required. The traffic data from both the NYCEDC and Gowanus Expressway studies was used to supplement the project traffic study in Section 4 - Supplemental Information, and was assumed to be representative of existing conditions for the study area.

The available LOS data indicated that the existing (1999) critical intersections along key access routes to the waterfront, such as Third Avenue, were primarily operating at a LOS B/D during both the AM (See Table 7) and PM peak hours (see Table 8).

Rail access to the site is currently provided by the Long Island Railroad (LIRR) from a line connecting to the Brooklyn-Army Terminal piers. However, there is no convenient connection to the main east-west interstate rail lines, and containers headed westbound must connect with rail services to the north of Albany, New York.

Table 1 Port Newark/Elizabeth Traffic Volume Summary (VPH) North Avenue/Center Drive Intersection					
	Lane MVT	1999 Volumes AM	PM	MD	WE
EB	L T R	603 1036 605	798 289 420	712 515 445	1306 104 106
WB	L T R	10 399 1	3 1156 5	14 727 12	0 129 9
NB	L T R	259 1 17	453 0 2	433 0 16	107 1 1
SB	L T R	8 0 150	4 1 1113	1 0 638	7 0 1227

Table 2
Existing Levels of Service at Study Area Intersections

Map Key	Intersection	AM Peak Hour		PM Peak Hour	
		LOS1	Critical Links	LOS1	Critical Links
	Signalized Intersections:				
3	Avenue A & North Street	B	-	B	-
4	John F. Kennedy Blvd. & North Street	B	-	B	-
5	John F. Kennedy Blvd. & Route 169 NB (near Seventh Street)	B	-	B	-
6	Avenue C & North Street\ Eighth Street	B	-	B	-
7	Avenue E & Broadway	B	-	B	-
8	Avenue E & Linnett Street	B	-	B	-
9	Route 169 & Railroad Bridge	B	-	B	Route 169 SB lefts (E)
10	Avenue E & 21st Street	C	21 St. EB (E)	B	-
11	Avenue E & 30th Street	B	-	B	-
12	Route 169 & MOTBY	B	-	F*	Route 169 SB thru & rights (F*), NB lefts (F)
13	Avenue E & 45th Street	B	-	B	-
16	Bayview Avenue & Caven Point Road	A	-	B	-
	Unsignalized Intersections:				
1	Avenue A & West Fifth Street	A	-	A	-
2	Avenue A & Bayonne Bridge SB Ramps	A	-	A	-
14	Linden Avenue & Garfield Avenue	A-E	Linden Avenue EB (E)	A-E	Linden Avenue EB (E)
15	Chapel Avenue & Caven Point Road	A-B	-	A-B	-
17	NJ Turnpike Hudson County Extension Interchange 14B Ramps & Bayview Avenue	A-D	-	A	-

"LOS" indicates overall level-of service for the entire intersection; "critical links" identify intersection approaches with LOS E or F.

F* indicates level of service F conditions with delays in excess of two minutes for at least one critical movement.

Source: Technical Memorandum, "Summary of Traffic Impact Analysis Procedures and Findings: Proposed Bayonne LRT Extension DEIS, Eng-Wong Taub & Associates, June 1995

Table 3 Assumed AM/PM Peak Hour Levels of Service at Bridge Crossings										
Location	Direction	Existing 1999 (AM)					Existing 1999 (PM)			
		Capacity (vph)	Peak Period Volume	Peak Hour Volume(vph)	V/C Ratio	LOS	Capacity (vph)	Peak Period Volume	Peak Hour Volume (vph)	V/C Ratio
Outerbridge Cr	EB	2700	9161	2492	0.92	E	3300	9890	2877	0.87
	WB	3200	8652	2440	0.76	D	3500	10282	2756	0.79
Goethals Br	EB	2400	6476	1742	0.73	D	3200	10684	3013	0.94
	WB	3000	8416	2399	0.8	D	3000	6679	1696	0.57
Bayonne Br	EB	2400	1496	423	0.18	C	3200	5394	170	0.53
	WB	3000	3034	1180	0.39	C	3000	1891	516	0.17
Holland Tunnel	EB	2800	11190	2853	1.02	F	2800	10635	2861	1.02
	WB	2800	10724	3099	1.11	F	2800	11214	2826	1.01
Lincoln Tunnel	EB	4200	16273	4361	1.04	F	2800	10788	2859	1.02
	WB	2800	8936	2520	0.9	E	4200	16435	4257	1.01
G Washington Br	EB	11800	36512	10442	0.88	E	11800	30999	8525	0.72
	WB	11200	28373	8711	0.78	D	11200	40367	10738	0.96
Tappan Zee Br	EB	7200	22846	7105	0.99	E	5400	18741	5285	0.98
	WB	5400	11462	3668	0.68	C	7200	21684	5811	0.81
Verrazano Br	EB	10800	30498	10095	0.93	E	10800	19820	5332	0.49
	WB	10800	14221	4181	0.39	C	10800	27961	7310	0.68
Battery Tunnel	EB	3600	1601	506	0.14	C	3600	15566	6605	1.22
	WB	3600	15840	4752	1.32	F	3600	8167	2091	0.58
Q M Tunnel	EB	3600	4009	1183	0.33	C	3600	12992	34795	0.97
	WB	3600	14044	3988	1.11	F	3600	12344	3246	0.9
Triboro Br	EB	5400	4322	1314	0.24	C	5400	11257	3129	0.58
	WB	5400	13686	3928	0.73	D	5400	8296	2207	0.41
Brooklyn Br	EB	2850	11012	3006	1.05	F	2850	14728	3756	1.32
	WB	2850	14512	3904	1.37	F	2850	13617	3568	1.25
Manhattan Br	EB	2850	6981	1948	0.68	D	2850	13458	3768	1.32

Table 3
Assumed AM/PM Peak Hour Levels of Service at Bridge Crossings

Location	Direction	Existing 1999 (AM)					Existing 1999 (PM)			
		Capacity (vph)	Peak Period Volume	Peak Hour Volume(vph)	V/C Ratio	LOS	Capacity (vph)	Peak Period Volume	Peak Hour Volume (vph)	V/C Ratio
	WB	2850	13088	3599	1.26	F	2850	8246	2144	0.75
Williamsburg Br	EB	3800	7673	2148	0.57	C	3800	16103	4364	1.15
	WB	3800	15276	4247	1.12	F	3800	9968	2542	0.67
Queensboro Br	EB	4750	8792	2523	0.53	C	4750	22497	6029	1.27
	WB	4750	20566	5594	1.18	F	4750	17112	4364	0.92
TOTAL	EB	71150	178842	52142			70150	223252	61407	
	WB	69050	200830	58209			72550	213993	56071	

Note: LOS based on Table 3-1 of the Highway Capacity manual for Freeway Segment with 50 mph design speed.
Source: Tables 6B – 14 and 6B - 15 (USCG, 1995)

Table 4 Existing Levels of Service At Critical Signalized Intersections						
Intersection	AM Peak Hour			PM Peak Hour		
	V/C Ratio	DELAY (sec/veh)	LOS	V/C Ratio	DELAY (sec/veh)	LOS
Bay Way Circle Area						
Bay Way Circle WB/Route 1&9	0.61	8.8	B	0.77	18.9	C
Bay Way Circle EB/Route 1&9	0.62	9.6	B	0.74	12.8	B
South Elmora Ave/Edgar Ave	0.73	10.6	B	0.79	15	B
South Elmora Ave/Lidgerwood Ave	0.61	11.3	B	*	*	*
Bay Way/Grier Ave	0.79	24.9	C	*	*	*
Bay Way/S.Broad St	0.48	6.3	B	0.68	12.6	B
Summer St/S. Broad St	0.43	9.6	B	0.45	9.9	B
Summer St/Grier Ave	0.34	10.5	B	0.35	10.8	B
Grier Ave/Route 1&9	*	*	*	*	*	*
Bacheller Ave/Route 1&9	0.51	6.6	B	0.69	8.9	B
NJ Turnpike Exit 13 Toll Plaza						
Bay Way/Off Ramp NJ Tpke/Atlantic Ave	0.82	19.1	C	1.01	38	D
Goethals Br On-Off Ramp/Atlantic Ave	0.59	15.5	C	0.72	35.1	D
Off Ramp/Trenton Ave/Relocated Bay Way	0.17	12.5	B	0.22	13.1	B
Bay Way/Clarkson Ave	0.39	6.7	B	0.59	8.7	B
Clifton St/Atlantic Ave	0.34	7.9	B	0.54	8.1	B
Richmond Avenue/Victory Boulevard						
Victory Blvd/Richmond Ave	0.63	15.1	C	*	*	*
Victory Blvd/Arlene St/Sideview Ave	0.32	11.6	B	0.9	20.5	C
Signs Rd/Richmand Ave	0.58	6.8	B	*	*	*
Eton.Pl/Richmond Ave	0.53	11.8	B	0.8	22.6	C
Paulding Ave/Richmond Ave	0.51	10	B	*	*	*
Merrill Ave/Morani St/Richmond Ave	0.58	9.1	B	0.77	11.6	B
Victory Blvd/Morani St/Park Entrance	0.64	11.7	B	*	*	*
Victory Boulevard/Staten Island College						
Victory Blvd/Lambert La	0.68	12.3	B	0.98	23.2	C
Victory Blvd/Staten Island College Dr.	*	*	*	1.04	49	E
Victory Blvd/No. Gannon Rd-Willow Rd	0.58	14.6	B	*	*	*
Victory Blvd/Willowbrook Rd	*	*	*	0.5	8.7	B

Table 4 Existing Levels of Service At Critical Signalized Intersections						
Intersection	AM Peak Hour			PM Peak Hour		
	V/C Ratio	DELAY (sec/veh)	LOS	V/C Ratio	DELAY (sec/veh)	LOS
State Route 440/Amboy Ave						
Grove St/Amboy Ave	0.86	17	C	0.75	13.3	B
Lawrence St/Amboy Ave	0.36	18.9	C	0.48	54.6	E
Lawrence St/Convery Blvd	0.27	10.5	B	0.4	4.8	A
Harding Ave/Convery Blvd	0.3	11.2	B	0.47	6.4	B
Verrazano-Narrows Br Toll Plaza						
Narrows Rd South/Lily Pond Ave	0.27	16.1	C	0.68	22.6	C
Narrows Rd North/Fingerboard Rd	0.29	11.9	B	0.58	10.4	B
Narrows Rd South/Fingerboard Rd	*	*	*	0.56	18.8	C
Narrows Rd North/Hylan Blvd SB	0.44	9.4	B	0.61	14.1	B
Narrows Rd North/Hylan Blvd NB	0.33	8	B	0.42	12	B
Narrows Rd South/Hylan Blvd SB	0.37	8.4	B	0.43	10.8	B
Narrows Rd South/Hylan Blvd NB	0.62	11.8	B	0.48	8.2	B
McClean Ave/Lily Pond Ave	0.96	28	D	*	*	*
Holland Tunnel Plaza						
1&9 Ramp/NJ Tpke Ramp/Jersey Ave	*	*	*	0.89	59.6	E
Boyle Plaza/Jersey Ave	0.77	17.6	C	*	*	*
12th St Viaduct/Erie St	0.65	9.4	B	0.66	11.2	B
Boyle Plaza/Erie St	0.55	5.9	B	*	*	*
12th St Viaduct/Manilla Ave	0.51	8.5	B	0.45	8.7	B
Boyle Plaza/Manilla Ave	0.42	6.3	B	0.65	6.9	B
Boyle Plaza/Munoz Marin Blvd.	0.52	19.6	C	*	*	*
Canal Street/Holland Tunnel						
Canal St/6th Ave	0.62	8.5	B	0.68	42	E
Canal-Laight St/6th Ave	0.62	14.3	B	0.68	42	E
Canal St/Hudson St	0.82	42.2	E	1	46.9	E
Canal St/Varick St	0.66	10.5	B	0.38	19.5	C
Canal St/West Broadway	0.37	12.9	B	0.47	20.7	C
Canal St/Wooster St	0.45	8.3	B	0.35	25.9	D
Canal St/Greene-Church St	0.49	7.7	B	0.41	25	C
Broome St/6th Ave	0.43	6.4	B	0.6	9.4	B
Grand St/6th Ave	0.21	6.9	B	0.29	6.2	B
Watts St/6th Ave	0.52	5.4	B	0.5	4.6	A
West Broadway/6th Ave	0.4	7.7	B	0.44	6.8	B
Walker St/6th Ave	0.41	6.5	B	0.31	5.9	B
Laight St/Varick St	0.4	6.7	B	0.53	6.8	B

Source: Table 6B - 17, (USCG 1995)

Table 5 Existing Levels of Service at Critical Unsignalized Intersections					
		AM PEAK HOURS		PM PEAK HOURS	
INTERSECTION	Approach/ Movement	Worst LOS	Reserve Capacity	Worst LOS	Reserve Capacity
Bay Way Circle					
Bay Way Circle/Summer St	WB Right	A	863	A	712
Bay Way/Bay Way Circle	WB Right	B	364	D	184
Gen. Karge Court/Wolski Dr	SB Left	C	202	D	128
South Elmora Ave/New York Ave	SB Left	E	41	E	47
Bay Way/Bonnett St	NB Left	C	201	D	128
Bay Way/South Broad St NB	NB Left	E	83	E	37
Myrtle St.Route 1&9	WB Right	A	565	A	499
Edgar Rd/ Spofford /Ashton Ave	WB Left	C	259	D	139
Allen St/Route 1&9	WB Right	A	592	A	475
Meacham Ave/Ashton Ave	WB Right	A	533	A	504
NJ Turnpike Exit 13 Toll Plaza					
Bay Way/Thomas St	NB Right	A	812	A	625
Bay Way/Polonia Ave	NB Left	D	107	E	67
Bay Way/McKinley St	WB Left	A	458	C	247
Richmond St/Clarkson Ave	SB Left	A	975	A	943
Richmond St/McKinley St	EB Left	A	976		
	NB Right			A	900
Richmond St/Pulaski St		A	884	A	840
Clifton St/Pulaski St	NB Left	A	582	A	782
Brunswick Ave On Ramp To I-278	NB Left	C	260	C	255
I-278 NB Off Ramp To Brunswick Ave	EB Left	F	-94	F	-388
Allen St/Brunswick Ave	WB Left	C	206	C	259
Relocated Bay Way/Atlantic Ave	SB Left	A	607	A	480
Goethals Bridge Toll Plaza					
Forest Ave/Gulf Ave	WB Left	C	298	B	334
Forest Ave/Goethals Rd North	Overall*	C		C	
Forest Ave/Northfield Ave	SB Left	B	392	A	454
Richmond Avenue/Victory Boulevard					
Victory Blvd/Speedwell Ave		B	364		
	NB Left			D	193
Victory Blvd/Jones St	NB Left	B	338	D	158
Carnegie Ave/Richmond Ave	EB Right	A	841	B	386

Table 5
Existing Levels of Service at Critical Unsignalized Intersections

INTERSECTION	Approach/ Movement	AM PEAK HOURS		PM PEAK HOURS	
		Worst LOS	Reserve Capacity	Worst LOS	Reserve Capacity
Croft Polace/Richmond Ave	WB Right	A	555	A	553
Forest St/Richmond Ave	EB Right	A	834	B	376
Victory Blvd/Saybrook St	NB Left	E	89	E	55
Victory Blvd/Goller St	NB Left	E	92	E	69
Clifton St/Richmond Ave	EB Right	A	804	B	337
Greentree La/Richmond Ave	WB Left	E	89	E	82
Victory Boulevard/Staten Island College					
Victory Blvd/Centerbury Ave	NB Left	E	62	E	88
Victory Blvd/South Gannon Rd	WB Left	A	409	D	171
Darcey Ave/South Gannon Ave	EB Right	A	939	A	826
Willowbrook Rd/South Gannon Ave	EB Right	A	834	A	701
Victory Blvd/Stewart Ave	NB Left	D	126		
	SB Left			E	53
Victory Blvd/Decatur Ave	NB Left	D	180		
	SB Left			D	101
Outerbridge Crossing Toll Plaza					
S.&N. Br St/Arthur Kill	WB Left	A	562	B	363
Veterans Rd/West Shore Pkwy	NB Left	A	584	A	495
Boscombe Ave. On/Off Ramp Richmond Pkwy	SB Left	D	144	D	134
Richmond Pkwy On Ramp/West Shore Expwy	SB Left	A	841	A	839
S. Bridge St/Page/Boscombe Ave	EB Left	C	239	E	9
Richmond Valley Rd/Page Ave	EB Left	D	157	D	195
Richmond valley Rd/Madsen Ave	SB Left	A	919	A	883
Boscombe Ave/Madsen Ave	NB Left	C	212	C	205
Boscombe Ave/Tyrellan Ave	SB Left	A	644		
	SB Right			A	690
Boscombe Ave/Weiner Ave	NB Left	A	840	A	869
State Route 440/Amboy Avenue					
Pfeiffer Blvd/Donald Ave	NB Right	A	981	A	945
Pfeiffer Blvd/Mary St	NB Right	A	987	A	997
Pfeiffer Blvd/Pershing St	NB Right	A	986	A	995
Pfeiffer Blvd/Krochmally Ave	NB Right	A	884	A	932
Pfeiffer/Chester St	NB Right	A	991	A	984

Table 5
Existing Levels of Service at Critical Unsignalized Intersections

INTERSECTION	Approach/ Movement	AM PEAK HOURS		PM PEAK HOURS	
		Worst LOS	Reserve Capacity	Worst LOS	Reserve Capacity
Pfeiffer/Spring St	NB Right	A	994	A	985
Pfeiffer/Francis St	NB Right	A	985	A	982
Lawrence/Hickory St	SB Right	A	996	A	984
Lawrence/Spruce St	SB Right	A	976	A	984
Lawrence/Birch St	SB Right	A	980	A	994
Lawrence/Pine St	SB Right	A	970	A	990
Lawrence/Francis St	SB Right	A	982	A	984
Lawrence/Wolff St	SB Right	A	992	A	989
Verrazano-Narrows Bridge Toll Plaza					
On Ramp To I-278 WB/School Rd	NB Left	F	267	F	-14
Narrows Rd North/St. John's Ave	SB Right	A	824	A	571
Narrows Rd North/Hylan Blvd Spur	NB Right	A	411	A	846
Narrows Rd North/Legion Place	NB Right	A	400	A	857
Narrows Rd North/Grasmere Dr	NB Right	A	528	A	823
Merle Place/Fingerboard Rd	EB Left	A	465	A	579
Harvey St/Fingerboard Rd	WB Left	A	451	A	576
Lincoln Place/Fingerboard Rd	WB Left	A	524	A	544
Cleveland Place/Finger Board Rd	WB Left	C	218	C	284
Hillbrook Dr/Fingerboard Rd	EB Left	C	228	C	281
Major Ave/Lily Pond Ave	WB Left	E	68	E	29

LOS = Level of Service
EB = Eastbound
NB = Northbound
WB = Westbound
SB = Southbound
* - Overall intersection LOS, All-way stop, reserve capacity not available.
Source: Table 6B - 19 (USCG 1995)

Table 6
Existing Levels of Service

Intersection & Approach		7 - 8 AM			5 - 6 PM		
		Mvt.	Avg. Delay	LOS	Mvt.	Avg. Delay	LOS
Brooklyn Union Gas Driveway	NB	TR	9.8	B	TR	9	B
Forest Avenue	SB	LT	16.9	C	LT	16.2	C
Gulf Avenue	EB	L	3	A	L	2.8	A
Overall Instruction		-	4.5	A	-	4.2	A
GOETHALS ROAD NORTH & FOREST AVENUE			(unsignalized)				
Forest Avenue	NB	LT	7.3	B	LT	5.6	B
Forest Avenue	SB	TR	2.8	A	TR	3.8	A
Goethals Road North	WB	LTR	5	A	LTR	3.9	A
Overall Instruction		-	5.7	B	-	4.6	A
GOETHALS ROAD NORTH & WESTERN AVENUE			(unsignalized)				
Western Avenue	NB	L	2.4	A	L	2.6	B
Howland Hook Terminal Access	EB	LR	3.5	A	LR	3.8	A
Goethals Road North	WB	L	5.6	B	L	7.2	B
		TR	4.3	A	TR	3.3	A
Overall Instruction		-	4.1	A	-	3.9	A

Junction and Weaving Area		7 - 8 AM			5 - 6 PM		
		Density (pc/mi/in)	Speed (mph)	LOS	Density (pc/mi/in)	Speed (mph)	LOS
SIE EASTBOUND							
1. Mainline & Gulf Avenue on-ramp		9	51	A	15	51	B
Weaving Vehicles			49	C		45	C
Non-Weaving Vehicles			57	B		54	B
2. Mainline & Gulf Avenue off-ramp		6	47	A	13	47	B
3. Mainline & West Shore Expwy SB ramp		9	48	A	18	47	B
SIE WESTBOUND							
4. Mainline & West Shore Expwy NB ramp		12	51	B	8	51	A
5. Mainline & Goethals Road on-ramp		15	51	B	10	51	A
Weaving Vehicles			44	D		50	B
Non-Weaving Vehicles			52	C		58	B
6. Mainline & Goethals Road off-ramp		17	47	B	10	48	B

Notes:

(1) Delay is measured in seconds per vehicle

(2) Levels of service for Ramp - Freeway junctions are based on qualitative measures such as density and speed in the *influence* area of the junction - Source: 1994 Highway Capacity Manual - TRB Special Report 209.

Source: Table VII - 5 and VII - 6(NYCEDC, 1999)

Table 7 South Brooklyn – Existing Intersection Levels of Traffic (AM)				
Intersection and Approach	1999 Existing (7 - 8 AM)			
	Mvt.	Avg. Stopped Daily	V/C	LOS
1. 2nd AVENUE *39th STREET/GOWANUS SB EXIT RAMP				
2nd Avenue NB	LTR	27.1	0.3	D
SB	LTR	26.2	0.16	D
39th Street EB	LTR	15.4	0.11	C
WB	LTR	16.1	0.22	C
Gowanus Expwy SB exit ramp WB	LTR	27	0.74	D
Overall Intersection	-	25.8	0.36	D
2a. 3rd AVENUE SB & 39th STREET				
3rd Avenue SB	LT	7.5	0.28	B
39th Street EB	TR	18.7	0.34	C
WB	LT	18.8	0.34	C
Overall Intersection	-	11.6	0.3	B
2b. 3rd AVENUE NB & 39th STREET				
3rd Avenue NB	LTR	13.8	0.83	B
39th Street EB	LT	18.3	0.29	C
WB	TR	20.3	0.48	C
Overall Intersection	-	14.5	0.7	B
3. 4th Avenue & 38th STREET				
4th Avenue NB	TR	9	0.66	B
SB	T	6	0.3	B
38th Street WB	L	25.2	0.17	D
	TR	24.6	0.09	C

Table 7 South Brooklyn – Existing Intersection Levels of Traffic (AM)				
Intersection and Approach	1999 Existing (7 - 8 AM)			
	Mvt.	Avg. Stopped Daily	V/C	LOS
Overall Intersection	-	9.1	0.52	B
4. 2nd AVENUE & 58th STREET				
2nd Avenue NB	LTR	**	1.05	F
SB	LTR	7.1	0.35	B
58th Street EB	LTR	16.6	0.24	C
Overall Intersection	-	**	**	F
5. 3rd AVENUE & 60th STREET				
3rd Avenue NB	L	107.3	0.99	F
	T	12.2	0.47	B
(Service Road) NB	TR	16.3	0.74	C
3rd Avenue(Mainline) SB	L	45.4	0.54	E
	T	11.1	0.35	B
(Service Road) SB	TR	10.3	0.24	B
60th Street EB	DfL	36.8	0.71	D
	TR	26.6	0.46	D
WB	LTR	28	0.59	D
Overall Intersection	-	19	0.66	C
6. 2nd AVENUE & 63rd STREET				
2nd Avenue NB	LT	19.1	0.88	C
SB	TR	6.9	0.12	B
Brooklyn Army Terminal Access EB	LR	14.1	0.08	B
63rd Street WB	LTR	45.8	0.37	C
Overall Intersection	-	16.3	0.67	C
7. 2nd AVENUE SB & 65th STREET				
2nd Avenue	TR	8.8	0.46	B

Table 7 South Brooklyn – Existing Intersection Levels of Traffic (AM)				
Intersection and Approach	1999 Existing (7 - 8 AM)			
	Mvt.	Avg. Stopped Daily	V/C	LOS
NB				
SB	DfL	18.8	0.67	C
	T	7.1	0.16	B
65th Street WB	L	14.2	0.09	B
	R	14.8	0.2	B
Overall Intersection	-	10	0.48	B
8. 3rd AVENUE NB & 65th STREET				
3rd Avenue NB	L	7.6	0.06	B
	T	12.3	0.61	B
	TR	11.1	0.53	B
SB	TR	8	0.15	B
65th Street EB	L	29.8	0.7	D
	R	29.4	0.02	C
WB	LTR	20.8	0.21	C
Overall Intersection	-	14.6	0.65	B
9. 7th AVENUE NB & 65th STREET				
7th Avenue NB	DfL	**	1.31	F
	TR	27.4	0.68	D
SB	DfL	24.4	0.43	C
	TR	21.1	0.24	C
65th Street EB	LTR	11.8	0.59	B
WB	LTR	40.8	1.01	E
Overall Intersection	-	**	**	F

Notes:
(1) Delay is measured in seconds per vehicle
(2) Levels of service for Ramp-Freeway junctions are based on qualitative measures such as density and speed in the influence area of the junction.
Source: Tables VI-9 and VI-10, NYEDC, 1999

Table 8 South Brooklyn – Existing Intersection Levels of Traffic (PM)					
Intersection and Approach		**1999 Existing (5 - 6 PM)**			
		Mvt.	**Avg. Stopped Daily**	**V/C**	**LOS**
1. 2nd AVENUE SB & 39th STREET/Gowanus SB Exit Ramp					
2nd Avenue	NB	LTR	27.6	0.37	D
	SB	LTR	26.7	0.24	D
39th Street	EB	LTR	15.7	0.16	C
	WB	LTR	15.7	0.16	C
Gowanus Expwy SB exit ramp	WB	LTR	23.8	0.56	D
Overall Intersection		-	23.9	0.34	C
2a. 3rd AVENUE SB & 39th STREET					
3rd Avenue	SB	LT	5.4	0.41	B
39th Street	EB	TR	24.6	0.51	C
	WB	LT	25.5	0.52	D
Overall Intersection		-	11	0.44	B
2b. 3rd AVENUE NB & 39th STREET					
3rd Avenue	NB	LTR	4.9	0.3	A
39th Street	EB	LT	25.4	0.55	D
	WB	TR	27.8	0.63	D
Overall Intersection		-	12.3	0.39	B
3. 4th Avenue & 38th STREET					
4th Avenue	NB	TR	5.8	0.25	B
	SB	T	7.4	0.5	B
38th Street	WB	L	27.4	0.43	D
		TR	28	0.46	D
Overall Intersection		-	10.8	0.49	B

Table 8 South Brooklyn – Existing Intersection Levels of Traffic (PM)				
Intersection and Approach	**1999 Existing (5 - 6 PM)**			
	Mvt.	**Avg. Stopped Daily**	**V/C**	**LOS**
4. 2nd AVENUE & 58th STREET				
2nd Avenue NB	LTR	11.1	0.68	B
SB	LTR	7.3	0.39	B
58th Street EB	LTR	16.9	0.29	C
Overall Intersection	-	11.4	0.54	B
5. 3rd AVENUE & 60th STREET				
3rd Avenue NB	L	41.9	0.43	E
	T	7.1	0.16	B
(Service Road) NB	TR	8.2	0.34	B
3rd Avenue(Mainline) SB	L	59.7	0.78	E
	T	10.1	0.56	B
(Service Road) SB	TR	9.6	0.51	B
60th Street EB	DfL	31.4	0.5	D
WB	LTR	31.3	0.48	D
Overall Intersection	-	17.2	0.56	C
6. 2nd AVENUE & 63rd STREET				
2nd Avenue NB	LT	8.7	0.43	B
SB	TR	7.2	0.19	B
Brooklyn Army Terminal Access EB	LR	15.4	0.28	C
63rd Street WB	LTR	16.7	0.43	C
Overall Intersection	-	10.3	0.43	B
7 2nd AVENUE SB & 65th STREET				
2nd Avenue NB	TR	6.2	0.21	B
	LT	7.4	0.43	B

Table 8 South Brooklyn – Existing Intersection Levels of Traffic (PM)				
Intersection and Approach	**1999 Existing (5 - 6 PM)**			
	Mvt.	**Avg. Stopped Daily**	**V/C**	**LOS**
	R	12.7	0.21	B
Overall Intersection	-	7.7		B
8. 3rd AVENUE NB & 65th STREET				
3rd Avenue NB	L	8	0.15	B
	T	8.2	0.18	B
	TR	8.2	0.18	B
SB	TR	8.8	0.28	B
65th Street EB	L	27.8	0.28	D
	R	19.8	0.07	C
WB	LTR	20.5	0.17	C
Overall Intersection	-	13.8	0.42	B
9. 7th AVENUE NB & 65th STREET				
7th Avenue NB	LTR	36.4	0.89	D
SB	LTR	24.5	0.54	C
65th Street EB	LTR	16.8	0.81	C
WB	LTR	53.2	1.05	E
Overall Intersection	-	33.1	0.99	D

Notes:

(1) Delay is measured in seconds per vehicle

(2) Levels of service for Ramp - Freeway junctions are based on qualitative measures such as density and speed in the influence area of the junction - Source: 1994 Highway Capacity Manual - TRB Special Report 209.

Source: Tables VI - 9 and VI - 10 (NYCEDC,1999)

Table 9
2060 Benchmark Scenario Alternative
Levels of Service at Representative Intersections

Map Key	Intersection	AM Peak Hour		PM Peak Hour	
		LOS[1]	Critical Links[2]	LOS	Critical Links
	Signalized Intersections				
3	Avenue A & North Street	B	--	B	--
2	Ave. A & Bayonne Bridge SB ramps[3]	B	--	B	--
4	Kennedy Blvd & North Street	B	--	B	--
5	Kennedy Blvd & Ramp 169 NB (near Seventh Street)	B	--	B	--
6	Avenue C & North Street/Eighth Street	B	--	B	--
7	Avenue E & Broadway	B	--	B	--
8	Avenue E & Linnett Street	C	--	C	Linnett Street WB (E)
9	Route 169 & Railroad Bridge	B	--	B	Route 169 SB Lefts (E)
10	Avenue E & 21st Street	D	21st St. EB (F)[5]	B	--
11	Avenue C & 30th Street	B	--	B	--
12	Route 169 & MOTBY	B	--	C	MOTBY exit WB Lefts (F)
13	Avenue E & 45th Street	B	--	B	--
16	Bayview Avenue & Caven Point Road	F	Bayview Ave. WB Lefts (F), EB (E)	B	--
	Unsignalized Intersections				
1	Avenue A & West Fifth Street	A-D	--	A-B	--
14	Linden Avenue & Garfield Avenue	A-E	Linden Ave. EB (E) Linden Ave. WB Lefts(E)	A-E	Linden Ave. EB (E) Linden Ave. WB Lefts(E)
15	Chapel Avenue & Caven Point Road	A-C	--	A-C	--
17	NJ Turnpike Hudson County Extension Interchange 14B Ramps & Bayview Avenue	A-F	NJ Turnpike SB Exit Lefts (F)	A	--

1. "LOS" indicates overall level-of service for the entire intersection.
2. "Critical Links" identify intersection approaches with LOS E or F.
3. Signalized and lanes reconfigured as part of the Preferred Build Alternative.
4. Assumed to be redesigned and widened by NJDOT.
5. Indicates level of service F conditions, with delays in excess of two minutes for at least one critical movement

Source: Technical Memorandum: Summary of Traffic Impact Analysis Procedures and Findings: Proposed Bayonne LRT Extension DEIS, for NJ TRANSIT Eng-Wong, Taub & Associates, June 1995.

Table 10
Assumed 2060 Benchmark Scenario AM/PM Peak Hour Levels of Services at Bridge Crossings

Location	Direction	2060 BENCHMARK SCENARIO (AM)					2060 BENCHMARK SCENARIO (PM)				
		Capacity (vph)	Peak Period Volume	Peak Hour Volume(vph)	V/C Ratio	LOS	Capacity (vph)	Peak Period Volume	Peak Hour Volume (vph)	V/C Ratio	LOS
Outerbridge Cr	EB	2700	8632	2348	0.87	E	3300	10149	3045	0.92	E
	WB	3200	9306	2624	0.82	D	3500	9065	2429	0.69	D
Goethals Br	EB	4100	6403	1722	0.42	C	4900	14837	4184	0.85	E
	WB	4700	12591	3588	0.76	D	4700	7153	1817	0.39	C
Bayonne Br	EB	2400	2039	577	0.24	C	3200	6985	2214	0.69	D
	WB	3000	3874	1507	0.5	C	3000	1791	489	0.16	C
Holland Tunnel	EB	2800	11047	2817	1.01	E	2800	11156	3001	1.07	F
	WB	2800	11153	3223	1.15	F	2800	11314	2851	1.02	F
Lincoln Tunnel	EB	4200	16440	4406	1.05	F	2800	10987	2912	1.04	F
	WB	2800	9538	2690	0.96	E	4200	16764	4342	1.03	F
G Washington Br	EB	11800	35531	10162	0.86	E	11800	36197	9954	0.84	E
	WB	11200	31944	9807	0.88	E	11200	40910	10882	0.97	E
Tappan Zee Br	EB	7200	22753	7076	0.98	E	5400	19749	5569	1.03	F
	WB	5400	12239	3916	0.73	D	7200	21711	5819	0.81	D
Verrazano Br	EB	10800	30620	10135	0.94	E	10800	20654	5556	0.51	C
	WB	10800	14292	4202	0.39	C	10800	28302	7472	0.69	D
Battery Tunnel	EB	3600	1440	455	0.13	C	3600	15741	4455	1.24	F
	WB	3600	15632	4690	1.3	F	3600	8067	2065	0.57	C
Q M Tunnel	EB	3600	4175	1232	0.34	C	3600	13146	3526	0.98	E
	WB	3600	14048	3990	1.11	F	3600	12512	3291	0.91	E
Triboro Br	EB	5400	4165	1266	0.23	C	5400	10834	3012	0.56	C
	WB	5400	13351	3832	0.71	D	5400	9304	2475	0.46	C
Brooklyn Br	EB	2850	10969	2995	1.05	F	2850	14477	3692	1.3	F
	WB	2850	14760	3970	1.39	F	2850	13700	3589	1.26	F
Manhattan Br	EB	2850	6880	1920	0.67	C	2850	13660	3825	1.34	F

Table 10
Assumed 2060 Benchmark Scenario AM/PM Peak Hour Levels of Services at Bridge Crossings

Location	Direction	2060 BENCHMARK SCENARIO (AM) Capacity (vph)	Peak Period Volume	Peak Hour Volume(vph)	V/C Ratio	LOS	2060 BENCHMARK SCENARIO (PM) Capacity (vph)	Peak Period Volume	Peak Hour Volume (vph)	V/C Ratio	LOS
	WB	2850	12976	3568	1.25	F	2850	8151	2119	0.74	D
Williamsburg Br	EB	3800	7497	2099	0.55	C	3800	16260	4406	1.16	F
	WB	3800	15223	4232	1.11	F	3800	9770	2491	0.66	C
Queensboro Br	EB	4750	9017	2588	0.54	C	4750	22910	6140	1.29	F
	WB	4750	20438	5559	1.17	F	4750	17327	4418	0.93	E
TOTAL	EB	72850	177608	51797			70150	237742	35500		
	WB	70750	211365	61399			72550	215841	56550		

Note: LOS based on Table 3-1 of the Highway Capacity Manual for Freeway Segment with 50 mph design speed.
Source: Tables 6B - 23 and 6B – 24 (USCG, 1995)

Table 11 2060 Benchmark Scenario Levels of Service at Critical Signalized Intersections						
Intersection	AM Peak Hour			PM Peak Hour		
	V/C Ratio	DELAY (sec/veh)	LOS	V/C Ratio	DELAY (sec/veh)	LOS
Bay Way Circle Area	0.66	11.3	B	*	*	*
Bay Way Circle WB/Route 1&9	0.66	9.8	B	0.83	15.2	C
Bay Way Circle EB/Route 1&9	0.77	12.2	B	0.96	48.8	E
South Elmora Ave/Edgard Ave	0.65	11.8	B	*	*	*
South Elmora Ave/Lidgerwood Ave	0.84	35.6	D	*	*	*
Bay Way/Grier Ave	0.52	6.5	B	0.75	15.5	C
Bay Way/S. Broad St	0.46	10	B	0.49	10.5	B
Summer St/Grier Ave	0.36	10.7	B	0.37	11	B
Grier Ave/Route 1&9	*	*	*	*	*	*
Bacheller Ave/Route 1&9	0.55	7	B	0.75	10.2	B
NJ Turnpike Exit 13 Toll Plaza						
Bay Way/Off Ramp NJ Turnpike/Atlantic Ave	0.93	28.6	D	*	*	*
Goethals Bridge On-Off Ramp/Atlantic Ave	0.72	21.9	C	*	*	*
Off Ramp/Trenton Ave/Relocated Bay Way	0.2	12.6	B	0.25	14.6	B
Bay Way/Clarkson Ave	0.45	7.2	B	0.68	10.1	B
Clifton St/Atlantic Ave	0.41	8.3	B	0.61	9.1	B
Richmond Ave/Victory Boulevard						
Victory Blvd/Richmond Ave	0.76	19	C	*	*	*
Victory Blvd/Arlene St/Sideview Ave	0.72	15.1	C	0.89	19.9	C
Signs Rd/Richmond Ave	0.68	7.6	B	*	*	*
Eton Pl/Richmond Ave	0.62	18.1	C	0.75	15.4	C
Paulding Ave/Richmond Ave	0.61	11.5	B	*	*	*
Merrill Ave/Morani St/Richmond Ave	0.71	10.5	B	0.71	10.7	B
Victory Blvd/Morani St/Park Entrance	0.76	26.7	D	*	*	*
Victory Boulevard/Staten Island College						
Victory Blvd/Lambert St	0.83	31.8	D	1	24	C
Victory Blvd/Staten Island College Dr.	*	*	*	1.03	46.1	E
Victory Blvd/No. Gannon Rd-Willow Rd	0.67	19.8	C	*	*	*
Victory Blvd/Willowbrook Rd	*	*	*	0.51	8.8	B
State Route 440/Amboy Avenue						
Grove St/Amboy Ave	0.98	30.1	D	0.82	16.1	C
Lawrence St/Amboy Ave	0.43	29	D	0.5	73.6	F
Lawrence St/Convery Blvd	0.31	10.8	B	0.42	4.8	A
Harding Ave/Convery Blvd	0.35	11.9	B	0.49	6.4	B
Verrazano-Narrows Br Toll Plaza						
Narrows Rd South/Lily Pond Ave	0.26	16.1	C	0.78	44.9	E
Narrows Rd North/Fingerboard Rd	0.29	12	B	0.69	12.1	B
Narrows Rd South/Fingerboard Rd	*	*	*	0.66	30.8	D
Narrows Rd North/Hylan Blvd SB	0.45	9.4	B	0.72	16.5	C
Narrows Rd North/Hylan Blvd NB	0.34	8.1	B	0.49	12.9	B

McClean Ave/Lily Pond Ave	0.98	30.5	D	*	*	*
Holland Tunnel Plaza						
1&9 Ramp/NJ Tpke Ramp/Jersey Ave	*	*	*	*	*	*
Boyle Plaza/Jersey Ave	0.81	22.3	C	*	*	*
12th St Viaduct/Erie St	0.66	9.6	B	0.71	12.6	B
Boyle Plaza/Erie St	0.58	6.1	B	*	*	*
12th St Viaduct/Manilla Ave	0.57	8.9	B	0.48	8.9	B
Boyle Plaza/Manilla Ave	0.49	6.9	B	0.68	7.5	B
Boyle Plaza/Munoz Marin Blvd.	0.57	25	C	*	*	*
Canal Street/Holland Tunnel						
Canal St/6th Ave	0.64	9.5	B	0.69	43.9	E
Canal-Laight St/6th Ave	0.64	14.9	B	0.69	43.9	E
Canal St/Hudson St	0.82	42.2	B	0.99	43.7	E
Canal St/Varick St	0.69	10.7	B	0.4	20	C
Canal St/West Broadway	0.38	13.4	B	0.48	21.2	C
Canal St/Wooster St	0.46	8.4	B	0.35	27.1	D
Canal St/Greene-Church St	0.5	7.8	B	0.42	26	D
Broome St/6th Ave	0.44	6.5	B	0.6	9.4	B
Grand St/6th Ave	0.24	6.9	B	0.33	6.5	B
Watts St/6th Ave	0.53	5.4	B	0.5	4.7	A
West Broadway/6th Ave	0.41	7.8	B	0.44	6.8	B
Walker St/6th Ave	0.42	7.2	B	0.31	5.9	B
Laight St/Varick St	0.4	6.8	B	0.53	6.9	B

Source: Table 6B - 29 (USCG, 1995)

Table 12
2060 Benchmark Scenario Levels of Service At Critical Unsignalized Intersections

INTERSECTION	Approach/ Movement	AM PEAK HOURS Worst LOS	AM PEAK HOURS Reserve Capacity	PM PEAK HOURS Worst LOS	PM PEAK HOURS Reserve Capacity
Bay Way Circle					
Bay Way Circle/Summer St	WB Right	A	846	A	673
Bay Way/Bay Way Circle	WB Right	B	302	E	73
Gen. Karge Court/Wolski Dr	SB Left	D	182	D	101
South Elmora Ave/New York Ave	SB Left	E	39	E	39
Bay Way/Bonnett St	NB Left	D	1182	D	103
Bay Way/South Broad St NB	NB Left	E	63	E	34
Myrtle St.Route 1&9	WB Right	A	529	A	470
Edgar Rd/ Spofford /Ashton Ave	WB Left	C	241	D	109
Allen St/Route 1&9	WB Right	A	555	A	446
Meacham Ave/Ashton Ave	WB Right	A	498	A	475
NJ Turnpike Exit 13 Toll Plaza					
Bay Way/Thomas St	NB Right	A	769	A	582
Bay Way/Polonia Ave	NB Left	E	95	E	62
Bay Way/McKinley St	WB Left	B	399	C	205
Richmond St/Clarkson Ave	SB Left	A	970	A	937
Richmond St/McKinley St	EB Left	A	972		889
	NB Right			A	820
Richmond St/Pulaski St	EB Left	A	888	A	760
Clifton St/Pulaski St	NB Left	A	523	A	211
Brunswick Ave On Ramp To I-278	NB Left	D	187	C	-466
I-278 NB Off Ramp To Brunswick Ave	EB Left	F	-170	F	216
Allen St/Brunswick Ave	WB Left	D	150	C	445
Relocated Bay Way/Atlantic Ave	SB Left	A	536	A	480
Goethals Bridge Toll Plaza					
Forest Ave/Gulf Ave	WB Left	C	255	D	128
Forest Ave/Goethals Rd North	Overall*	C		C	
Forest Ave/Northfield Ave	SB Left	B	342	B	337
Richmond Avenue/Victory Boulevard					
Victory Boulevard/Speedwell Avenue	SB Left	C	284		
	NB Left			D	197
Victory Boulevard	NB Left	C	259	D	162
Carnegie Ave/Richmond Ave	EB Right	A	782	B	384
Croft Polace/Richmond Ave	WB Right	A	484	A	582
Forest St/Richmond Ave	EB Right	A	776	B	377
Victory Blvd/Saybrook St	NB Left	E	89	E	52
Victory Blvd/Goller St	NB Left	E	90	E	69
Clifton St/Richmond Ave	EB Right	A	735	B	338
Greentree La/Richmond Ave	WB Left	E	88	E	82
Victory Boulevard/Staten Island College					
Victory Blvd/Centerbury Ave	NB Left	E	57	E	88

Table 12
2060 Benchmark Scenario Levels of Service At Critical Unsignalized Intersections

INTERSECTION	Approach/ Movement	AM PEAK HOURS		PM PEAK HOURS	
		Worst LOS	Reserve Capacity	Worst LOS	Reserve Capacity
Victory Blvd/South Gannon Rd	WB Left	B	303	D	180
Darcey Ave/South Gannon Ave	EB Right	A	890	A	831
Willowbrook Rd/South Gannon Ave	EB Right	A	762	A	82
Victory Blvd/Stewart Ave	NB Left	E	31		
	SB Left			E	53
Victory Blvd/Decatur Ave	NB Left	D	117		
	SB Left			D	101
Greentree La/Richmond Ave	WB Left	E	88	E	82
Outerbridge Crossing Toll Plaza					
S.&N. Br St/Arthur Kill	WB Left	A	562	B	330
Veterans Rd/West Shore Pkwy	NB Left	A	579	A	504
Boscombe Ave. On/Off Ramp Richmond	SB Left	D	141	D	142
Richmond Pkwy On Ramp/West Shore E	SB Left	A	840	A	842
S. Bridge St/Page/Boscombe Ave	EB Left	C	235	E	15
Richmond Valley Rd/Page Ave	EB Left	D	154	C	204
Richmond Valley Rd/Madsen Ave	SB Left	A	919	A	884
Boscombe Ave/Madsen Ave	NB Left	C	209	C	212
Boscombe Ave/Tyrellan Ave	SB Left	A	642	A	704
Boscombe Ave/Weiner Ave	NB Left	A	839	A	871
State Route 440/Amboy Avenue					
Pfeiffer Blvd/Donald Ave	NB Right	A	970	A	943
Pfeiffer Blvd/Mary St	NB Right	A	977	A	997
Pfeiffer Blvd/Pershing St	NB Right	A	976	A	994
Pfeiffer Blvd/Krochmally Ave	NB Right	A	866	A	982
Pfeiffer/Chester St	NB Right	A	981	A	983
Pfeiffer/Spring St	NB Right	A	986	A	979
Pfeiffer/Francis St	NB Right	A	982	A	984
Lawrence/Hickory St	SB Right	A	995	A	993
Lawrence/Spruce St	SB Right	A	974	A	990
Lawrence/Birch St	SB Right	A	978	A	984
Lawrence/Pine St	SB Right	A	966	A	989
Lawrence/Francis St	SB Right	A	979	A	984
Lawrence/Wolff St	SB Right	A	991	A	989
Verrazano-Narrows Bridge Toll Plaza					
On Ramp To I-278 WB/School Rd.	NB Left	C	283	F	-77
Narrows Rd North/St. John's Ave	SB Right	A	818	A	485
Narrows Rd North/Hylan Blvd Spur	NB Right	B	395	A	808
Narrows Rd North/Legion Place	NB Right	B	387	A	823
Narrows Rd North/Grasmere Dr	NB Right	A	516	A	793
Merle Place/Fingerboard Rd	EB Left	A	453	A	528
Harvey St/Fingerboard Rd	WB Left	A	441	A	522

Table 12 2060 Benchmark Scenario Levels of Service At Critical Unsignalized Intersections					
INTERSECTION	Approach/ Movement	AM PEAK HOURS		PM PEAK HOURS	
		Worst LOS	Reserve Capacity	Worst LOS	Reserve Capacity
Lincoln Place/fingerboard Rd	WB Left	A	512	A	484
Cleveland Place/Fingerboard Rd	WB Left	C	208	C	220
Hillbrook Dr/Fingerboard Rd	EB Left	C	218	C	214
Major Ave/Lily Pond Ave	WB Left	E	68	E	7

Source: Table 6B-33 USCG 1995

Table 13
2060 Benchmark Scenario AM Peak Hour Levels of Service

INTERSECTION APPROACH	BENCHMARK SCENARIO MVMT	V/C Ratio	DELAY (sec/veh)	LOS	WITH MITIGATION V/C Ratio	DELAY (sec/veh)	LOS	MITIGATED MOVEMENT
BAY WAY CIRCLE AREA								
BAY WAY CIRCLE WB/ROUTE 1&9								
WB	L	0.577	36.3	D	0.53	34.1	D	
WB	LT	1.023	58.1	E	0.94	41.6	E	<== Shift 1 Sec
WB	R	0.189	16.7	C	0.17	16	C	NB/SB to WB
NB	T	0.575	3.3	A	0.59	3.8	A	
SB	TR	0.37	2.5	A	0.38	2.9	A	
SB	R	0.305	2.4	A	0.31	2.7	A	
Intersection		0.661	11.3	B	0.66	9.4	B	
BAY WAY/GRIER AVENUE								
EB	LTR	1.029	46.2	E	0.97	31.5	D	<== Shift 2 Sec From
WB	LTR	0.964	35.9	D	0.82	17.2	C	<== NB/SB to EB/WB
NB	LTR	0.541	9.6	B	0.58	10.5	B	
SB	LTR	0.181	27.2	D	0.19	29.2	D	
Intersection		0.838	35.6	D	0.83	22.7	C	
GRIER AVENUE/ROUTE 1 & 9								
EB	LTR	0.761	45.6	E	0.71	40.5	E	
WB	LTR	1.416	*	*	1.34	*	*	<== Shift 1 Sec From
NB	TR	0.54	2.2	A	0.55	2.4	A	NB/SB to EB/WB
SB	TR	0.328	1.7	A	0.33	1.8	A	
Intersection		*	*	*	*	*	*	
NJ TURNPIKE EXIT 13 TOLL PLAZA AREA								
BAY WAY/OFF RAMP NJ TPK/ATLANTIC AVENUE								
EB	L	0.69	20.5	C	0.72	21.6	C	Shift 1 Sec From
EB	LR	0.82	23	C	0.85	25.1	D	EB to WB and
WB	LT	1.11	79.9	F	1.03	51.2	E	<== Shift 1 Sec From
WB	R	0.46	11.1	B	0.43	10.4	B	NB/SB to WB
NB	LT	0.78	19.8	C	0.81	25.8	D	
SB	T	0.88	28.8	D	0.92	32.9	D	
SB	R	0.57	0.5	A	0.57	0.5	A	
Intersection		0.93	28.6	D	0.93	25.8	D	
GOETHALS BRIDGE ON/OFF RAMP/ATLANTIC AVE								
WB	L	0.92	40.8	E	0.85	31	D	<== Shift 2 Sec From
WB	LR	0.91	34.5	D	0.85	27.6	D	SB to WB
NB	TR	0.87	20.7	C	0.87	20.7	C	

Table 13
2060 Benchmark Scenario AM Peak Hour Levels of Service

INTERSECTION	BENCHMARK SCENARIO				WITH MITIGATION			MITIGATED
APPROACH	MVMT	V/C Ratio	DELAY (sec/veh)	LOS	V/C Ratio	DELAY (sec/veh)	LOS	MOVEMENT
SB	L	0.18	5.2	B	0.21	6	B	
SB	T	0.23	3.9	A	0.24	4.4	A	
Intersection		0.72	21.9	C	0.72	19.5	C	

Source: Table 6B - 41 (USCG, 1995)

Table 14
2060 Benchmark Scenario PM Peak Hour Levels of Service

INTERSECTION		BENCHMARK SCENARIO			WITH MITIGATION			MITIGATED
APPROACH	MVMT	V/C Ratio	DELAY (sec/veh)	LOS	V/C Ratio	DELAY (sec/veh)	LOS	MOVEMENT
BAY WAY CIRCLE AREA								
BAY WAY CIRCLE WB/ROUTE 1&9								
WB	L	0.47	34.3	D	0.43	32.6	D	
WB	LT	1.27	152.4	F	1.16	106.9	F	←Shift 2 Sec
WB	R	0.43	0	A	0.04	0	A	From NB/SB
NB	T	0.57	3.3	A	0.58	3.7	A	To WB
SB	TR	0.64	4.2	A	0.65	4.8	A	
SB	R	0.65	5	A	0.66	5.7	B	
Intersection		*	*	*	0.77	17.8	C	
BAY WAY CIRCLE EB/ROUTE 1&9								
EB	L	0.59	28.6	D	0.57	27.7	D	
EB	LT	0.93	41.2	E	0.91	38	D	←Shift 1 Sec From
EB	R	0.12	23.2	C	0.11	22.6	C	NB/SB to EB
NB	TR	0.71	8.9	B	0.72	9.3	B	
SB	T	0.79	10.1	B	0.8	10.7	B	
Intersection		0.83	15.2	C	0.83	15.1	C	
SOUTH ELMORA AVENUE/ EDGAR ROAD								
EB	LTR	1.17	100.4	F	1	31.6	D	←Shift 6 Sec From
WB	LTR	0.55	3.8	A	0.55	3.8	A	WB to EB/WB
NB	LTR	0.42	16.5	C	0.42	16.5	C	
SB	LTR	0.66	28.1	D	0.66	28.1	D	
Intersection		.96	48.8	E	0.86	18.4	C	
SOUTH ELMORA AVENUE/ LIDGERWOOD AVENUE								
EB	LTR	0.49	2.9	A	0.52	4.1	A	
WB	LTR	583	3.4	A	0.62	5	A	
NB	LTR	3.37	9540	F	2.28	2406.7	F	←Shift 4 Sec From
SB	LTR	3.03	6597	F	2	1458.8	F	←EB/WB to NB/SB
Intersection			*	*	*	*	*	
BAY WAY/GRIER AVE								
EB	LTR	1.48	237.9	F	0.66	9.1	B	←Remove Parking
WB	LTR	1.52	295.5	F	0.98	39.2	D	←from EB approach and

Table 14
2060 Benchmark Scenario PM Peak Hour Levels of Service

INTERSECTION		BENCHMARK SCENARIO			WITH MITIGATION			MITIGATED
APPROACH	MVMT	V/C Ratio	DELAY (sec/veh)	LOS	V/C Ratio	DELAY (sec/veh)	LOS	MOVEMENT
NB	LTR	0.57	25.3	D	0.57	25.3	D	departure legs during
SB	LTR	0.42	11.9	B	0.42	11.9	B	PM peak hour.
Intersection		*	*	*	0.82	19.7	C	
BAY WAY/S. BROAD STEET- SB APPROACH								
EB	LTR	0.57	6.8	B	0.6	8.7	B	
WB	LTR	0.53	6.5	B	0.55	7.2	B	
SB	LR	1.03	60.9	F	0.97	44.3	E	←Shift 2 Sec from
Intersection		0.75	15.5	C	0.75	13.9	B	EB/WB to SB
GRIER AVENUE ROUTE 1&9								
EB	LTR	1.49	*	*	1.41	*	*	←Shift 1 Sec from
WB	LTR	2.17	*	*	1.95	*	*	←NB/SB to EB/WB
NB	TR	0.55	2.4	A	0.56	2.7	A	
SB	TR	0.6	2.6	A	0.61	3.3	A	
Intersection		*	*	*	*	*	*	
NJ TURNPIKE EXIT 13 TOLL PLAZA AREA/BAY WAY/OFF RAMP NJ TPK/ ATLANTIC AVENUE								
EB	L	0.83	25.8	D	0.81	24.4	C	Shift 1 Sec From
EB	LR	1.16	114.2	F	1.1	84.3	F	←NB/SB to EB
WB	LT	0.91	34.8	D	0.91	34.8	D	Restrict Left Turn
WB	R	0.45	15	B	0.45	15	B	on NB
NB	LT	0.96	143.4	F	0.96	42.6	E	←
SB	T	0.75	20.9	C	0.75	22	C	
SB	R	0.63	0.8	A	0.63	0.8	A	
Intersection		1.01	*	*	1.01	34.6	D	
GOETHALS BRIDGE ON/OFF RAMP/ ATLANTIC AVE								
WB	L	0.67	23.6	C	0.66	23.4	C	
WB	LR	0.66	28.3	D	0.66	28.4	D	
NB	TR	1.25	167	F	1.18	107.1	F	←Shift 2 Sec from
SB	L	0.53	8.2	B	0.6	9.9	B	Leading SB phase
SB	T	0.3	4.1	A	0.3	4.1	A	To NB/SB

Table 14
2060 Benchmark Scenario PM Peak Hour Levels of Service

INTERSECTION			BENCHMARK SCENARIO			WITH MITIGATION			MITIGATED
APPROACH		MVMT	V/C Ratio	DELAY (sec/veh)	LOS	V/C Ratio	DELAY (sec/veh)	LOS	MOVEMENT
Intersection			*	*	*	0.87	63.1	F	
RICHMOND AVENUE/VICTORY BLVD/RICHMOND AVE VICTORY BLVD/RICHMOND AVE									
	EB	L	1.36	351.5	F	1.36	350.5	F	
	EB	TR	0.78	23.4	C	0.78	23.4	C	
	WB	L	2.14	*	*	2.14	*	F	
	WB	TR	0.71	14.8	B	0.71	14.8	B	
	NB	L	1.18	194.2	F	1.13	159	F	←Restripe NB left
	NB	T	0.63	13.3	B	0.7	14.2	B	Lane from 10ft to
	SB	L	0.32	13.5	B	0.38	14.2	B	11ft.
	SB	TR	1.13	90.2	F	1.13	90.2	F	
Intersection			*	*	*	*	*	*	
VERRAZANO-NARROWS BRIDGE TOLL PLAZA NARROWS ROAD SOUTH/LILY POND AVE									
NARROWS ROAD SOUTH	EB	L	0.14	21.3	C	0.14	22	C	
	EB	LR	0.14	21.4	C	0.15	22	C	
	EB	R	0.16	21.5	C	0.17	22.1	C	
S.I.E. OFF RAMP	EB	L	0.85	33.7	D	0.85	33.7	D	
	NB	T	0.32	13.7	E	0.31	13.2	B	
	SB	T	1.08	59.5	E	1.05	47.9	E	←Shift 1 Sec from EB
Intersection			0.78	44.9	E	0.78	37.8	D	Narrows Rd. South to
									NB/SB.
NARROWS ROAD SOUTH/ FINGERBOARD ROAD									
	EB	LTR	0.31	11.4	B	0.33	12.4	B	
	NB	TR	0.48	17.5	C	0.46	16	C	
	SB	L	0.37	12	B	0.35	10.9	B	
	SB	T	1	51.8	E	0.96	38.8	D	←Shift 2 Sec from EB to
Intersection			0.66	30.8	D	0.66	24.8	C	NB/SB.
McCLEAN AVE/LILY POND AVE									
	EB	L				0.71	21.4	C	
	EB	TR				0.57	33.1	D	
	EB	LTR	1.67	507.2	F				←Shift 2 Sec from

Table 14 2060 Benchmark Scenario PM Peak Hour Levels of Service								
INTERSECTION		BENCHMARK SCENARIO			WITH MITIGATION			MITIGATED
APPROACH	MVMT	V/C Ratio	DELAY (sec/veh)	LOS	V/C Ratio	DELAY (sec/veh)	LOS	MOVEMENT
WB	LTR	0.72	15.6	C	0.7	15.4	C	EB/WB to NB/SB
NB	L	0.61	20.1	C	0.61	19.3	C	Remove parking from
NB	TR	0.66	10	B	0.64	9	B	EB approach and
SB	LTR	1.05	39.7	D	1	26.7	D	← provide 2 moving lanes.
Intersection		*	*	*	0.88	21.8	C	
HOLLAND TUNNEL TOLL PLAZA BOYLE PLAZA/JERSEY AVE								
WB	L	0.09	5.5	B				
WB	LTR	1.19	98.5	F				
NB	L	2	1509.2	F				
NB	T	1.15	117.9	F				<== Mitigation not feasible.
SB	T	1.03	40.6	E				
SB	R	1.09	72.5	F				
Intersection		*	*	*				
CANAL STREET AREA CANAL STREET/HUDSON STREET								Police controlled intersection.
EB	L	1.05	60.9	F				<== Mitigation not
EB	T	0.97	45.1	E				<== feasible.
WB	T	0.56	29.5	D				
WB	R	0.94	51.2	E				
NB	T	0.99	42.6	E				
NB	R	0.08	19	C				
NB	LT	0.7	24	C				
Intersection		0.99	43.7	E				

Source: Table 6B - 42 (USCG, 1995)

Table 15
2060 Benchmark Scenario Intersection Traffic Levels of Service (AM/PM)

Intersection and Approach		2060 Benchmark Scenario				(AM/PM) With Mitigation				
		Mvt.	V/C	Avg. Stop	LOS	Mvt.	V/C	Avg. Stop	LOS	Mitigation Measures
WEEKDAY 7-8 AM (Roadway Peak)										
GULF AVENUE & FOREST AVENUE										
Brooklyn Union Gas Driveway	NB	TR	0.1	7.2	B					Mitigation not
Forest Avenue	SB	DfL	0.18	7.5	B					required for Year
	SB	T	0.02	7	B					2020 if traffic signal
Gulf Avenue	EB	LTR	0.4	8.5	B					installed for Year 2005
Overall Intersection		-	0.29	8.2	B					Build condition.
GOETHALS ROAD NORTH & FOREST AVENUE										
Forest Avenue		HCS cannot analyze this				LT	0.65	8.8	B	Install traffic
Forest Avenue		intersection since traffic vol				TR	0.26	10.6	B	signal.
Goethals Road North		exceeds analysis thresholds.				LTR	0.34	10	B	
Overall Intersection							0.52	9.5	B	
GOETHALS ROAD NORTH & WESTERN AVENUE										
Western Avenue	NB	LT	0.02	12.3	B					Mitigation not
	SB	TR	0.46	14.6	B					required for Year
Howland Hook Terminal Access	EB	LR	0.24	3.7	A					2020 if traffic signal
Goethals Road North	WB	L	0.23	3.6	A					installed for Year 2005
Overall Intersection		-	0.49	5.7	B					Build condition.
WEEKDAY 5-6 pm: (Roadway Peak)										
GULF AVENUE & FOREST AVENUE										
Brooklyn Union Gas Driveway	NB	TR	0.04	7	B					Mitigation not
Forest Avenue	SB	DfL	0.17	7.5	B					required for Year
	SB	T	0.1	7.2	B					2020 if traffic signal
Gulf Avenue	EB	LTR	0.4	8.5	B					installed for Year 2005
Overall Intersection		-	0.26	8.2	B					Build condition.

Table 15
2060 Benchmark Scenario Intersection Traffic Levels of Service (AM/PM)

Intersection and Approach		2060 Benchmark Scenario				(AM/PM) With Mitigation				
		Mvt.	V/C	Avg. Stop	LOS	Mvt.	V/C	Avg. Stop	LOS	Mitigation Measures
GOETHALS ROAD NORTH & WESTERN AVENUE										
Forest Avenue		HCS cannot analyze this				NB	0.7	9.4	B	Install traffic
Forest Avenue		intersection since traffic vol				SB	0.32	10.9	B	signal.
Goethals Road North		exceeds analysis thresholds.				WB	0.28	9.7	B	
Overall Intersection										
GOETHALS ROAD NORTH & WESTERN AVENUE										
Western Avenue	NB	LT	0.01	12.3	B					Mitigation not
	SB	TR	0.57	15.7	C					required for Year
Howland Hook Terminal Access	EB	LR	0.81	12.3	B					2020 if traffic signal
Goethals Road North	WB	L	0.22	3.6	A					installed for Year 2005
		TR	0.32	3.9	A					Build condition.
Overall Intersection		-	0.74	8.5	B					

Notes: (1) Delay is measured in seconds per vehicle.

(2) Level of service for unsignalized intersections is based upon average delay per vehicle (sec/veh) for each lane group as listed in the 1994 Highway Capacity Manual - TRB Special Report 209.

Source: Table VII – 23 (NYCEDC, 1999)

Table 16 2060 Benchmark Scenario Intersection Traffic Levels of Service (AM/PM)											
Intersection and Approach		2060 Benchmark Scenario				(AM/PM) With Mitigation				
		Mvt.	V/C	Avg. Stop	LOS	Mvt.	V/C	Avg. Stop	LOS	Mitigation Measures
WEEKDAY 9 - 10 AM: SITE GENERATED PEAK										
GULF AVENUE & FOREST AVENUE										
Brooklyn Union Gas Driveway	NB	TR		0.01	M					Mitigation not
Forest Avenue	SB	DfL	0.11	7.2	B					required for Year
	SB	T	0.03	7	B					2020 if traffic signal
Gulf Avenue	EB	LTR	0.38	8.4	B					installed for Year 2005
Overall Intersection		-	0.24	8.2	B					Build condition.
GOETHALS ROAD NORTH & FOREST AVENUE										
Forest Avenue	NB	HCS cannot analyze this				LT	0.53	7.7	B	Install traffic
Forest Avenue	SB	intersection since traffic vol				TR	0.73	10.5	B	signal.
Goethals Road North	WB	exceeds analysis thresholds.				LTR	0.19	9.4	B	
Overall Intersection							0.39	8.7	B	
GOETHALS ROAD NORTH & WESTERN AVENUE										
Western Avenue	NB	LT	0.01	12.3	B					Mitigation not
	SB	TR	0.35	13.8	B					required for Year
Howland Hook Terminal Access	EB	LR	0.9	21.5	C					2020 if traffic signal
Goethals Road North	WB	L	0.2	3.5	A					installed for Year 2005
		TR	0.53	4.9	A					
Overall Intersection		-	0.74	9.6	B					Build condition.
WEEKDAY 3-4 PM:										
GULF AVENUE & FOREST AVENUE										
Brooklyn Union Gas Driveway	NB	TR	0.06	7.1	B					Mitigation not
Forest Avenue	SB	DfL	0.22	2.7	B					required for Year
		T	0.04	7	B					2020 if traffic signal
Gulf Avenue	EB	LTR	0.5	9	B					installed for Year 2005
Overall Intersection		-	0.36	8.7	B					Build condition.

GOETHALS ROAD NORTH & FOREST AVENUE										
Forest Avenue	NB	HCS cannot analyze this				LT	0.74	10.4	B	Install traffic
	SB	intersection since traffic vol				TR	0.25	10.6	B	signal.
Goethals Road North	WB	exceeds analysis thresholds.				LT R	0.35	9.6	B	
Overall Intersection						-	0.53	10.2	B	
GOETHALS ROAD NORTH & WESTERN AVENUE										
Western Avenue	NB	LT	0.01	12.3	B	LT	0.01	12.3	B	Mitigation not
	SB	TR	0.49	14.8	B	TR	0.49	14.8	B	required for Year
Howland Hook Terminal Access	EB	LR	1.65	-	F	LR	0.72	7.9	B	2020 if traffic signal
						R	0.5	5	A	installed for Year 2005
Goethals Road North	WB	L	0.28	3.8	A	L	0.28	3.8	A	Build condition.
		TR	0.51	4.7	A	TR	0.51	4.7	A	
Overall Intersection		-	0.65	-	F	-	0.65	6.4	B	

Notes: (1) Delay is measured in seconds per vehicle.

(2) Level of service for unsignalized intersections is based upon average delay per vehicle (sec/veh) for each lane group as listed in the 1994 Highway Capacity Manual - TRB Special Report 209.

Table 17 2060 Benchmark Scenario (AM/PM) Levels of Service				
Junction and Weaving Area		2060 Benchmark Scenario		
		Density (pc/mi/in)	Speed (mph)	LOS
WEEKDAY 7-8 AM:				
SIE EASTBOUND				
1.	Mainline & Gulf Avenue on-ramp	13	51	B
	Weaving Vehicles		44	D
	Non-Weaving Vehicles		51	C
2.	Mainline & Gulf Avenue off-ramp	11	47	B
3.	Mainline & West Shore Expwy SB ramp	14	47	B
SIE WESTBOUND				
4.	Mainline & West Shore Expwy NB ramp	16	51	B
5.	Mainline & Goethals Road on-ramp	21	51	C
	Weaving Vehicles		38	E
	Non-Weaving Vehicles		45	D
6.	Mainline & Goethals Road off-ramp	26	47	C
WEEKDAY 5-6 PM:				
SIE EASTBOUND				
1.	Mainline & Gulf Avenue on-ramp	21	51	C
	Weaving Vehicles		39	E
	Non-Weaving Vehicles		47	D
2.	Mainline & Gulf Avenue off-ramp	21	47	C
3.	Mainline & West Shore Expwy SB ramp	26	47	C
SIE WESTBOUND				
4.	Mainline & West Shore Expwy NB ramp	11	51	B
5.	Mainline & Goethals Road on-ramp	14	51	B
	Weaving Vehicles		44	D
	Non-Weaving Vehicles		51	C
6.	Mainline & Goethals Road off-ramp	17	47	B

Table 18
2060 Benchmark Scenario Levels of Service at Key Intersections

INTERSECTION Approach		A.M. Peak Hour	P.M. Peak Hour
SEVENTH AVE. AT FT. HAMILTON PKWY.			
Seventh Ave.	EB	D	D
Ft. Hamilton Pkwy.	SB	D	D
Intersection		D	D
SEVENTH AVE. AT 65th STREET			
Seventh Ave.	EB	D	D
Seventh Ave.	WB	D	D
65th Street	NB	C	D
65th Street	SB	E	D
Intersection		D	D
SIXTH AVE. AT 65th STREET			
Seventh Ave.	EB	C	C
Seventh Ave.	WB	C	D
65th Street	NB	C	D
65th Street	SB	D	B
Intersection		C	C
FIFTH AVE. AT 65th STREET			
Fifth Ave.	EB	C	C
Fifth Ave.	WB	C	C
65th Street	NB	A	B
65th Street	SB	C	A
Intersection		B	B

INTERSECTION Approach		A.M. Peak Hour	P.M. Peak Hour
THIRD AVE. AT 39th STREET			
Third Ave.	EB	F	C
Third Ave.	WB	C	C
39th Street	NB	D	C
39th Street	SB	C	C
Intersection		E	C
THIRD AVE. AT PROSPECT AVE.			
Third Ave.	EB	D	D
Third Ave.	WB	E	E
Prospect Ave.	NB	D	E
Intersection		D	E
HAMILTON AVE. INBOUND AT SMITH STREET			
Smith Street	EB	D	D
Hamilton Ave.	NB	C	B
Intersection		C	B
HAMILTON AVE. OUTBOUND AT SMITH STREET			
Smith Street	EB	D	E
Smith Street	WB	D	D
Hamilton Ave.	SB	B	B
Intersection		B	B
HAMILTON AVE. INBOUND AT COURT STREET			
Court Street	WB	C	D

Table 18
2060 Benchmark Scenario Levels of Service at Key Intersections

INTERSECTION Approach	A.M. Peak Hour	P.M. Peak Hour
FOURTH AVE. AT 65th STREET		
Fourth Ave. EB	B	D
Fourth Ave. WB	D	B
65th Street NB	C	D
65th Street SB	E	B
Intersection	C	C
THIRD AVE. AT 60th STREET		
Third Ave. EB	F	C
Third Ave. WB	C	B
60th Street NB	C	D
60th Street SB	C	D
Intersection	E	B
HAIMLTON AVE. INBOUND AT NINTH STREET		
Ninth Street WB	D	D
Hamilton Ave. NB	B	B
Intersection	B	C
HAMILTON AVE. IRONBOUND AT CLINTON STREET		
Clinton Street EB	D	D
Hamilton Ave. NB	B	B
Intersection	B	B
Hamilton Ave. NB	C	C
Intersection	C	C
HAMILTON AVE. OUTBOUND AT COURT STREET		
Court Street EB	C	C
Court Street WB	C	C
Hamilton Ave. NB	C	B
Intersection	C	C
HAMILTON AVE. OUTBOUND AT CLINTON STREET		
Clinton Street EB	D	D
Clinton Street WB	C	C
Hamilton Ave. SB	B	B
Intersection	B	B

Source: Gowanus EIS, 1995

Table 19
2060 Benchmark Scenario Levels of Service

Intersection and Approach		2060 Benchmark Scenario			With Mitigation			Mitigation Measures
		Mvt.	V/C	LOS	Mvt.	V/C	LOS	
7 to 8 AM								
1. 2nd AVENUE *39th STREET/GOWANUS SB EXIT RAMP								
2nd Avenue	NB	LTR	0.19	B				Mitigation not required; Gowanus Expressway SB exit ramp relocated to 1st Avenue/39th Street
	SB	LTR	0.1	B				
39th Street	EB	LTR	0.74	B				
	WB	LTR	0.3	B				
Gowanus Expwy SB exit ramp	WB			B				
Overall Intersection		-	0.5	B				
2a. 3rd AVENUE SB & 39th STREET								
3rd Avenue	SB	LT	0.35	B				Mitigation not required.
39th Street	EB	TR	0.44	C				
	WB	LT	0.48	C				
Overall Intersection		-	0.4	B				
2b. 3rd AVENUE NB & 39th STREET								
3rd Avenue	NB	LT	1.03	D				Mitigation not required.
39th Street	EB	LT	0.42	C				
	WB	LT	0.6	C				
Overall Intersection		-	0.88	D				
3. 4th Avenue & 38th STREET								
4th Avenue	NB	TR	0.82	B				Mitigation not required
	SB	T	0.37	B				
38th Street	WB	L	0.22	D				
		TR	0.13	C				
Overall Intersection		-	0.65	B				

4. 2nd AVENUE & 58th STREET								
2nd Avenue	NB	LTR	1.59	F	LTR	0.89	C	Restripe NB approach for two 10' lanes by
	SB	LTR	0.58	B	LTR	0.6	B	reducing SB approach width 2'.
58th Street	EB	LTR	0.3	C	LTR	0.33	C	Modify signal times (shift 2sec. green time from
								EB/SB phase)
Overall Intersection		-	**	F	-	0.7	C	Remove parking on NB approach.
5. 3rd AVENUE & 60th STREET								
3rd Avenue	NB	L	2.33	F	L	1.1	F	Modify signal timing (shift 2 sec. green time
		T	0.59	B	T	0.7	C	from NB/SB phase to EB/WB phase; shift 9 sec.
(Service Road)	NB	TR	0.81	C	TR	0.94	D	green time from NB/SB phase to NB/SB
3rd Avenue(Mainline)	SB	L	0.67	E	L	0.32	D	exclusive left turn phase.
		T	0.44	B	T	0.52	C	
(Service Road)	SB	TR	0.3	B	TR	0.33	C	Remove parking on EB and WB approaches.
60th Street	EB	DfL	1.07	F	DfL	0.98	F	
		TR	0.6	D	TR	0.48	D	Remove parking on east side of the NB
	WB	LTR	0.76	D	LTR	0.65	D	approach north of the intersection.
Overall Intersection		-	**	F	-	0.86	D	
6. 2nd AVENUE & 63rd STREET								
2nd Avenue	NB	LT	1.15	F	LT	1.02	D	Modify signal timing (shift 2 sec. green time
	SB	TR	0.27	B	TR	0.24	B	from EB/WB phase to NB/SB phase)
Brooklyn Army Terminal Access	EB	LR	0.11	B	LR	0.13	C	
63rd Street	WB	LTR	0.42	C	LTR	0.51	C	
Overall Intersection		-	**	F	-	0.86	D	

Intersection and Approach		2040 Benchmark Scenario			With Mitigation			Mitigation Measures
		Mvt.	V/C	LOS	Mvt.	V/C	LOS	
7 2nd AVENUE SB & 65th STREET								
2nd Avenue	NB	TR	0.58	B	TR	0.67	B	Modify signal timing (add a SB lead phase; shift

	SB	DfL	1.58	F	LT	0.36	B	7 sec. green time from NB/SB phase to SB lead phase)
		T	0.2	B				
65th Street	WB	L	0.11	B	L	0.11	B	
		R	0.26	C	R	0.26	C	
	Overall Intersection	-	**	F	-	0.32	B	
8. 3rd AVENUE NB & 65th STREET								
3rd Avenue	NB	L	0.09	B	L	0.1	B	Mitigation not required.
		T	0.76	C	T	0.86	C	
		R	0.65	B	R	0.73	C	
	SB	TR	0.18	B	TR	0.21	B	
65th Street	EB	L	1.01	F	L	0.82	D	
		R	0.03	C	R	0.03	C	
	WB	LTR	0.27	C	LTR	0.22	C	
	Overall Intersection	-	0.85	C	-	0.84	C	
9 7th AVENUE NB & 65th STREET								
7th Avenue	NB	DfL	2.09	F	L	0.91	D	Cut back sidewalk at NB approach to add a NB exclusive left turn lane. Remove parking for EB and WB approaches. Modify signal timing (provide lead NB and WB phase; reduce cycle length from 120 seconds to 90 seconds.) Prohibit SB and EB left turns. Shift centerline to widen WB approach.
	NB	TR	0.85	D	LTR	0.87	D	
	NB				R	0.17	B	
		DfL	0.98	F	TR	0.28	C	
	SB	TR	0.3	C				
65th Street	EB	DfL	0.65	D	LTR	0.63	C	
		TR	0.89	C				
	WB	LTR	1.71	F	L	0.89	E	
					TR	0.88	C	
	Overall Intersection	-	**	F	-	0.88	C	

Notes:

(1) Delay is measured in seconds per vehicle

(2) Levels of service for Ramp - Freeway junctions are based on qualitative measures such as density and speed in the influence area of the junction - Source: 1994 highway Capacity Manual - TRB Special Report 209.

FEIS APPENDIX B-1.10

AIR QUALITY – STATEMENT OF CONFORMITY

CLEAN AIR ACT
STATEMENT OF CONFORMITY

NEW YORK and NEW JERSEY HARBOR NAVIGATION STUDY
FEDERAL NAVIGATION PROJECT

Based on the conformity analysis in the subject report, I have determined that the proposed action conforms to the applicable State Implementation Plans (SIP). The Environmental Protection Agency had specific comments requesting additional cumulative analyses of specific emissions that could be attributed to the project under their Clean Air Act authority. All air quality comments were fully addressed with a determination that the project would not lead to adverse air emission as compared to the no-action alternative; and thus, would comply with Section 176 (c) (1) of the Clean Air Act Amendments of 1990.

_____
Date

_____
William H. Pearce
Colonel, Corps of Engineers
District Engineer

APPENDIX B-1.8: AIR QUALITY

Section 1 - Introduction

This technical appendix presents the results of air quality analyses, which were conducted to assess the impact of the proposed project and the no action alternative. This analysis considers the four sites at which cargo will be received and off-loaded onto trucks for transport to cargo destinations. At each of the four terminal sites, microscale analyses have been conducted in order to determine the concentrations of relevant air pollutants, which are then compared to applicable standards. The analysis also considers the regional emissions associated with the growth in cargo volumes through 2060.

The four sites include Port Newark/Elizabeth, Port Jersey/MOTBY, Howland Hook, and South Brooklyn. The proposed project includes deepening the shipping channels used to access these sites to allow fully loaded deeper draft container vessels to call at these terminals. Independent of the implementation of further channel deepening, a program of improvements will be carried out at the existing terminal sites. These actions will include the deployment of more efficient cranes; development of a modern container terminal at South Brooklyn; enhancement of the cross harbor movement of cargo; reconfiguration of terminal operations at Port Newark/Elizabeth, including the conversion of 100 acres of warehouse space to container terminal; and at Port Jersey, the conversion of the 80 acre NEAT facility and the development of 130 acres at MOTBY into container terminal. The result of these non-project dependent actions will be increased terminal throughput capacity from a present level of 3.0 million TEUs/year to 9.6 million TEUs/year by the year 2060. As discussed above, in order to accomplish this increase in throughput, the present acreage of container terminals will be increased from 1197 to 1607 acres, and productivity, currently estimated at 1500 lifts/acre is assumed to increase to a level of 3500 lifts/acre by 2040.

The "no action" alternative assumes that the shipping channels will not be deepened. As a result, cargo passing through the container terminals will be carried by a greater number of shallower draft vessels. It is expected that the actual cargo throughput will expand to 9.6 million TEUs as described above. Thus, the primary difference between the "no action" alternative and the "Proposed Action" or "With Project" alternative is the number and size vessels anticipated to pass through the Harbor.

In order to meaningfully assess the proposed project and no action alternatives, a benchmark is needed for comparison. This benchmark is defined as the current throughput level at each site imposed upon future traffic and air quality conditions in the analysis years (2030 and 2060). That is to say, no expansion in the acreage of the container terminals is assumed, and no increases in productivity are assumed. This is defined as the "benchmark" scenario.

The current and future container acreage and throughput capacities for each site are shown below, representing both the "proposed action" and "no action" alternatives:

TABLE 1 ACREAGE AND THROUGHPUT CAPACITIES FOR CONTAINER TERMINAL SITES				
Site	Existing Area	Existing Throughput Capacity (M TEU/year	Area - 2060	Throughput 2060 (M TEU/year)
Port Newark/ Elizabeth	950	2.42	1050	6.25
Port Jersey/ MOTBY	100	.26	310	1.84
Howland Hook	147	.38	147	.87
South Brooklyn	0	0	100	.60
Total	1197	3.06	1607	9.56

This Appendix is organized into five sections. Following this Introduction are sections which describe existing conditions, assess local microscale impacts, assess regional cumulative impacts, and present technical back-up information.

Section 2 - Existing Conditions at Terminal Sites

Based on the requirements of the Clean Air Act, the Federal Environmental Protection Agency (USEPA) has developed National Ambient Air Quality Standards (NAAQS) to protect the health and welfare of the general public. The NAAQS were developed for specific criteria pollutants, which were identified as pollutants most common to all states and of primary concern due to the level of emissions nationwide. The NJDEP is responsible for the attainment and maintenance of the State's air quality standards. These standards are presented in Table 2 entitled National and State of New Jersey Ambient Air Quality Standards.

The New York State Department of Environmental Conservation (NYSDEC) and the New York City Department of Environmental Protection (NYCDEP) are the responsible agencies for the attainment and maintenance of the NAAQS and the State's air quality standards. These standards are presented in Table 3 entitled New York State and National Ambient Air Quality Standards.

Table 2 National and State of New Jersey Ambient Air Quality Standards – June 1996				
Pollutant	**Standard**	**Averaging Period**	**New Jersey[1]**	**National[2]**
Sulfur Dioxide (SO_2) Secondary	Primary Primary 12-mo. Arith. Mean Secondary Secondary	12-mo. Arith. Mean 24-hour average[3] 60 ug/m^3 (0.02 ppm) 24-hour average 3-hour average[3]	80 ug/m^3 (0.03 ppm) 365 ug/m^3 (0.14 ppm) -- 260 ug/m^3 (0.10 ppm) 1300 ug/m^3 (0.05 ppm)	80 ug/m^3 (0.02 ppm) 365 ug/m^3 (0.14 ppm) -- -- 1300 ug/m^3 (0.05 ppm)
Particulate (PM-10)	Primary & Secondary Primary & Secondary	Annual Arith. Mean 24-house average	-- --	50 ug/m^3 150 ug/m^3
Carbon Monoxide	Primary & Secondary Primary & Secondary	8-hour average 1-house average	9 ppm (10mg/m^3) 35 ppm (40mg/m^3)	9 ppm (10mg/m^3)[5] 35 ppm (40mg/m^3)[5]
Ozone	Primary Secondary	Max. daily 1-hour avg. 1-hour average	0.12 ppm (235mg/m^3) 0.08 ppm (160mg/m^3)	0.12 ppm (235mg/m^3)[6] 0.12 ppm (235mg/m^3)[6]
Lead	Primary & Secondary	3-month average quarterly mean	1.5 ug/m^3 (in 24 hours)	1.5 ug/m^3

1. New Jersey short-term standards are not to be exceeded more than once in any 12-month period
2. National short-term standards are not to be exceeded more than once in a calendar year.
3. National standards are block averages rather than moving averages.
4. Intended as a guideline for achieving short-term standard.
5. National secondary standards for carbon monoxide have been dropped.
6. Maximum daily 1-hour average (averaged over a three year period), the expected number of days above the standards must be less than or equal to one.

Table 3 New York State and National Ambient Air Quality Standards										
		New York State Standards				Corresponding Federal Standards				
						Primary Standard				Secondary Standard
Pollutant[1]	Average Period	Conc.	Units	Statistic[2]	Conc.	Units[3]	Statistic	Conc.	Units	Statistic
Sulfur Dioxide	12 consecutive months	0.03	PPM	Arithmetic Mean (A.M.)	80	ug/m^3	A.M.			
	24-Hour	0.14	PPM	Maximum(2)	365	ug/m^3	Maximum(2)			
	3-Hour	0.5	PPM	Maximum				1300	ug/m^3	Maximum
Carbon Monoxide	8-Hour	9	PPM	Maximum	10	mg/m^3	Maximum	10	mg/m^3	Maximum
	1-Hour	35	PPM	Maximum	40	mg/m^3	Maximum	40	mg/m^3	Maximum
Ozone(4)	1-Hour	0.12	PPM	Maximum	235	ug/m^3	Maximum	235	ug/m^3	Maximum
Hydrocarbons (non-methane)	3-Hour (6-9 AM)	0.24	PPM	Maximum						
Nitrogen Dioxide	12 consecutive months	0.05	PPM	A.M.	100	ug/m^3	A.M.	100	ug/m^3	A.M.
Lead(5)	3 consecutive months				1.5	ug/m^3	Maximum			
Inhalable(6) Particulates (PM 10)	12 consecutive months				50	ug/m^3	A.M.	50	ug/m^3	A.M.
	24-Hour				150	ug/m^3	Maximum	150	ug/m^3	Maximum
Total Suspended Particulates (TSP)(7)	12 consecutive months	75	ug/m^3	Geometric Mean (G.M.)						
	24-Hour	250	ug/m^3	Maximum	260	ug/m^3	Maximum	150	ug/m^3	Maximum

Criteria pollutants of concern for transportation sources for which NAAQS have been set include carbon monoxide (CO), hydrocarbons (HC), ozone (O_3), nitrogen dioxide (NO_2), total suspended particulates (TSP), inhalable particulates (PM-10), sulfur dioxide (SO_2), and lead (Pb). The primary standards are intended to prevent adverse health effects and the secondary standards are intended to protect the public welfare.

The primary pollutants emitted from transportation sources are CO, HC, and NO_2. Lead emissions from motor vehicles are not considered significant, declining in recent years through the use of unleaded gasoline. Since the potential emissions of TSP and SO_2 from mobile sources are insignificant in comparison to direct (nonmobile) emission sources such as major industrial stack emissions, only the potential impact of vehicle-related emissions of CO, HC and NO_x pollutants are generally evaluated with respect to indirect sources, in addition to particulate emissions from heavy duty trucks. HC and NO_X pollutants are highly reactive and accurate models to predict concentrations of these pollutants downwind from their sources have not been thoroughly developed. Except for CO, the other pollutants are more of a regional concern and were not evaluated on a microscale level for this project.

The major portion of CO emissions attributable to transportation sources, such as the local employee and truck trips generated by the expansion of the container terminal sites, were evaluated for this project. Carbon monoxide is a colorless and odorless gas created largely by the incomplete combustion of fossil fuels and generally of a localized nature with regard to transportation sources rather than a regional problem. Therefore, the air quality impact of the proposed project was evaluated through a microscale analysis of traffic-related CO levels, whose major concentration is generally found immediately adjacent to a roadway, and a mesoscale analysis addressing the total emissions burden of NO_x, VOC and TSP pollutants as required by the USEPA.

Port Newark/Elizabeth Site

For the Port Newark/Elizabeth site, it is assumed that the existing air quality levels at specific intersections will not be addressed by computer modeling of expected concentrations. Representative ambient air quality data will be addressed at this site using the latest data from the NJDEP Annual Air Quality Report (1997) shown in Table 4 (Existing Air Pollutant Levels, Union County). The data for all pollutants in Table 4 shows that Existing air quality levels in the study area are in compliance with the NAAQS as set forth in 40 CFR 50. The previous study performed by the Port Authority for the North Avenue East road improvements (Killam, 1994) confirms that CO levels at the intersection of Kapkowski Road and North Avenue in the year 2000 would be 9.8 ppm (1-hour) and 6.9 (8-hour), levels that do not exceed the 1-hour or 8-hour NAAQS for CO of 35 ppm and 9 ppm, respectively. Exceedances of the NAAQS for all pollutants have been addressed in the NJDEP annual air quality report (1997). Union County and the entire State of New Jersey have been listed as non-attainment areas for carbon monoxide and ozone levels, respectively. At the two NJDEP sites in Elizabeth which are representative of existing air quality at the site, carbon monoxide levels have not exceeded either the 1-hour or 8-hour standards. The summary of NJDEP air quality data in Table 4, indicates that Existing air

quality conditions in the study area are in compliance with the National and State air quality standards for all pollutants.

Table 4
Port Newark/Elizabeth
Existing Air Pollutant Levels, Union County, 1996

Pollutant	Averaging Period	1996 Highest Concentrations	Station Location
Sulfur	12-month average 24-hour average 3-hour average	0.007 ppm 0.032 ppm 0.053 ppm	Elizabeth Lab
Total Suspended Particulates (TSP)	12-month geom. 24-hour average	46.6 ug/m^3 95.0 ug/m^3	Elizabeth
Particulate Matter (PM_{10})	12-month average 24-hour average	59 ug/m^3 80 ug/m^3	Elizabeth Lab
Carbon Monoxide	8-hour average 1-hour average	5.9 ppm* 8.2 ppm**	Elizabeth
Ozone	12-month average	0.141 ppm 0.141 ppm	Newark
Nitrogen Oxide	12-month average	0.028 ppm	Elizabeth Lab
Lead	3-month average	0.070 ug/m^3	Newark

* - The NAAQS and State Standard is 9 ppm; not to be exceeded more than once per year.
** - The NAAQS and State Standard is 35 ppm; not to be exceeded more than once per year.

Source: NJDEP, 1997

Port Jersey/MOTBY

For the Port Jersey/MOTBY site, it was assumed that the existing air quality levels at critical intersections would not have to be addressed by computer modeling of expected concentrations. Since the review agencies will be primarily concerned with the project impact, only future analysis year emissions will need to be evaluated for the Benchmark and Proposed Project/No Action scenarios. Representative ambient air quality data was addressed at this site using the latest 1996 data from the NJDEP Air Quality Report (1997). Existing air quality levels in the general study area was addressed in terms of compliance with the USEPA air quality standards (NAAQS) as set forth in 40 CFR 50 and the State standards.

Exceedances of the NAAQS for all pollutants have been addressed in the NJDEP annual report. Hudson and Bergen Counties and the entire State of New Jersey have been listed as non-attainment areas for carbon monoxide and ozone levels, respectively. At the NJDEP sites in Jersey City and Bayonne, assumed to be representative of existing air quality at the project site, CO levels have not been exceeded for either the 1-hour or 8-hour standards. A summary of NJDEP air quality data for the project study area utilized to describe the existing environment at

sensitive receptors is presented in Table 5 entitled 1996 Existing Air Pollutant Levels-Hudson County. The data in Table 5 indicates that existing pollutant levels the study area are in compliance with the NAAQS and State air quality standards for all pollutants.

Table 5
Existing Air Pollutant Levels, Hudson County 1996

Pollutant	Averaging Period	1996 Highest Concentrations	Station Location
Sulfur	12-month average 24-hour average 3-hour average	0.006 ppm 0.030 ppm 0.049 ppm	Veteran's Park Bayonne
Total Suspended Particulates (TSP)	12-month geom. 24-hour average	54.4 ug/m^3 119 ug/m^3	355 Newark Avenue, Jersey City
Particulate Matter (PM_{10})	12-month average	23.9 ug/m^3	29th Street & Avenue C, Bayonne
	24-hour average	41.0 ug/m^3	Duncan Avenue, Jersey City
Carbon Monoxide	8-hour average 1-hour average	5.1 ppm* 8.5 ppm**	2828 John F. Kennedy Boulevard, Jersey City
Ozone	12-month average	0.120 ppm 0.120 ppm	Veteran's Park Bayonne
Nitrogen Oxides	12-month average	0.027 ppm	Veteran's Park Bayonne
Lead	3-month average	0.030 ug/m^3	355 Newark Avenue, Jersey City

* The NAAQS and State Standard is 9 ppm; not to be exceeded more than once per year
** The NAAQS and State Standard is 35 ppm; not to be exceeded more than once per year.

Source: NJDEP, 1997

Howland Hook Site

For this assessment, existing air quality conditions at the Howland Hook site were addressed in general terms with respect to compliance with the NAAQS using available 1996 measured data from the NYSDEC monitoring sites without modeling. The most recent environmental study performed in the project area to address local air quality conditions was the Staten Island Bridges DEIS completed in May, 1995. However, this study focused on the bridge crossings and toll plazas and not the local street networks and the air quality data was outdated. The recent environmental study performed by the New York State Department of Transportation (NYSDOT) for the Gowanus Expressway (I-278) road improvements used NYSDEC monitoring data from three different NYSDEC monitoring sites in Brooklyn (Greenpoint, PS-321, and PS-314) to address existing air quality conditions. Therefore, air quality data from three different

NYSDEC monitoring sites, Susan Wagner H.S. (for SO_2/TSP/PB/OZ) and Port Richmond (for PM-10) in Staten Island and P.S. 321 (for CO) in Brooklyn, were used as representative of 1999 Existing conditions for this project site. The summary of air quality data for all pollutants from the latest NYSDEC report (1997) shown in Table 6, indicated that Existing CO levels representative of the study area of 5.2 ppm (1-hour) and 3.6 (8-hour) would not exceed the CO standards of 35 ppm (1-hour) and 9 ppm (8-hour).

Exceedances of the NAAQS for all pollutants have been addressed in the NYSDEC annual air quality report (1997). The New York City Metropolitan Area remains classified as a non-attainment area for CO and ozone levels, even though only one exceedance of the 8-hour standard of 9 ppm has occurred in the last 5-years and only 4 exceedances of the ozone standard (0.12 ppm) have occurred. None of these exceedances occurred at the NYSDEC sites in Brooklyn or Staten Island-CO levels were below the 1-hour (35 ppm) and 8-hour (9 ppm) standards and ozone levels were below the 1-hr standard of 0.12 ppm. The existing air quality representative of the Staten Island study area (Table 6) was also used to describe the air quality environment at sensitive receptors adjacent to the project site. Based on the NYSDEC monitoring data, the 1999 Existing air quality in the project area was determined to be in compliance with the NAAQS and the New York State air quality standards.

Table 6 Existing Ambient Pollutant Concentrations				
Contaminant	Averaging Period	Standard	1996 Monitored Value *	Monitoring Site
Sulfur Dioxide	annual	0.03 ppm	0.006 ppm	Susan Wagner H.S.
	24-hour max.	0.14 ppm	0.029 ppm (0.027 ppm)	Susan Wagner H.S.
	3-hour max.	0.5 ppm	0.048 ppm (0.045 ppm)	Susan Wagner H.S.
Inhalable	annual	50 ug/m^3	22mg/m^3 (22mg/m^3)	Port Richmond
Particulates (PM10)	24-hour max.	150 ug/m^3	62 ug/m^3	Port Richmond
Total Suspended	annual	75 ug/m^3	33 ug/m^3	Susan Wagner H.S.
Particulates	24-hour max.	250 ug/m^3	74 ug/m^3 (63 ug/m^3)	Susan Wagner H.S.
Carbon Monoxide	8-hour max.	9 ppm	3.6 ppm (3.4 ppm)	P.S. 321 (rooftop)
(CO) **	1-hour max.	35 ppm	5.2 ppm (5.1 ppm)	P.S. 321 (rooftop)
Lead	3-month	0.15 ug/m^3	0.02 ug/m^3	Susan Wagner H.S.
Ozone	1-hour	0.12 ppm	0.119 ppm	Susan Wagner H.S.

The NYSDECC air quality station in Brooklyn which provided data that is most representative Of the project area was the rooftop monitor at P.S. 321 at 108 Seventh Avenue for carbon monoxide.
*-Values in parantheses are the ones which should be compared with the NAAQS. For the most pollutants, these values are the second highest concentration. In the case of PM10, the value in parantheses represents the expected value during the last three years.
** - 1996 monitored values
Source: Staten Island Bridges DEIS (1995)

South Brooklyn Site

For this assessment, existing air quality conditions at the project site were addressed in general terms with respect to compliance with the NAAQS using available 1996 measured data from the NYSDEC monitoring sites assumed representative of existing conditions. The recent environmental study performed by the New York State Department of Transportation (NYSDOT) for the Gowanus Expressway (I-278) road improvements used NYSDEC monitoring data from three different NYSDEC monitoring sites in Brooklyn (Greenpoint, PS-321, and PS-314) to address existing air quality conditions for the primary pollutants. The summary of air quality data for all pollutants from the latest NYSDEC report (1997) shown in Table 7, indicated that existing CO levels of 10.8 ppm (1-hour) and 6.1 (8-hour) would not exceed the 1-hour or 8-hour CO standards of 35 ppm and 9 ppm, respectively.

Exceedances of the NAAQS for all pollutants have been addressed in the NYSDEC annual air quality report (1997). The New York City Metropolitan Area remains classified as a non-attainment area for CO and ozone levels, even though only one exceedance of the 8-hour standard of 9 ppm has occurred in the last 5-years and only 4 exceedances of the ozone standard (0.12 ppm) have occurred. None of these exceedances occurred at the NYSDEC sites in Brooklyn-CO levels were below the 1-hour (35 ppm) and 8-hour (9 ppm) standards and ozone levels were below the 1-hr standard of 0.12 ppm. The existing air quality in the Brooklyn study area (see Table 7) was also used to describe the air quality environment at sensitive receptors adjacent to the project site. Based on the NYSDEC monitoring data, the 1999 existing air quality in the project area was assumed to be in compliance with the USEPA NAAQS as set forth in 40 CFR 50 and the New York State air quality standards.

Table 7 1999 Existing Ambient Concentrations				
Contaminant	**Averaging Period**	**Standard**	**1996 Monitored Value***	**Monitoring Site**
Sulfur Dioxide	Annual	0.03 ppm	0.009 ppm	P.S. 321
	24-hour max.	0.14 ppm	0.039 ppm (0.038 ppm)	P.S. 321
	3-hour max.	0.5 ppm	.081 ppm (.062 ppm)	P.S. 321
Inhalable Particulates (PM10)	Annual	50 ug/m^3	27 ug/m^3 (28 ug/m^3)	P.S. 314
	24-hour max.	150 ug/m^3	66 ug/m^3	P.S. 314
Total Suspended Particulates	Annual	75 ug/m^3	57 ug/m^3	Greenpoint
	24-hour max.	250 ug/m^3	100 ug/m^3 (95 ug/m^3)	Greenpoint
Carbon Monoxide (CO) **	8-hour max.	9 ppm	6.5 ppm 6.1 ppm	Brooklyn Transit (street level)
	1-hour max.	35 ppm	11.2 ppm (10.8 ppm)	Brooklyn Transit (street level)
Lead	3-month	0.15 ug/m^3	0.16 ug/m^3	P.S. 314
Ozone	1-hour	0.12 ppm	0.117 ppm	Greenpoint

The NYSDEC air quality monitoring stations in Brooklyn which provide data that is most representative of the project area are as follows:

- A rooftop monitor at P.S. 321 at 108 Sevent Avenue at First Avenue for sulfur dioxide, total suspended particulates and carbon monoxide.
- A rooftop monitor at P.S. 314 at 60th Street and Gowanus Expressway for inhalable particulates and lead.
- A street-level receptor at Brooklyn Transit between Tillary and Johnson Streets for carbon monoxide.

(*) Values in paraentheses are the ones which should be compared with the NAAQS. For most pollutants these values are the second highest concentration. In the case of PM10, the value in parantheses represent the expected value during the last three years.

(**) 1996 monitored values

Source: Gowanus EIS, 1995

Port Newark/Elizabeth Site

Benchmark Scenario

Future year CO levels were determined using the methodology recommended in the New Jersey Department of Environmental Protection (NJDEP) guidelines entitled Air Quality Analysis for Intersections dated November 1996. The CAL3QHC model was used for predictions of pollutant concentrations associated with vehicular emissions. The analysis took into account the ambient temperature, worst case meteorological conditions such as wind speed and direction, the roadway geometry, intersection signal timing, and the background CO air quality levels. These input parameters for the CAL3QHC model are described in detail in Appendix A. Worst-case CO levels were predicted for the peak one-hour and eight-hour time periods corresponding to both the NAAQS and the NJDEP standards for CO of 35 ppm (1-hour) and 9 ppm (8-hour). Total CO levels are presented for the future Benchmark scenario conditions in the analysis year 2060, the estimated project completion date, and an interim year 2030 when significant port improvements will have occurred.

Receptor Sites. There are no sensitive receptors such as residences in the immediate port area dominated by commercial and industrial uses. The receptors analyzed were at either the center of adjacent sidewalks on the four corners of the critical intersection or the center of the sidewalk and nearest receptors adjacent to the critical free-flow links evaluated. The receptor sites were selected to evaluate the potential impact of the project at locations where the maximum change in vehicular activity would occur. The receptor height of 1.8 meters (6 feet) was used in accordance with the NJDEP recommended guidelines for air quality analyses.

The critical roadway segment evaluated for this site was on North Avenue near I-95 at the point of maximum (worst case) traffic congestion associated port generated traffic, using the traffic data in the Traffic Appendix provided for 2030 and 2060 conditions.

The potential impact of the proposed project on CO levels was evaluated at the nearest receptor locations which were commercial/industrial properties immediately adjacent to the North Avenue roadway segment analyzed. The results of the air quality analysis for the Benchmark scenario conditions are shown in Table 8, which indicates that the maximum CO levels predicted for the PM peak-hour period were below both the NAAQS and NJDEP CO standards immediately adjacent to the roadway where vehicle emissions are the highest. The maximum CO levels predicted to occur at the North Avenue receptor sites were levels of 8.9 ppm (1-hour) and 6.2 ppm (8-hour) in 2030, and levels of 9.0 ppm (1-hour) and 6.3 ppm (8-hour) in 2060. The predicted Benchmark scenario CO concentrations were below the NAAQS for CO of 35 ppm (1-hour) and 9 ppm (8-hour), and indicate that normal growth in traffic volumes in the Port Newark/Elizabeth study area will not result in violations of NAAQS for either the 2030 or 2060 Benchmark scenario conditions.

Proposed Project/No Action Alternatives

The results of the air quality analysis for the Proposed Project/No Action alternatives, also shown in Table 8, indicate that the maximum CO levels predicted for the PM peak-hour period are below both the NAAQS and NJDEP CO standards. The maximum CO levels predicted to occur for the Proposed Project/No Action case were at commercial receptors along North Avenue, with levels of 9.5 ppm (1-hour) and 6.7 ppm (8-hour) in 2030, and levels of 9.7 ppm (1-hour) and 6.8 ppm (8-hour) in 2060 (see Section 5 of this Appendix). The maximum predicted CO levels at Site 3 show that the project generated traffic does not result in violations of the NAAQS for CO of 35 ppm (1-hour) and 9 ppm (8-hour). Therefore, the proposed project is not expected to have a significant impact on air quality in the Port Newark/Elizabeth study area.

Table 8
Results of Air Quality Analysis
(North Avenue Near I-95)

Receptor Locations	2030 CO Levels (ppm)				2060 CO Levels (ppm)			
	Benchmark		Proposed/No Action		Benchmark		Proposed/No Action	
	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
Intersection of North Avenue Near I-95	9.3	6.5	10.0	7.0	9.5	6.7	10.1	7.1

NOTES: All CO levels include background concentrations of 5.0 ppm (1-Hour) and 3.5 ppm (8-Hour). Results show maximum CO of all receptors analyzed.

The NAAQS and State standards for carbon monoxide levels are 35.0 ppm (1-Hour) and 9.0 ppm (8-Hour).

Port Jersey/MOTBY Site

Benchmark Scenario

Future year CO levels were determined using the methodology recommended in the NJDEP guidelines entitled Air Quality Analysis for Intersections dated November 1996. The CAL3QHC model was used for predictions of pollutant concentrations associated with vehicular emissions. The input parameters for the CAL3QHC model are described in detail in Appendix A. Worst-case CO levels were predicted for the peak one-hour and eight-hour time periods, corresponding to both the NAAQS and the NJDEP standards for CO of 35 ppm (1-hour) and 9 ppm (8-hour). Total CO levels are presented for the future Benchmark scenario conditions of the analysis year 2060, the estimated project completion date, and an interim year 2030 when significant port improvements will have occurred.

Receptor Sites. There are no sensitive receptors such as residences in the immediate port area dominated by commercial and industrial uses. The receptors analyzed were at either the

center of adjacent sidewalks on the four corners of the critical intersection or the center of the sidewalk and nearest receptors adjacent to the critical free-flow links evaluated. These receptor sites were selected to evaluate the potential impact of the project at locations where the maximum change in vehicular activity would occur. The receptor height of 1.8 meters (6 feet) was used in accordance with the NJDEP recommended guidelines for air quality analyses.

The critical roadway segments evaluated for this site were at the intersection of West Pulaski Street and Port Jersey Boulevard, a point of maximum congestion associated port generated traffic, using the available traffic data provided for 2030 and 2060 conditions.

The potential impact of the proposed project on CO levels was evaluated at the nearest receptor locations (commercial/industrial sites), which were immediately adjacent to the W. Pulaski/Port Jersey Blvd. intersection. There were no sensitive receptors such as residences or parks affected by the proposed improvements. The results of the air quality analysis for the Benchmark scenario conditions are shown in Table 9, which indicate that the maximum CO levels predicted for the PM peak-hour period were below both the NAAQS and NJDEP CO standards immediately adjacent to the roadways. The maximum CO levels were predicted to occur at the Southwest corner of the intersection, levels of 7.6 ppm (1-hour) and 5.3 ppm (8-hour) in 2030, and levels of 7.8 ppm (1-hour) and 5.5 ppm (8-hour) in 2060. The predicted CO concentrations were below the NAAQS for CO of 35 ppm (1-hour) and 9 ppm (8-hour) and indicate that normal growth in traffic volumes in the Port Jersey/MOTBY study area will not result in future violations of NAAQS for either the 2030 or 2060 Benchmark scenario conditions.

Proposed Project/No Action Alternatives

The results of the air quality analysis for the Proposed Project/No Action scenario are also shown in Table 9, which indicate that the maximum CO levels predicted for the PM peak-hour period are below both the NAAQS and NJDEP CO standards. The maximum CO levels predicted to occur for the Proposed Action/No Action alternatives, at the SW corner sidewalk receptor, were levels of 8.0 ppm (1-hour) and 5.6 ppm (8-hour) in 2030, and levels of 8.2 ppm (1-hour) and 5.7 ppm (8-hour) in 2060. The maximum predicted CO levels at this intersection show that the project generated traffic will not result in violations of the NAAQS for CO of 35 ppm (1-hour) and 9 ppm (8-hour). Therefore, the proposed project is not expected to have a significant impact on air quality in the Port Jersey/MOTBY port study area.

Table 9 Results of Air Quality Analysis (W. Pulaski Street and Port Jersey Boulevard)								
Receptor Locations	2030 CO Levels (ppm)				2060 CO Levels (ppm)			
	Benchmark		Proposed/No Action		Benchmark		Proposed/No Action	
	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
Intersection of W. Pulaski Street and Port Jersey Boulevard	7.6	5.3	8.0	5.6	7.8	5.5	8.2	5.7

NOTES: All CO levels include background concentrations of 5.0 ppm (1-Hour) and 3.5 ppm (8-Hour). Results show maximum CO of all receptors analyzed.

The NAAQS and State standards for carbon monoxide levels are 35.0 ppm (1-Hour) and 9.0 ppm (8-Hour).

Howland Hook Site

Benchmark Scenario

Future year CO levels were determined using the CAL3QHC model for predictions of pollutant concentrations associated with vehicular emissions. The input parameters for the CAL3QHC model are described in detail in Appendix A. Worst-case CO levels were predicted for the peak one-hour and eight-hour time periods, corresponding to both the NAAQS and the NYCDEP standards for CO of 35 ppm (1-hour) and 9 ppm (8-hour). Total CO levels are presented for the future Benchmark scenario conditions in analysis year 2060, the estimated project completion date, and an interim year 2030 when significant port improvements will have occurred.

Receptor Sites. There are no sensitive receptors such as residences in the immediate port area dominated by commercial and industrial uses. The receptors analyzed were at either the center of adjacent sidewalks on the four corners of the critical intersection or the center of the sidewalk and nearest receptors adjacent to the critical free-flow links evaluated. These receptor sites were selected to evaluate the potential impact of the project at locations where the maximum change in vehicular activity would occur.

The critical roadway segments evaluated for this site were at the intersection of Goethals Road North and Western Avenue, a point of maximum congestion associated with port generated traffic, using the project traffic data provided for both 2030 and 2060 conditions. The nearest receptor locations were commercial/industrial sites immediately adjacent to the intersection. The results of the air quality analysis for the Benchmark scenario conditions are shown in Table 10, which indicate that the maximum CO levels predicted for the PM peak-hour period were below both the NAAQS and NYCDEP standards immediately adjacent to the roadways where vehicle emissions are the highest. The maximum concentrations predicted to occur at the intersection were CO levels of 6.2 ppm (1-hr) and 2.9 ppm (8-hr) in 2030, and CO levels of 6.3 ppm (1-hr)

and 2.9 ppm (8-hr) in 2060. The predicted CO concentrations were below the NAAQS for CO of 35 ppm (one-hour) and 9 ppm (eight-hour) and indicate that normal growth in traffic volumes in the Howland Hook study area will not result in future violations of NAAQS for either the 2030 or 2060 Benchmark scenaro.

Proposed Project/No Action Aternatives

The results of the air quality analysis for the Proposed Project/No Action scenario conditions are also shown in Table 10, which indicate that the maximum CO levels predicted for the PM peak-hour period are below both the NAAQS and NJDEP CO standards. The maximum CO levels predicted to occur for the Proposed/No action alternatives were levels of 6.3 ppm (1-hour) and 2.9 ppm (8-hour) in 2030, and levels of 6.4 ppm (1-hour) and 3.0 ppm (8-hour) in 2060. The maximum predicted CO levels at this intersection show that the project generated traffic will not result in violations of the NAAQS for CO of 35 ppm (1-hour) and 9 ppm (8-hour). Therefore, the proposed project is not expected to have a significant traffic related impact on air quality in the Howland Hook port study area.

Table 10
Results of Air Quality Analysis
(Goethals Road North and Western Avenue)

Receptor Locations	2030 CO Levels (ppm)				2060 CO Levels (ppm)			
	Benchmark		Proposed/No Action		Benchmark		Proposed/No Action	
	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
Intersection of Goethals Road North and Western Avenue	6.2	2.9	6.3	2.9	6.3	2.9	6.4	3.0

NOTES: All CO levels include background concentrations of 5.0 ppm (1-Hour) and 3.5 ppm (8-Hour). Results show maximum CO of all receptors analyzed.

The NAAQS and State standards for carbon monoxide levels are 35.0 ppm (1-Hour) and 9.0 ppm (8-Hour).

South Brooklyn Site

Benchmark Scenario

Future year CO levels were determined using the CAL3QHC model for predictions of pollutant concentrations associated with vehicular emissions. The input parameters for the CAL3QHC model are described in detail in Appendix A. Worst-case CO levels were predicted for the peak one-hour and eight-hour time periods, corresponding to both the NAAQS and the NYSDEC standards for CO of 35 ppm (1-hour) and 9 ppm (8-hour). Total CO levels are presented for the future Benchmark scenario conditions of the analysis year 2060, the estimated

project completion date, and an interim year 2030 when significant port improvements will have occurred.

Receptor Sites - There are no sensitive receptors such as residences in the immediate port area dominated by commercial and industrial uses. The receptors analyzed were at either the center of adjacent sidewalks on the four corners of the critical intersection or the center of the sidewalk and nearest receptors adjacent to the critical free-flow links evaluated. These receptor sites were selected to evaluate the potential impact of the project at locations where the maximum change in vehicular activity would occur.

The critical roadway segments evaluated for this site were at the intersection of 39th Street and Second Avenue, a point of maximum congestion associated with port generated traffic, using the available traffic data provided for 2030 and 2060 conditions.

The potential impact of the proposed project on CO levels was evaluated at the nearest receptor locations, commercial/industrial sites immediately adjacent to the intersection. The results of the air quality analysis for the Benchmark scenario conditions are shown in Table 11, which indicate that the maximum CO levels predicted for the PM peak-hour period were below both the NAAQS and NYCDEP CO standards immediately adjacent to the roadways where vehicle emissions are the highest. The maximum CO levels predicted to occur at the intersection were levels of 7.5 ppm (1-hour) and 3.8 ppm (8-hour) in 2030, and levels of 7.6 ppm (1-hour) and 3.8 ppm (8-hour) in 2060. The predicted CO concentrations were below the NAAQS for CO of 35 ppm (1-hour) and 9 ppm (8-hour) and indicate that normal growth in traffic volumes in the South Brooklyn study area will not result in future violations of NAAQS for either the 2030 or 2060 Benchmark scenario conditions.

Proposed Project/No Action Alternatives

The results of the air quality analysis for the Proposed/No Action alternative conditions are also shown in Table 11, which indicate that the maximum CO levels predicted for the PM peak-hour period are below both the NAAQS and NYSDEC CO standards. The maximum CO levels predicted to occur for the Proposed/No action alternatives, at the SW corner sidewalk receptor, were levels of 8.6 ppm (1-hr) and 4.5 ppm (8-hr) in 2030, and levels of 8.6 ppm (1-hour) and 4.5 ppm (8-hour) in 2060. The maximum predicted CO levels at this intersection show that the project generated traffic will not result in violations of the NAAQS for CO of 35 ppm (1-hour) and 9 ppm (8-hour). Therefore, the proposed project is not expected to have a significant impact on air quality in the South Brooklyn port study area.

Table 11 Results of Air Quality Analysis (39th Street and Second Avenue)								
Receptor Locations	2030 CO Levels (ppm)				2060 CO Levels (ppm)			
	Benchmark		Proposed/No Action		Benchmark		Proposed/No Action	
	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour	1-Hour	8-Hour
Intersection of 39th Street and Second Avenue	7.5	3.8	8.6	4.5	7.6	3.8	8.6	4.5

NOTES: All CO levels include background concentrations of 5.0 ppm (1-Hour) and 3.5 ppm (8-Hour). Results show maximum CO of all receptors analyzed.

The NAAQS and State standards for carbon monoxide levels are 35.0 ppm (1-Hour) and 9.0 ppm (8-Hour).

Section 4 – Cumulative Impact Analysis

Introduction

Air quality impacts associated with the operation of the container terminals result from the increased level of traffic associated the proposed productivity improvements at the existing container terminals, plus an additional 410 acres of container terminal to be developed from other existing port-related uses (warehousing, auto terminal, bulk terminal). These terminal expansions and productivity increases are independent of the proposed project action. This increased level of traffic will have microscale impacts on a very localized level. These impacts were analyzed and quantified in Section 3 above. In addition to these microscale effects, the increased throughput at the container terminals will have a regional impact due to the transportation of cargo to hinterland destinations. The discussion below evaluates the regional, or mesoscale, impacts associated with such transportation (assumed to be via truck as a worst case condition), and compares the projected impacts of the Proposed Action and No Action alternatives with the Benchmark scenario in which no productivity improvements are implemented and no additional acreage of container terminal is constructed.

This analysis recognizes that the total cargo demand within the 14 state "region" served by the Port is expected to be 19.1 million TEU by 2060. *Therefore, it is assumed that such cargo will be delivered to destinations within the Port region whether or not such cargo is routed through the Port of New York. To the extent that throughput capacity is insufficient to meet the projected demand, cargo will be routed through alternative Ports to the same destinations.*

Methodology

It has been determined that by the year 2030 the Port of New York will experience a demand for cargo throughput capacity totaling 12 million TEU/yr. The Port serves a region encompassing 14 states. By 2060, the demand will be over 19 million TEU/yr. At present

(2000), the throughput capacity for the Port is estimated at 3 million TEU/yr. With the proposed productivity improvements and additional acreage, the throughput capacity is expected to increase to 8.7 million TEU by 2030 and 9.6 million TEU by 2060.

In order to determine the total pollutant burden associated with and without the projected increase in throughput capacity over the existing conditions, a mesoscale analysis has been conducted to determine emissions forecasts based on total vehicle miles traveled (VMT) for nitrogen oxides (NO_x), Volatile Organic Compounds (VOCs), and Particulate matter with a diameter less than 10 microns (PM_{10}) over the regional transportation network affected by the project. The ports of Baltimore and Halifax have been identified as alternative distribution locations to handle the increasing demand. Therefore, the mesoscale analyses include investigation of distribution scenarios involving these ports to examine the effects of alternative distribution plans.

Simply stated, if the proposed actions identified above are implemented (Proposed Project alternative and No Action alternative), the available throughput capacity will be 9.6 million TEU in 2060, the analysis year. The demand at that time will be 19.1 million TEU. The Proposed Project/No Action scenarios scenario assume that the Port's terminals will operate at capacity, and the shortfall will be routed to destinations within the Port's region from other nearby Ports (Baltimore and/or Halifax). Under the "Benchmark" scenario, throughput capacity will remain at 3.0 million TEU/yr. which will pass through the Port, and the much larger difference (16.1 million TEU) will pass through the alternative Ports. The difference in total vehicle miles traveled under these two scenarios is the basis for the mesoscale air quality analysis, which will quantify the emissions burden associated with each of these scenarios in 2030 and 2060.

Regional emission forecasts of NOx and VOCs were developed for 2030 and 2050 (for the 2060 scenario) with the Mobile5B model. Calendar year 2050 is the furthermost year into the future that the model can accept. Due to the type of traffic generated by the proposed action, only the heavy duty diesel truck emission category was considered. A summer temperature of 81.6° Fahrenheit and a speed of 40 mph was used in the determination of VOCs and NOx emission rates. All highways throughout the region were considered to be identical (NY Metropolitan area expressways). National defaults settings and no I/M or oxygenated fuel factors were considered in the model. The resulting emission factors for 2030 and 2050, obtained for heavy duty diesel traffic, were the same: VOC = 1.17 g/mile; NOx = 6.72 g/mile.

The US EPA PART5 model was used to obtain PM_{10} emission forecast for the regional analyses. The PART5 model is used to calculate particle emission factors for particles smaller that 10 microns based on variables such as exhaust particulate, brakewear, tirewear, and re-entrained road dust. The model was run for 2020, the furthermost year into the future that PART5 projects, based on 55,000 pound, 18-wheeled trucks. The US EPA PART5 model was used to obtain PM_{10} emission forecast for the regional analyses. A value of 0.2 g/mile used for road dust, which is twice the US EPA AP-42 recommendation. The resulting PM_{10} emission factor was 45.36 g/mile.

Based on the identified distribution destinations (Figures 1 and 2), estimates of vehicle mileage from a point identified as the center (centroid) of the Baltimore, Halifax and New York area ports to the inland distribution points were obtained using a geographic analysis of the major roadways in the 14 state region (Table 12). Route-specific VMT was determined by multiplying the trip length between port and destination by the total number of trucks needed to carry the cargo. The route specific VMT calculations used in the analysis are useful in the regional analysis because they allow a comparison of the impact of the overall VMT as discussed below.

The sum of the route-specific pollutant loadings results in a daily regional loading. Table 13 identifies the scenarios of distribution analyzed for 2030 and 2060. The Benchmark scenario represent a condition in which no expansion of the New York area ports has taken place, no productivity improvements have been made and, therefore, no additional TEUs pass through the port; all additional demand in 2030 and 2060 passes through either Baltimore or, through an even split of the additional demand, through both Baltimore and Halifax. The same scenarios are presented for both 2030 and 2060 in the Proposed Project/No Action condition in which the New York area ports process the projected through-put capacity in each year after expansion has occurred.

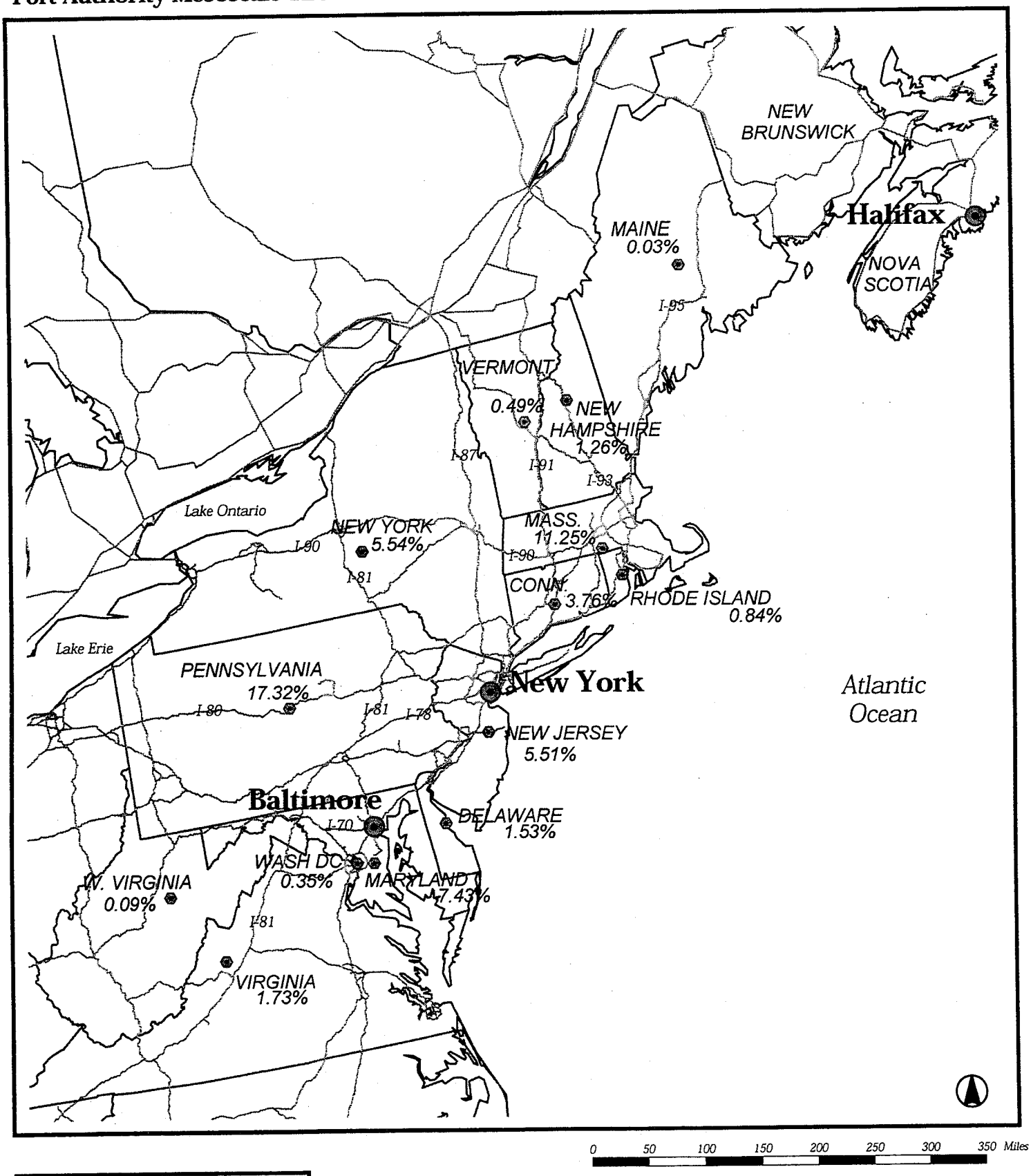
When the VOC, NOx and PM_{10} emission factors obtained from Mobile5B and PART5 are multiplied by the VMT, the pollutant loadings in tons/day are obtained for each route. Table 14 shows the comparison of the regional loadings of the scenarios discussed above in the two analysis years.

Results

The results of the regional analysis indicate that the lowest emission burden results from the Proposed Project/No Action alternatives (which are equivalent). For example, in 2060, the emissions of VOCs under the Benchmark scenario are 13.3 tons per year if Baltimore is the alternative port. Under Proposed Project/No Action scenario, with demand deficits serviced at Baltimore, the VOC emissions drop to 11.3 tons per year, a decrease of 15%. Comparable reductions in the other pollutants would also be realized. Further, the use of Halifax as an alternative port would significantly increase the emissions burden as compared to either Baltimore or New York. Finally, the data also indicates that the emissions burden could be reduced further (as compared to the Proposed Project/No Action alternative) if the New York terminals were expanded to fully meet the cargo demand (throughput equal to 19.1 million TEU/yr.).

In summary, this analysis indicates that routing cargo through the Port of New York results in lower air emissions than routing cargo through either Baltimore or Halifax. This is based on fewer vehicle miles traveled for each TEU of cargo routed through New York as opposed to the alternative ports. While the emissions burden is lower for the proposed project or no action alternative than the benchmark scenario (since both the proposed project and no action alternative will result in a throughput of 9.6 million TEU in New York), the emissions burden for either of the analysis years is higher than for existing conditions.

Port Authority Mesoscale TEU Distribution - State Centroids in the Northeast **Figure 1**

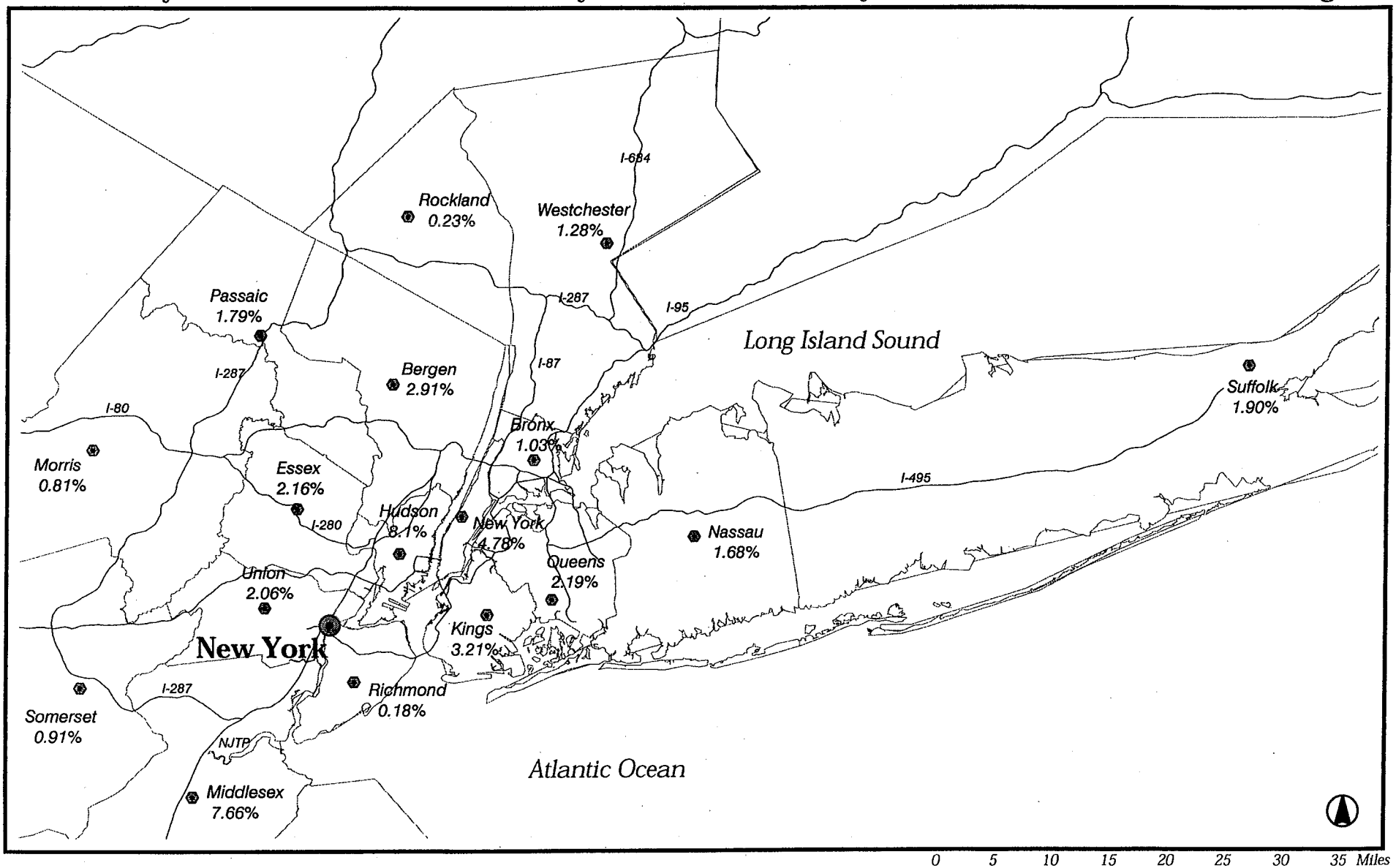


LEGEND

- **Shipping Ports**
- *STATE CENTROIDS*
- *Interstate/Provincal Highways*

Prepared by Allee King Rosen & Fleming
August 1999

Port Authority Mesoscale TEU Distribution - County Centroids in the Vicinity of New York **Figure 2**



LEGEND

- **Shipping Port**
- *County Centroids*
- *Interstate Highways*

Prepared by Allee King Rosen & Fleming
August 1999

Table12

Geographic Analysis Results - Routes and Distances Between Ports and Distribution Destinations

Destination	Port of Baltimore		Port of New York		Port of Halifax	
	Distance from Port (miles)	Route	Distance from Port (miles)	Route	Distance from Port (miles)	Route
Bergen, NJ	229	I95,NJTP,I80	30	I278,I95,I80	689	C2,C102,I95,I87
Essex, NJ	191	I95,NJTP,I280	20	I278,I95,I80	695	C2,C102,I95,I280
Hudson, NJ	187	I95,NJTP,I78	10	LOCAL ROADS	697	C2,C102,I95
Middlesex, NJ	156	I95,NJTP	23	I278,NJTP	627	C2,C102,I95
Morris, NJ	215	I95,NJTP,I287,I80	42	I278,I95,I280,I80	717	C2,C102,I95,I87,I287
Passaic, NJ	219	I95,NJTP,I287	43	I278,I95,I280,I80,I287	692	C2,C102,I95,I87,I287
Somerset, NJ	179	I95,NJTP,I287	28	I278,I95,I287	732	C2,C102,I95,I87,I287
Union, NJ	181	I95,NJTP,I78	10	I278,LOCAL ROADS	702	C2,C102,I95
Rockland, NY	236	I95,NJTP,I287	65	I278,I87	672	C2,C102,I95,I287,I87
Richmond, NY	181	I95,NJTP,I278	5	LOCAL ROADS	709	C2,C102,I95,I278
Bronx, NY	204	I95,NJTP,I95	30	I278,I95	677	C2,C102,I95
Kings, NY	192	I95,NJTP,I278	15	I278,LOCAL ROADS	700	C2,C102,I95,I678
New York, NY	193	I95,NJTP,I78	18	I278,I478	687	C2,C102,I95,I278
Queens, NY	198	I95,NJTP,I278	20	I278,LOCAL ROADS	690	C2,C102,I95,I678
Nassau, NY	211	I95,NJTP,I278,I495	40	I278,I495	682	C2,C102,I95,I295,I49
Suffolk, NY	263	I95,NJTP,I278,I495	57	I278,I495	702	C2,C102,I95,I295,I49
Westchester, NY	232	I95,I684	58	I278,I95,I684	657	C2,C102,I95,I287,I68
Massachusetts	343	I95,I395	196	I95,I395	684	C2,C102,I95,I90
Rhode Island	328	I95	172	I95	721	C2,C102,I95
New Hampshire	450	I95,I91,I89	320	I95,I91,I93	745	C2,C102,I95,I495,I93
Maine	490	I95	344	I95	609	C2,C102,I95
Vermont	436	I95,I91	270	I95,I91,I89	756	C2,C102,I95,I91,I89
Connecticut	269	I95,I91	100	I95,I91	768	C2,C102,I95,I91
New Jersey	141	I95,I195	55	NJTP,I195	935	C2,C102,I95
New York	287	I83,I81	215	I95,I280,I80,I81	980	C2,C102,I95,I90
Pennsylvania	227	I83,I81,I80	202	I95,I280,I80	1040	C2,C102,I95,I90,I84,I
Deleware	102	I95	150	NJTP,I295	1000	C2,C102,I95,
District of Columbia	35	I95	209	NJTP,I95	1040	C2,C102,I95
Maryland	38	I595	205	NJTP,I95	1060	C2,C102,I95
Virginia	149	I95,I66	380	NJTP,I95,I66,I81	1205	C2,C102,I95,I70,I66
W Virginia	94	I70	340	NJTP,I95,I70	1300	C2,C102,I95,I70,I68

NJTP - New Jersey Turnpike

Table 13 Scenarios for Regional Analysis (TEUs)				
Ports	**Benchmark Scenario**		**Proposed Project/No Action Alternatives**	
	Excess via Baltimore	**Excess via Baltimore/ Halifax**	**Excess via Baltimore**	**Excess via Baltimore/ Halifax**
2030				
New York Ports	3 million	3 million	8.7 million	8.7 million
Baltimore	9 million	4.5 million	3.3 million	1.65 million
Halifax	0	4.5 million	0	1.65 million
2060				
New York Ports	3 million	3 million	9.6 million	9.6 million
Baltimore	16.1 million	8.05 million	9.5 million	4.75 million
Halifax	0	8.05 million	0	4.75 million

Table 14 Regional Pollutant Loadings (tons/day)				
Pollutants	**Benchmark Scenario**		**Proposed Project/No Action Alternatives**	
	Excess via Baltimore	**Excess via Baltimore/ Halifax**	**Excess via Baltimore**	**Excess via Baltimore/ Halifax**
2030				
VOC	8.0	17.7	6.1	9.7
NOx	46.0	101.8	35.1	55.5
PM_{10}	310.6	686.9	236.7	374.7
2060				
VOC	13.3	30.7	11.3	22.0
NOx	76.7	176.4	64.7	126.6
PM_{10}	517.4	1190.6	436.7	854.8

Section 5 – Supplemental Information

Following this page is a compilation of supplemental information, input assumptions and model runs generated in conducted the analyses discussed above.

CO MICROSCALE ANALYSIS

CO MICROSCALE ANALYSIS

To compare estimated carbon monoxide concentrations with the national and state ambient air quality standards for carbon monoxide (which are based on 1- and 8-hour averages of carbon monoxide concentrations), estimates of maximum concentrations for these same periods must be prepared.
The prediction of motor vehicle-generated carbon monoxide concentrations in an urban environment influenced by meteorological phenomena, traffic conditions, and physical configurations is a challenging problem. Air pollutant dispersion models simulate mathematically how traffic, meteorology, and geometry combine to affect pollutant concentrations. The mathematical expressions and formulations that make up the various models attempt to describe an extremely complex physical phenomenon as closely as possible. However, because all models contain simplifications and approximations of actual conditions and interactions, and because a worst-case condition is of most interest, most of these dispersion models are conservative and tend to overpredict pollutant concentrations, particularly under adverse meteorological conditions.
The CO analysis for the proposed action has employed a modeling approach approved by EPA that has been widely used for evaluating air quality impacts of projects throughout the country, and has coupled this approach with a series of worst-case assumptions relating to meteorology, traffic, background concentration levels, etc. This combination results in a conservative estimate of expected CO concentrations and resulting air quality impacts caused by the proposed action.

Dispersion Models For Microscale Analyses

At the intersections selected for study in the vicinity of the Howland Hook and South Brooklyn ports, a first-level conservative analysis was performed using EPA's CAL3QHC model, version 2[1]. The CAL3QHC model is based on the CALINE-3 line source dispersion model with an additional algorithm for estimating vehicle queue lengths at signalized intersections. The CALINE-3 model is a Gaussian model, which assumes that the dispersion of pollutants downwind of a pollution source follows a Gaussian (or normal) distribution, and is used for predicting CO concentrations along roadway segments. The pollution source is the emissions from motor vehicles operating under free-flow conditions. The refinement that CAL3QHC provides is the inclusion of the contribution of emissions from idling vehicles in the overall concentration. The queuing algorithm requires additional input for site-specific traffic parameters, such as signal timing, and performs delay calculations involving the number of idling vehicles. The CAL3QHC model was recently modified to include saturation flow rate, vehicle arrival type, and signal actuation characteristics as input parameters.

The CO microscale analysis was performed for the analysis year 2060, the estimated project completion date, and an interim year 2030, when significant port improvements will have occurred. For both years, the analysis was carried out for two conditions: without (the No Build) and with the proposed action (Build).

Worst-case Meteorological Conditions

In general, the transport and concentration of pollutants from vehicular sources are influenced by three principal meteorological factors: wind direction, wind speed, and atmospheric stability.
Wind direction influences the accumulation of pollutants at a particular receptor location. Wind direction was chosen to maximize pollutant concentrations at each of the prediction sites. In applying the CAL3QHC model, the wind angle was varied to determine the worst-case wind direction resulting in the maximum concentrations.

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1 *User's Guide to CAL3QHC, A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections,* Office of Air Quality, Planning Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina

Following the recommendations of EPA and the procedures followed in the recent SIP submissions, carbon monoxide computations were performed using a wind speed of 1 meter/second, and stability class D at the sites chosen for CO microscale analysis in New York. A persistence factor of 0.7 for the 8-hour period was selected. A surface roughness of 3.21 meters was chosen, and a 43° Fahrenheit ambient temperature was assumed for the emissions computations. At each receptor location, the wind angle that maximized the pollutant concentrations was used in the analysis, regardless of frequency of occurrence.

Vehicle Emissions Data

To predict ambient concentrations of pollutants generated by vehicular traffic, emissions from vehicle exhaust systems must be estimated accurately. Vehicular emissions were computed using the EPA-developed Mobile Source Emissions Model, MOBILE5B.

Oxygenated-fuel credits were taken in the microscale modeling analyses. Emission estimates for oxygenated fuels were based on a gasoline blend with a 2.7 percent oxygen content. Emission estimates were based on implementation of the New York State auto and light-duty gasoline-powered truck inspection and maintenance (I&M) program begun in January 1982 and the taxi I&M program begun in October 1977. The I&M program requires annual inspections of automobiles and light trucks to determine if carbon monoxide and hydrocarbon emissions from the vehicles' exhaust systems are below emission standards. Vehicles failing the emissions test must undergo maintenance and pass a re-test to be registered in New York State.

Heavy-duty vehicle emission estimates reflect local engine displacement and vehicle loading characteristics. Light-duty truck emissions were based on an assumed 73 percent-27 percent split between trucks weighing less than 6,000 pounds and trucks weighing 6,000 to 8,500 pounds. These data were obtained from the New York City Department of Environmental Protection (DEP) and are based on vehicle registration data.

Recently, New York State has decided to revise its future I&M program. Originally, the future I&M program was envisioned to include centralized facilities that would test vehicles under an "enhanced" program, at a dynamic load instead of at a simple idle. However, New York State has recently decided that, while the future I&M program would still involve an enhanced I&M program, motorists would be allowed to take their vehicles to nearby service stations that would be allowed both to test and repair autos that failed the new I&M test. The new I&M program is proposed to start in July 1998. Emissions for the analyses were developed using the new I&M program.

For automobiles and light-duty gasoline-powered trucks, emission estimates account for three possible vehicle operating conditions: cold-vehicle operation, hot-start operation, and hot-stabilized operation. It is important to distinguish between these three operating categories, because vehicles emit carbon monoxide at different rates depending on whether they are cold or warmed up.

The amount of time a vehicle is parked affects its operating condition: vehicles that have been parked for less than one hour are still hot when started again, and therefore are considered to be in "hot-start" operation when leaving the parking facility. Vehicles parked for more than an hour have cooled down, and operate in the "cold-start" mode. Auto operating conditions used in the analyses were obtained from data supplied by DEP, Bureau of Science and Technology *Report No. 34 (Revised)*. **Table 2** summarizes the thermal state conditions used in the analysis.

Traffic Data

Traffic data for the air quality analysis were derived from traffic counts and other information developed as part of the proposed action's traffic analysis (see "Traffic" chapter). For the air quality analysis, the weekday PM (5-6 PM) period was subjected to a full-scale microscale analysis. This time period was selected for the

mobile source analysis because the maximum project-generated traffic is produced during this period and therefore, the greatest potential for significant traffic and/or air quality impacts exists.

Table 2
Vehicle Operating Conditions

	Staten Island Expressway	Staten Island Local	Brooklyn Expressway	Brooklyn Arterial
Auto				
Percentage Cold (Non Catalytic)	8.2	17.2	6.9	24.2
Percentage Cold (Catalytic)	12.6	22.2	9.1	11.2
Percentage Hot (Catalytic)	2.9	7.4	2.3	30.2
Light-Duty Gasoline Trucks				
Percentage Cold (Non Catalytic)	4.1	4.1	4.1	4.1
Percentage Cold (Catalytic)	5.4	5.4	5.4	5.4
Percentage Hot (Catalytic)	50.5	50.5	50.5	50.5
Source: DEP Bureau of Science and Technology, *Report No. 34 (Revised)*				

Background Concentrations

Background concentrations are those pollutant concentrations not directly accounted for through the modeling analysis (which directly accounts for vehicular-generated emissions on the streets within 1,000 to 1,600 feet and line-of-sight of the receptor location). Background concentrations must be added to modeling results to obtain total pollutant concentrations at a prediction site.

The 1- and 8-hour average CO background concentrations used in this analysis are 5.4 ppm and 2.3 ppm CO for the 1-hour and 8-hour time periods, respectively. These values, obtained from DEP, are year 2000 projections based on CO concentrations measured at DEC monitoring stations and adjusted to reflect the changes in vehicular emissions expected since the concentrations were measured.

Mobile Source Receptor Locations

A receptor site is a computer simulation of sidewalk or roadside locations near the intersection with continuous public access. Multiple receptor sites were modeled at these intersections (i.e., receptors were placed along the approach and departure links at spaced intervals). The receptors analyzed were at either the center of adjacent sidewalks on the four corners of the critical intersection or the center of the sidewalk adjacent to the critical free-flow links evaluated.

These receptor sites were selected because they are key locations in the study area where the combination of the highest levels of project-generated traffic and overall constrained traffic conditions are expected and therefore represent the locations where the greatest air quality impacts and maximum changes in the CO concentrations would be expected.

PART5 Input Files

```
`Port Authority 2020 10 wheel Trucks 55,000 lbs   8/12/99   JD
3      :VMFLAG (alternate VMT mixes)
1      :MYMRFG (default mileage accumulation rates & registration)
1      :IMFLAG (no inspection and maintenance program)
1      :RFGFLG (2 to apply reformulated gasoline effects, 1 not to)
3      :OUTFMT (indicates type of output format)
2      :IDLFLG (2 to print, 1 not to print idle emission factors)
1      :SO2FLG (2 to print Gaseous SO2 emissions, 1 not to print them)
1      :PRTFLG (determines which pollutants to print out)
1      :BUSFLG (determines which alternative bus cycles to print out)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000           :VMT MIX
0.0000 0.0000 0.0000 0.0000 1.0000 0.0000           :VMT MIX
1 2020 1 40.0     : region, year, speed cycle, speed
00.0 00.20  2     : unpaved silt%, ind. silt g/m^2, WHEELFLG
120               : number of precip. days
Trucks                           :scene name
10.   -- Particle size cutoff
55000
10
```

PART5 Revised 02-24-95
`Port Authority 2020 10 wheel Trucks 55,000 lbs 8/12/99 - JD

User supplied veh miles traveled mixture .
Trucks
Particle Size Cutoff 10.00 Microns Altitude: 500. Ft. Driving: Transient RFG:No
Cal. Year: 2020 I/M Program: No Region: Low

Veh. Type:	LDGV	LDGT1	LDGT2	HDGV	MC	LDDV	LDDT	2BHDDV	LHDDV	MHDDV	HHDDV	BUSES	All Veh.
Veh. Speeds:	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
VMT Mix:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	
Composite Emission Factors (g/mi)													
Lead:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SOF:	-	-	-	-	-	0.000	0.000	0.000	0.000	0.000	0.055	0.000	-
RCP:	-	-	-	-	-	0.000	0.000	0.000	0.000	0.000	0.175	0.000	-
Direct SO4:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.031	0.000	0.031
Exhaust PM:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.262	0.000	0.262
Indir. SO4:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.128	0.000	0.128
Sulfate PM:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.159	0.000	0.159
Brake:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.013
Tire:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.036	0.000	0.036
Total PM:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.438	0.000	0.438

Fugitive Dust: Unpaved Roads Fleet Average 2303.76 g/mi (as calculated in AP42 Vol 1 9/88)*
Paved Roads Fleet Average 45.36 g/mi (as calculated in draft AP42 Vol 1 3/93)*
Unpaved Roads Fleet Average 2303.56 g/mi (as calculated in AP42 Vol 1 9/88, minus tailpipe and tire-wear emissions)**
Paved Roads Fleet Average 45.15 g/mi (as calculated in draft AP42 Vol 1 3/93, minus tailpipe and tire-wear emissions)**

* Includes fleet average tailpipe, tire-wear and brake-wear emissions.
** Includes fleet average brake-wear emissions.

Paved Road Silt: 0.20 (g/m^2)
Unpaved Silt: 4.3%
Precipitation Days: 120 >0.01 in. (per year)

Fleet average vehicle weight: 55000
Fleet average number of wheels: 10

Veh. Type:	LDGV	LDGT1	LDGT2	HDGV	MC	LDDV	LDDT	2BHDDV	LHDDV	MHDDV	HHDDV	BUSES	All Veh.
Total Idle (g/hr) :	*	*	*	*	*	*	*	0.000	0.000	0.000	1.004	0.000	*

* Missing Data

PART5 Revised 02-24-95
`Port Authority 2020 18 wheel Trucks 55,000 lbs 8/12/99 JD

User supplied veh miles traveled mixture .
Trucks
Particle Size Cutoff 10.00 Microns Altitude: 500. Ft. Driving: Transient RFG:No
Cal. Year: 2020 I/M Program: No Region: Low

Veh. Type:	LDGV	LDGT1	LDGT2	HDGV	MC	LDDV	LDDT	2BHDDV	LHDDV	MHDDV	HHDDV	BUSES	All Veh.
Veh. Speeds:	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
VMT Mix:	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000	0.0000	
Composite Emission Factors (g/mi)													
Lead:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
SOF:	-	-	-	-	-	0.000	0.000	0.000	0.000	0.000	0.055	0.000	-
RCP:	-	-	-	-	-	0.000	0.000	0.000	0.000	0.000	0.175	0.000	-
Direct SO4:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.031	0.000	0.031
Exhaust PM:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.262	0.000	0.262
Indir. SO4:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.128	0.000	0.128
Sulfate PM:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.159	0.000	0.159
Brake:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.013
Tire:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.036	0.000	0.036
Total PM:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.438	0.000	0.438

Fugitive Dust: Unpaved Roads Fleet Average 3090.82 g/mi (as calculated in AP42 Vol 1 9/88)*
Paved Roads Fleet Average 45.36 g/mi (as calculated in draft AP42 Vol 1 3/93)*
Unpaved Roads Fleet Average 3090.61 g/mi (as calculated in AP42 Vol 1 9/88, minus tailpipe and tire-wear emissions)**
Paved Roads Fleet Average 45.15 g/mi (as calculated in draft AP42 Vol 1 3/93, minus tailpipe and tire-wear emissions)**

* Includes fleet average tailpipe, tire-wear and brake-wear emissions.
** Includes fleet average brake-wear emissions.

Paved Road Silt: 0.20 (g/m^2)
Unpaved Silt: 4.3%
Precipitation Days: 120 >0.01 in. (per year)
Fleet average vehicle weight: 55000
Fleet average number of wheels: 18

Veh. Type:	LDGV	LDGT1	LDGT2	HDGV	MC	LDDV	LDDT	2BHDDV	LHDDV	MHDDV	HHDDV	BUSES	All Veh.
Total Idle (g/hr) :	*	*	*	*	*	*	*	0.000	0.000	0.000	1.004	0.000	*

* Missing Data

CAL3QHC Input Files

```
'CASE:1 NOBUILD: Goethals/Western'  60 321    0    0 28    0.3048 0 1
'1:                    '       -87        85         6
'2:                    '       -46        56         6
'3:                    '       -25        42         6
'4:                    '        -1        35         6
'5:                    '        22        45         6
'6:                    '        38        63         6
'7:                    '        72       101         6
'8:                    '       106        80         6
'9:                    '        73        42         6
'10:                   '        56        23         6
'11:                   '        40         5         6
'12:                   '        60       -10         6
'13:                   '        81       -24         6
'14:                   '       121       -54         6
'15:                   '        19       -89         6
'16:                   '        51       -58         6
'17:                   '        31       -44         6
'18:                   '         8       -32         6
'19:                   '       -10       -48         6
'20:                   '       -25       -69         6
'21:                   '       -43      -116         6
'22:                   '       -89       -96         6
'23:                   '       -65       -52         6
'24:                   '       -55       -29         6
'25:                   '       -48        -5         6
'26:                   '       -69         9         6
'27:                   '       -90        23         6
'28:                   '      -131        51         6
'CAL3HQ v2.0 (o-s)  <cqs3nb.dat>' 30  1   1  'C'
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'Link  1A'            'AG'    678    755     13     -7      77  9.9  0.0 26.0
  1
'Link  1B'            'AG'    678    755     13     -7      77   0.0   0.0  14.0
  1
'Link  2A'            'AG'      3     -2    -64   -104       0  0.0  0.0 35.0
  1
'Link  2B'            'AG'      3     -2    -64   -104       0  0.0   0.0  23.0
  1
'Link  3A'            'AG'    828   -830      4   -261     791  9.7  0.0 52.0
  1
'Link  3B'            'AG'    828   -830      4   -261     791   0.0   0.0  40.0
  1
'Link  4A'            'AG'      4   -261    -75   -104     791  9.7  0.0 52.0
  1
'Link  4B'            'AG'      4   -261    -75   -104     791   0.0   0.0  40.0
  1
'Link  5A'            'AG'    -75   -104    -10      4     791  9.7  0.0 38.0
  1
'Link  5B'            'AG'    -75   -104    -10      4     791   0.0   0.0  26.0
  1
'Link  6A'            'AG'     -1      0    671    763     409  9.8  0.0 26.0
  1
'Link  6B'            'AG'     -1      0    671    763     409   0.0   0.0  14.0
  1
'Link  7A'            'AG'     -9     -7    -63     33     127 24.5  0.0 41.0
  1
'Link  7B'            'AG'     -9     -7    -63     33     127   0.0   0.0  29.0
  1
'Link  8A'            'AG'    -63     33   -838    595     127  9.8  0.0 41.0
  1
'Link  8B'            'AG'    -63     33   -838    595     127   0.0   0.0  29.0
  1
'Link  9A'            'AG'   -816    628   -220    161     112  9.7  0.0 27.0
  1
'Link  9B'            'AG'   -816    628   -220    161     112   0.0   0.0  15.0
  1
'Link 10A'            'AG'   -220    161      1      7     112 24.4  0.0 52.0
  1
'Link 10B'            'AG'   -220    161      1      7     112   0.0   0.0  40.0
  1
'Link 11A'            'AG'      0      3     55    -36     444  9.7  0.0 52.0
  1
'Link 11B'            'AG'      0      3     55    -36     444   0.0   0.0  40.0
  1
'Link 12A'            'AG'     55    -36    841   -590     444  9.7  0.0 52.0
  1
'Link 12B'            'AG'     55    -36    841   -590     444   0.0   0.0  40.0
  1
'Link 13A'            'BR'   -866   -655   -888    499    1944  4.5 30.0 57.0
  1
'Link 13B'            'BR'   -866   -655   -888    499    1944   0.0  30.0  45.0
  1
'Link 14A'            'BR'    156    534    156   -196    2438  4.5 30.0 57.0
  1
'Link 14B'            'BR'    156    534    156   -196    2438   0.0  30.0  45.0
  1
'Link 15A'            'BR'    -63   -196    814   -625    2438  4.5 30.0 57.0
  1
'Link 15B'            'BR'    -63   -196    814   -625    2438   0.0  30.0  45.0
  1   0 4  1000    0 'Y'  2  0 180
```

```
'CASE:1 BUILD: Goethals/Western'  60 321    0    0 28    0.3048 0 1
'1:                     '       -87        85         6
'2:                     '       -46        56         6
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'4:                     '        -1        35         6
'5:                     '        22        45         6
'6:                     '        38        63         6
'7:                     '        72       101         6
'8:                     '       106        80         6
'9:                     '        73        42         6
'10:                    '        56        23         6
'11:                    '        40         5         6
'12:                    '        60       -10         6
'13:                    '        81       -24         6
'14:                    '       121       -54         6
'15:                    '        19       -89         6
'16:                    '        51       -58         6
'17:                    '        31       -44         6
'18:                    '         8       -32         6
'19:                    '       -10       -48         6
'20:                    '       -25       -69         6
'21:                    '       -43      -116         6
'22:                    '       -89       -96         6
'23:                    '       -65       -52         6
'24:                    '       -55       -29         6
'25:                    '       -48        -5         6
'26:                    '       -69         9         6
'27:                    '       -90        23         6
'28:                    '      -131        51         6
'CAL3HQ v2.0 (o-s)  <cqs3bd.dat>' 30  1   1  'C'
  1
'Link  1A'            'AG'    678    755     13     -7      77  9.9  0.0 26.0
  1
'Link  1B'            'AG'    678    755     13     -7      77   0.0   0.0  14.0
  1
'Link  2A'            'AG'      3     -2    -64   -104       0  0.0  0.0 35.0
  1
'Link  2B'            'AG'      3     -2    -64   -104       0  0.0   0.0  23.0
  1
'Link  3A'            'AG'    828   -830      4   -261     855 10.2  0.0 52.0
  1
'Link  3B'            'AG'    828   -830      4   -261     855   0.0   0.0  40.0
  1
'Link  4A'            'AG'      4   -261    -75   -104     855 10.2  0.0 52.0
  1
'Link  4B'            'AG'      4   -261    -75   -104     855   0.0   0.0  40.0
  1
'Link  5A'            'AG'    -75   -104    -10      4     855 10.2  0.0 38.0
  1
'Link  5B'            'AG'    -75   -104    -10      4     855   0.0   0.0  26.0
  1
'Link  6A'            'AG'     -1      0    671    763     409  9.8  0.0 26.0
  1
'Link  6B'            'AG'     -1      0    671    763     409   0.0   0.0  14.0
  1
'Link  7A'            'AG'     -9     -7    -63     33     191 30.0  0.0 41.0
  1
'Link  7B'            'AG'     -9     -7    -63     33     191   0.0   0.0  29.0
  1
'Link  8A'            'AG'    -63     33   -838    595     191 11.9  0.0 41.0
  1
'Link  8B'            'AG'    -63     33   -838    595     191   0.0   0.0  29.0
  1
'Link  9A'            'AG'   -816    628   -220    161     216  9.4  0.0 27.0
  1
'Link  9B'            'AG'   -816    628   -220    161     216   0.0   0.0  15.0
  1
'Link 10A'            'AG'   -220    161      1      7     216 24.0  0.0 52.0
  1
'Link 10B'            'AG'   -220    161      1      7     216   0.0   0.0  40.0
  1
'Link 11A'            'AG'      0      3     55    -36     548  9.6  0.0 52.0
  1
'Link 11B'            'AG'      0      3     55    -36     548   0.0   0.0  40.0
  1
'Link 12A'            'AG'     55    -36    841   -590     548  9.6  0.0 52.0
  1
'Link 12B'            'AG'     55    -36    841   -590     548   0.0   0.0  40.0
  1
'Link 13A'            'BR'   -866   -655   -888    499    2003  4.5 30.0 57.0
  1
'Link 13B'            'BR'   -866   -655   -888    499    2003   0.0  30.0  45.0
  1
'Link 14A'            'BR'    156    534    156   -196    2474  4.5 30.0 57.0
  1
'Link 14B'            'BR'    156    534    156   -196    2474   0.0  30.0  45.0
  1
'Link 15A'            'BR'    -63   -196    814   -625    2474  4.5 30.0 57.0
  1
'Link 15B'            'BR'    -63   -196    814   -625    2474   0.0  30.0  45.0
  1   0 4  1000    0 'Y'  2  0 180
```

```
'CASE:1 NOBUILD: Goethals/Western'  60 321    0    0 28    0.3048 0 1
'1:                    '       -87        85         6
'2:                    '       -46        56         6
'3:                    '       -25        42         6
'4:                    '        -1        35         6
'5:                    '        22        45         6
'6:                    '        38        63         6
'7:                    '        72       101         6
'8:                    '       106        80         6
'9:                    '        73        42         6
'10:                   '        56        23         6
'11:                   '        40         5         6
'12:                   '        60       -10         6
'13:                   '        81       -24         6
'14:                   '       121       -54         6
'15:                   '        19       -89         6
'16:                   '        51       -58         6
'17:                   '        31       -44         6
'18:                   '         8       -32         6
'19:                   '       -10       -48         6
'20:                   '       -25       -69         6
'21:                   '       -43      -116         6
'22:                   '       -89       -96         6
'23:                   '       -65       -52         6
'24:                   '       -55       -29         6
'25:                   '       -48        -5         6
'26:                   '       -69         9         6
'27:                   '       -90        23         6
'28:                   '      -131        51         6
'CAL3HQ v2.0 (o-s)  <cqs6nb.dat>' 30  1   1  'C'
  1
'Link  1A'            'AG'    678    755     13     -7      92  9.9  0.0 26.0
  1
'Link  1B'            'AG'    678    755     13     -7      92   0.0   0.0  14.0
  1
'Link  2A'            'AG'      3     -2    -64   -104       0  0.0  0.0 35.0
  1
'Link  2B'            'AG'      3     -2    -64   -104       0  0.0   0.0  23.0
  1
'Link  3A'            'AG'    828   -830      4   -261     929  9.7  0.0 52.0
  1
'Link  3B'            'AG'    828   -830      4   -261     929   0.0   0.0  40.0
  1
'Link  4A'            'AG'      4   -261    -75   -104     929  9.7  0.0 52.0
  1
'Link  4B'            'AG'      4   -261    -75   -104     929   0.0   0.0  40.0
  1
'Link  5A'            'AG'    -75   -104    -10      4     929  9.7  0.0 38.0
  1
'Link  5B'            'AG'    -75   -104    -10      4     929   0.0   0.0  26.0
  1
'Link  6A'            'AG'     -1      0    671    763     489  9.8  0.0 26.0
  1
'Link  6B'            'AG'     -1      0    671    763     489   0.0   0.0  14.0
  1
'Link  7A'            'AG'     -9     -7    -63     33     134 24.5  0.0 41.0
  1
'Link  7B'            'AG'     -9     -7    -63     33     134   0.0   0.0  29.0
  1
'Link  8A'            'AG'    -63     33   -838    595     134  9.8  0.0 41.0
  1
'Link  8B'            'AG'    -63     33   -838    595     134   0.0   0.0  29.0
  1
'Link  9A'            'AG'   -816    628   -220    161     132  9.7  0.0 27.0
  1
'Link  9B'            'AG'   -816    628   -220    161     132   0.0   0.0  15.0
  1
'Link 10A'            'AG'   -220    161      1      7     132 24.4  0.0 52.0
  1
'Link 10B'            'AG'   -220    161      1      7     132   0.0   0.0  40.0
  1
'Link 11A'            'AG'      0      3     55    -36     530  9.7  0.0 52.0
  1
'Link 11B'            'AG'      0      3     55    -36     530   0.0   0.0  40.0
  1
'Link 12A'            'AG'     55    -36    841   -590     530  9.7  0.0 52.0
  1
'Link 12B'            'AG'     55    -36    841   -590     530   0.0   0.0  40.0
  1
'Link 13A'            'BR'   -866   -655   -888    499    2317  4.5 30.0 57.0
  1
'Link 13B'            'BR'   -866   -655   -888    499    2317   0.0  30.0  45.0
  1
'Link 14A'            'BR'    156    534    156   -196    2918  4.5 30.0 57.0
  1
'Link 14B'            'BR'    156    534    156   -196    2918   0.0  30.0  45.0
  1
'Link 15A'            'BR'    -63   -196    814   -625    2918  4.5 30.0 57.0
  1
'Link 15B'            'BR'    -63   -196    814   -625    2918   0.0  30.0  45.0
  1   0 4  1000    0 'Y'  2  0 180
```

```
'CASE:1 BUILD: Goethals/Western'  60 321    0    0 28    0.3048 0 1
'1:                    '       -87        85         6
'2:                    '       -46        56         6
'3:                    '       -25        42         6
'4:                    '        -1        35         6
'5:                    '        22        45         6
'6:                    '        38        63         6
'7:                    '        72       101         6
'8:                    '       106        80         6
'9:                    '        73        42         6
'10:                   '        56        23         6
'11:                   '        40         5         6
'12:                   '        60       -10         6
'13:                   '        81       -24         6
'14:                   '       121       -54         6
'15:                   '        19       -89         6
'16:                   '        51       -58         6
'17:                   '        31       -44         6
'18:                   '         8       -32         6
'19:                   '       -10       -48         6
'20:                   '       -25       -69         6
'21:                   '       -43      -116         6
'22:                   '       -89       -96         6
'23:                   '       -65       -52         6
'24:                   '       -55       -29         6
'25:                   '       -48        -5         6
'26:                   '       -69         9         6
'27:                   '       -90        23         6
'28:                   '      -131        51         6
'CAL3HQ v2.0 (o-s)  <cqs6bd.dat>' 30  1   1  'C'
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'Link  1A'             'AG'    678    755     13     -7      92  9.9  0.0 26.0
  1
'Link  1B'             'AG'    678    755     13     -7      92   0.0   0.0  14.0
  1
'Link  2A'             'AG'      3     -2    -64   -104       0  0.0  0.0 35.0
  1
'Link  2B'             'AG'      3     -2    -64   -104       0  0.0   0.0  23.0
  1
'Link  3A'             'AG'    828   -830      4   -261    1014 10.2  0.0 52.0
  1
'Link  3B'             'AG'    828   -830      4   -261    1014   0.0   0.0  40.0
  1
'Link  4A'             'AG'      4   -261    -75   -104    1014 10.2  0.0 52.0
  1
'Link  4B'             'AG'      4   -261    -75   -104    1014   0.0   0.0  40.0
  1
'Link  5A'             'AG'    -75   -104    -10      4    1014 10.2  0.0 38.0
  1
'Link  5B'             'AG'    -75   -104    -10      4    1014   0.0   0.0  26.0
  1
'Link  6A'             'AG'     -1      0    671    763     489  9.8  0.0 26.0
  1
'Link  6B'             'AG'     -1      0    671    763     489   0.0   0.0  14.0
  1
'Link  7A'             'AG'     -9     -7    -63     33     219 30.3  0.0 41.0
  1
'Link  7B'             'AG'     -9     -7    -63     33     219   0.0   0.0  29.0
  1
'Link  8A'             'AG'    -63     33   -838    595     219 12.0  0.0 41.0
  1
'Link  8B'             'AG'    -63     33   -838    595     219   0.0   0.0  29.0
  1
'Link  9A'             'AG'   -816    628   -220    161     246  9.5  0.0 27.0
  1
'Link  9B'             'AG'   -816    628   -220    161     246   0.0   0.0  15.0
  1
'Link 10A'             'AG'   -220    161      1      7     246 24.1  0.0 52.0
  1
'Link 10B'             'AG'   -220    161      1      7     246   0.0   0.0  40.0
  1
'Link 11A'             'AG'      0      3     55    -36     644  9.6  0.0 52.0
  1
'Link 11B'             'AG'      0      3     55    -36     644   0.0   0.0  40.0
  1
'Link 12A'             'AG'     55    -36    841   -590     644  9.6  0.0 52.0
  1
'Link 12B'             'AG'     55    -36    841   -590     644   0.0   0.0  40.0
  1
'Link 13A'             'BR'   -866   -655   -888    499    2382  4.5 30.0 57.0
  1
'Link 13B'             'BR'   -866   -655   -888    499    2382   0.0  30.0  45.0
  1
'Link 14A'             'BR'    156    534    156   -196    2968  4.5 30.0 57.0
  1
'Link 14B'             'BR'    156    534    156   -196    2968   0.0  30.0  45.0
  1
'Link 15A'             'BR'    -63   -196    814   -625    2968  4.5 30.0 57.0
  1
'Link 15B'             'BR'    -63   -196    814   -625    2968   0.0  30.0  45.0
  1   0 4  1000    0 'Y'  2  0 180
```

```
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'8:                    '       122       115         6
'9:                    '        92        75         6
'10:                   '        77        55         6
'11:                   '        62        35         6
'12:                   '        82        20         6
'13:                   '       101         4         6
'14:                   '       140       -27         6
'15:                   '        78      -112         6
'16:                   '        38       -82         6
'17:                   '        18       -67         6
'18:                   '        -3       -52         6
'19:                   '       -18       -72         6
'20:                   '       -33       -92         6
'21:                   '       -64      -131         6
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'23:                   '       -71       -52         6
'24:                   '       -56       -32         6
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'26:                   '       -60         4         6
'27:                   '       -79        19         6
'28:                   '      -119        50         6
'CAL3HQ v2.0 (o-s)  <cqb3nb.dat>' 28  1   1  'C'
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  1
'Link  1B'            'AG'    604    806     10     -7     173   0.0   0.0  21.0
  1
'Link  2A'            'AG'     10     -7   -604   -801     111 11.0  0.0 33.0
  2
'Link  2B'            'AG'    -19    -45   -604   -801       0   21    2
       95        63       1.0  111  115.26   900   1   3
  1
'Link  3A'            'AG'   -608   -789     -8      8     378 11.1  0.0 33.0
  1
'Link  3B'            'AG'   -608   -789     -8      8     378   0.0   0.0  21.0
  1
'Link  4A'            'AG'     -8      8    596    812      61 11.1  0.0 33.0
  2
'Link  4B'            'AG'     16     41    596    812       0   21    2
       95        60       1.0   61  115.48   900   1   3
  1
'Link  5A'            'AG'    783   -614     -7    -19     296 11.0  0.0 48.0
  1
'Link  5B'            'AG'    783   -614     -7    -19     296   0.0   0.0  28.0
  1
'Link  6A'            'AG'     -5    -14   -811    612     331 11.0  0.0 37.0
  2
'Link  6B'            'AG'    -38     13   -811    612       0   25    2
       95        72       1.0  331  114.82   900   1   3
  1
'Link  7A'            'AG'   -794    626      9     10     109 10.8  0.0 37.0
  1
'Link  7B'            'AG'   -794    626      9     10     109   0.0   0.0  25.0
  1
'Link  8A'            'AG'      5      2    793   -595     120 10.8  0.0 52.0
  2
'Link  8B'            'AG'     40    -25    793   -595       0   32    2
       95        72       1.0  120  114.61   900   1   3
  1
'Link  9A'            'AG'     28     38    220   -114     333 11.1  0.0 36.0
  2
'Link  9B'            'AG'     63     11    220   -114       0   24    2
       95        61       1.0  333  115.75   900   1   3
  1
'Link 10A'            'BR'    220   -114    539   -363     333 11.1 15.0 36.0
  1
'Link 10B'            'BR'    220   -114    539   -363     333   0.0  15.0  24.0
  1
'Link 11A'            'BR'    539   -363    637   -368     333 11.1 30.0 36.0
  1
'Link 11B'            'BR'    539   -363    637   -368     333   0.0  30.0  24.0
  1
'Link 12A'            'BR'    637   -368    762   -270     333 11.1 30.0 36.0
  1
'Link 12B'            'BR'    637   -368    762   -270     333   0.0  30.0  24.0
  1
'Link 13A'            'BR'   1280    338     67  -1239    3694  4.4 30.0 57.0
  1
'Link 13B'            'BR'   1280    338     67  -1239    3694   0.0  30.0  45.0
  1
'Link 14A'            'BR'     11  -1233   1261    370    4570  4.4 30.0 57.0
  1
'Link 14B'            'BR'     11  -1233   1261    370    4570   0.0  30.0  45.0
  1   0 4  1000    0 'Y'  2  0 180
```

```
'CASE:1 BUILD: 39th St/2nd Ave'  60 321    0     0 28    0.3048 0 1
'1:                    '       -82       102          6
'2:                    '       -42        72          6
'3:                    '       -23        56          6
'4:                    '        -1        43          6
'5:                    '        14        63          6
'6:                    '        29        83          6
'7:                    '        59       123          6
'8:                    '       122       115          6
'9:                    '        92        75          6
'10:                   '        77        55          6
'11:                   '        62        35          6
'12:                   '        82        20          6
'13:                   '       101         4          6
'14:                   '       140       -27          6
'15:                   '        78      -112          6
'16:                   '        38       -82          6
'17:                   '        18       -67          6
'18:                   '        -3       -52          6
'19:                   '       -18       -72          6
'20:                   '       -33       -92          6
'21:                   '       -64      -131          6
'22:                   '      -102       -91          6
'23:                   '       -71       -52          6
'24:                   '       -56       -32          6
'25:                   '       -41       -12          6
'26:                   '       -60         4          6
'27:                   '       -79        19          6
'28:                   '      -119        50          6
'CAL3HQ v2.0 (o-s)  <cqb3bd.dat>' 28  1   1  'C'
  1
'Link  1A'             'AG'    604    806     10     -7     243 10.5  0.0 33.0
  1
'Link  1B'             'AG'    604    806     10     -7     243   0.0   0.0  21.0
  1
'Link  2A'             'AG'     10     -7   -604   -801     111 11.0  0.0 33.0
  2
'Link  2B'             'AG'    -19    -45   -604   -801       0   21    2
        95        63        1.0  111  115.26   900   1   3
  1
'Link  3A'             'AG'   -608   -789     -8      8     429 11.8  0.0 33.0
  1
'Link  3B'             'AG'   -608   -789     -8      8     429   0.0   0.0  21.0
  1
'Link  4A'             'AG'     -8      8    596    812      91 10.0  0.0 33.0
  2
'Link  4B'             'AG'     16     41    596    812       0   21    2
        95        60        1.0   91  105.68   900   1   3
  1
'Link  5A'             'AG'    783   -614     -7    -19     458 13.2  0.0 48.0
  1
'Link  5B'             'AG'    783   -614     -7    -19     458   0.0   0.0  28.0
  1
'Link  6A'             'AG'     -5    -14   -811    612     514 13.7  0.0 37.0
  2
'Link  6B'             'AG'    -38     13   -811    612       0   25    2
        95        72        1.0  514  144.59   900   1   3
  1
'Link  7A'             'AG'   -794    626      9     10     188 10.2  0.0 37.0
  1
'Link  7B'             'AG'   -794    626      9     10     188   0.0   0.0  25.0
  1
'Link  8A'             'AG'      5      2    793   -595     205  9.7  0.0 52.0
  2
'Link  8B'             'AG'     40    -25    793   -595       0   32    2
        95        72        1.0  205  103.87   900   1   3
  1
'Link  9A'             'AG'     28     38    220   -114     397 11.1  0.0 36.0
  2
'Link  9B'             'AG'     63     11    220   -114       0   24    2
        95        61        1.0  397  114.18   900   1   3
  1
'Link 10A'             'BR'    220   -114    539   -363     397 11.1 15.0 36.0
  1
'Link 10B'             'BR'    220   -114    539   -363     397   0.0  15.0  24.0
  1
'Link 11A'             'BR'    539   -363    637   -368     397 11.1 30.0 36.0
  1
'Link 11B'             'BR'    539   -363    637   -368     397   0.0  30.0  24.0
  1
'Link 12A'             'BR'    637   -368    762   -270     397 11.1 30.0 36.0
  1
'Link 12B'             'BR'    637   -368    762   -270     397   0.0  30.0  24.0
  1
'Link 13A'             'BR'   1280    338     67  -1239    3694  4.4 30.0 57.0
  1
'Link 13B'             'BR'   1280    338     67  -1239    3694   0.0  30.0  45.0
  1
'Link 14A'             'BR'     11  -1233   1261    370    4570  4.4 30.0 57.0
  1
'Link 14B'             'BR'     11  -1233   1261    370    4570   0.0  30.0  45.0
  1   0 4  1000    0 'Y'  2  0 180
```

```
'CASE:1 NOBUILD: 39th St/2nd Ave'  60 321    0    0 28    0.3048 0 1
'1:                    '       -82       102         6
'2:                    '       -42        72         6
'3:                    '       -23        56         6
'4:                    '        -1        43         6
'5:                    '        14        63         6
'6:                    '        29        83         6
'7:                    '        59       123         6
'8:                    '       122       115         6
'9:                    '        92        75         6
'10:                   '        77        55         6
'11:                   '        62        35         6
'12:                   '        82        20         6
'13:                   '       101         4         6
'14:                   '       140       -27         6
'15:                   '        78      -112         6
'16:                   '        38       -82         6
'17:                   '        18       -67         6
'18:                   '        -3       -52         6
'19:                   '       -18       -72         6
'20:                   '       -33       -92         6
'21:                   '       -64      -131         6
'22:                   '      -102       -91         6
'23:                   '       -71       -52         6
'24:                   '       -56       -32         6
'25:                   '       -41       -12         6
'26:                   '       -60         4         6
'27:                   '       -79        19         6
'28:                   '      -119        50         6
'CAL3HQ v2.0 (o-s)  <cqbknb.dat>' 28  1   1  'C'
  1
'Link  1A'            'AG'    604    806     10     -7     185 11.0  0.0 33.0
  1
'Link  1B'            'AG'    604    806     10     -7     185   0.0   0.0  21.0
  1
'Link  2A'            'AG'     10     -7   -604   -801     120 11.0  0.0 33.0
  2
'Link  2B'            'AG'    -19    -45   -604   -801       0   21    2
       95        63       1.0  120  115.26   900   1   3
  1
'Link  3A'            'AG'   -608   -789     -8      8     405 11.1  0.0 33.0
  1
'Link  3B'            'AG'   -608   -789     -8      8     405   0.0   0.0  21.0
  1
'Link  4A'            'AG'     -8      8    596    812      66 11.1  0.0 33.0
  2
'Link  4B'            'AG'     16     41    596    812       0   21    2
       95        60       1.0   66  115.48   900   1   3
  1
'Link  5A'            'AG'    783   -614     -7    -19     305 11.0  0.0 48.0
  1
'Link  5B'            'AG'    783   -614     -7    -19     305   0.0   0.0  28.0
  1
'Link  6A'            'AG'     -5    -14   -811    612     339 11.0  0.0 37.0
  2
'Link  6B'            'AG'    -38     13   -811    612       0   25    2
       95        72       1.0  339  114.82   900   1   3
  1
'Link  7A'            'AG'   -794    626      9     10     116 10.8  0.0 37.0
  1
'Link  7B'            'AG'   -794    626      9     10     116   0.0   0.0  25.0
  1
'Link  8A'            'AG'      5      2    793   -595     127 10.8  0.0 52.0
  2
'Link  8B'            'AG'     40    -25    793   -595       0   32    2
       95        72       1.0  127  114.61   900   1   3
  1
'Link  9A'            'AG'     28     38    220   -114     359 11.1  0.0 36.0
  2
'Link  9B'            'AG'     63     11    220   -114       0   24    2
       95        61       1.0  359  115.75   900   1   3
  1
'Link 10A'            'BR'    220   -114    539   -363     359 11.1 15.0 36.0
  1
'Link 10B'            'BR'    220   -114    539   -363     359   0.0  15.0  24.0
  1
'Link 11A'            'BR'    539   -363    637   -368     359 11.1 30.0 36.0
  1
'Link 11B'            'BR'    539   -363    637   -368     359   0.0  30.0  24.0
  1
'Link 12A'            'BR'    637   -368    762   -270     359 11.1 30.0 36.0
  1
'Link 12B'            'BR'    637   -368    762   -270     359   0.0  30.0  24.0
  1
'Link 13A'            'BR'   1280    338     67  -1239    4005  4.4 30.0 57.0
  1
'Link 13B'            'BR'   1280    338     67  -1239    4005   0.0  30.0  45.0
  1
'Link 14A'            'BR'     11  -1233   1261    370    4954  4.4 30.0 57.0
  1
'Link 14B'            'BR'     11  -1233   1261    370    4954   0.0  30.0  45.0
  1   0 4  1000   0 'Y'  2  0 180
```

```
'CASE:1 BUILD: 39th St/2nd Ave'  60 321    0    0 28    0.3048 0 1
'1:                    '       -82       102         6
'2:                    '       -42        72         6
'3:                    '       -23        56         6
'4:                    '        -1        43         6
'5:                    '        14        63         6
'6:                    '        29        83         6
'7:                    '        59       123         6
'8:                    '       122       115         6
'9:                    '        92        75         6
'10:                   '        77        55         6
'11:                   '        62        35         6
'12:                   '        82        20         6
'13:                   '       101         4         6
'14:                   '       140       -27         6
'15:                   '        78      -112         6
'16:                   '        38       -82         6
'17:                   '        18       -67         6
'18:                   '        -3       -52         6
'19:                   '       -18       -72         6
'20:                   '       -33       -92         6
'21:                   '       -64      -131         6
'22:                   '      -102       -91         6
'23:                   '       -71       -52         6
'24:                   '       -56       -32         6
'25:                   '       -41       -12         6
'26:                   '       -60         4         6
'27:                   '       -79        19         6
'28:                   '      -119        50         6
'CAL3HQ v2.0 (o-s)  <cqbkbd.dat>' 28  1   1  'C'
  1
'Link  1A'             'AG'    604    806     10     -7     255 10.6  0.0 33.0
  1
'Link  1B'             'AG'    604    806     10     -7     255   0.0   0.0  21.0
  1
'Link  2A'             'AG'     10     -7   -604   -801     120 11.0  0.0 33.0
  2
'Link  2B'             'AG'    -19    -45   -604   -801       0   21    2
        95        63        1.0  120  115.26   900   1   3
  1
'Link  3A'             'AG'   -608   -789     -8      8     456 11.8  0.0 33.0
  1
'Link  3B'             'AG'   -608   -789     -8      8     456   0.0   0.0  21.0
  1
'Link  4A'             'AG'     -8      8    596    812      96 10.1  0.0 33.0
  2
'Link  4B'             'AG'     16     41    596    812       0   21    2
        95        60        1.0   96  106.19   900   1   3
  1
'Link  5A'             'AG'    783   -614     -7    -19     467 13.1  0.0 48.0
  1
'Link  5B'             'AG'    783   -614     -7    -19     467   0.0   0.0  28.0
  1
'Link  6A'             'AG'     -5    -14   -811    612     522 13.7  0.0 37.0
  1
'Link  6B'             'AG'    -38     13   -811    612     522   112   0.0  25.0
  1
'Link  7A'             'AG'   -794    626      9     10     195 10.2  0.0 37.0
  1
'Link  7B'             'AG'   -794    626   -773    610     195   301   0.0  25.0
  1
'Link  8A'             'AG'      5      2    793   -595     212  9.7  0.0 52.0
  2
'Link  8B'             'AG'     40    -25    793   -595       0   32    2
        95        72        1.0  212  104.23   900   1   3
  1
'Link  9A'             'AG'     28     38    220   -114     423 11.1  0.0 36.0
  2
'Link  9B'             'AG'     63     11    220   -114       0   24    2
        95        61        1.0  423  114.27   900   1   3
  1
'Link 10A'             'BR'    220   -114    539   -363     423 11.1 15.0 36.0
  1
'Link 10B'             'BR'    220   -114    539   -363     423   0.0  15.0  24.0
  1
'Link 11A'             'BR'    539   -363    637   -368     423 11.1 30.0 36.0
  1
'Link 11B'             'BR'    539   -363    637   -368     423   0.0  30.0  24.0
  1
'Link 12A'             'BR'    637   -368    762   -270     423 11.1 30.0 36.0
  1
'Link 12B'             'BR'    637   -368    762   -270     423   0.0  30.0  24.0
  1
'Link 13A'             'BR'   1280    338     67  -1239    4005  4.4 30.0 57.0
  1
'Link 13B'             'BR'   1280    338     67  -1239    4005   0.0  30.0  45.0
  1
'Link 14A'             'BR'     11  -1233   1261    370    4954  4.4 30.0 57.0
  1
'Link 14B'             'BR'     11  -1233   1261    370    4954   0.0  30.0  45.0
  1   0 4  1000    0 'Y'  2  0 180
```

CAL3QHC Output Files

```
`Port Authority 2020 18 wheel Trucks 55,000 lbs   8/12/99   JD
3      :VMFLAG (alternate VMT mixes)
1      :MYMRFG (default mileage accumulation rates & registration)
1      :IMFLAG (no inspection and maintenance program)
1      :RFGFLG (2 to apply reformulated gasoline effects, 1 not to)
3      :OUTFMT (indicates type of output format)
2      :IDLFLG (2 to print, 1 not to print idle emission factors)
1      :SO2FLG (2 to print Gaseous SO2 emissions, 1 not to print them)
1      :PRTFLG (determines which pollutants to print out)
1      :BUSFLG (determines which alternative bus cycles to print out)
0.0000 0.0000 0.0000 0.0000 0.0000 0.0000          :VMT MIX
0.0000 0.0000 0.0000 0.0000 1.0000 0.0000          :VMT MIX
1 2020 1 40.0     : region, year, speed cycle, speed
00.0 00.20  2     : unpaved silt%, ind. silt g/m^2, WHEELFLG
120               : number of precip. days
Trucks                              :scene name
10.    -- Particle size cutoff
55000
18
```

PART5 Output Files

JOB: CASE:1 BUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3bd.dat>

DATE : 8/18/99
TIME : 15: 4:53

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. Link 1A	184.1	245.7	3.0	-2.1	307.	216.	AG	243.	10.5	.0	10.1		
2. Link 1B	184.1	245.7	3.0	-2.1	307.	216.	AG	243.	.0	.0	6.4		
3. Link 2A	3.0	-2.1	-184.1	-244.1	306.	218.	AG	111.	11.0	.0	10.1		
4. Link 2B	-5.8	-13.7	-9.3	-18.3	6.	218.	AG	410.	100.0	.0	6.4	.20	1.0
5. Link 3A	-185.3	-240.5	-2.4	2.4	304.	37.	AG	429.	11.8	.0	10.1		
6. Link 3B	-185.3	-240.5	-2.4	2.4	304.	37.	AG	429.	.0	.0	6.4		
7. Link 4A	-2.4	2.4	181.7	247.5	307.	37.	AG	91.	10.0	.0	10.1		
8. Link 4B	4.9	12.5	7.6	16.1	5.	37.	AG	358.	100.0	.0	6.4	.15	.8
9. Link 5A	238.7	-187.1	-2.1	-5.8	301.	307.	AG	458.	13.2	.0	14.6		
10. Link 5B	238.7	-187.1	-2.1	-5.8	301.	307.	AG	458.	.0	.0	8.5		
11. Link 6A	-1.5	-4.3	-247.2	186.5	311.	308.	AG	514.	13.7	.0	11.3		
12. Link 6B	-11.6	4.0	-219.2	164.9	263.	308.	AG	588.	100.0	.0	7.6	1.36	43.8
13. Link 7A	-242.0	190.8	2.7	3.0	308.	127.	AG	188.	10.2	.0	11.3		
14. Link 7B	-242.0	190.8	2.7	3.0	308.	127.	AG	188.	.0	.0	7.6		
15. Link 8A	1.5	.6	241.7	-181.4	301.	127.	AG	205.	9.7	.0	15.8		
16. Link 8B	12.2	-7.6	22.0	-15.0	12.	127.	AG	422.	100.0	.0	9.8	.54	2.0
17. Link 9A	8.5	11.6	67.1	-34.7	75.	128.	AG	397.	11.1	.0	11.0		
18. Link 9B	19.2	3.4	35.1	-9.3	20.	129.	AG	393.	100.0	.0	7.3	.68	3.4
19. Link 10A	67.1	-34.7	164.3	-110.6	123.	128.	BR	397.	11.1	4.6	11.0		
20. Link 10B	67.1	-34.7	164.3	-110.6	123.	128.	BR	397.	.0	4.6	7.3		
21. Link 11A	164.3	-110.6	194.2	-112.2	30.	93.	BR	397.	11.1	9.1	11.0		
22. Link 11B	164.3	-110.6	194.2	-112.2	30.	93.	BR	397.	.0	9.1	7.3		
23. Link 12A	194.2	-112.2	232.3	-82.3	48.	52.	BR	397.	11.1	9.1	11.0		
24. Link 12B	194.2	-112.2	232.3	-82.3	48.	52.	BR	397.	.0	9.1	7.3		
25. Link 13A	390.1	103.0	20.4	-377.6	606.	218.	BR	3694.	4.4	9.1	17.4		
26. Link 13B	390.1	103.0	20.4	-377.6	606.	218.	BR	3694.	.0	9.1	13.7		
27. Link 14A	3.4	-375.8	384.4	112.8	620.	38.	BR	4570.	4.4	9.1	17.4		
28. Link 14B	3.4	-375.8	384.4	112.8	620.	38.	BR	4570.	.0	9.1	13.7		

JOB: CASE:1 BUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3bd.dat>

DATE : 8/18/99
TIME : 15: 4:53

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
4. Link 2B	95	63	1.0	111	900	115.26	1	3
8. Link 4B	95	60	1.0	91	900	105.68	1	3
12. Link 6B	95	72	1.0	514	900	144.59	1	3
16. Link 8B	95	72	1.0	205	900	103.87	1	3
18. Link 9B	95	61	1.0	397	900	114.18	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. 1:	-25.0	31.1	1.8
2. 2:	-12.8	21.9	1.8
3. 3:	-7.0	17.1	1.8
4. 4:	-.3	13.1	1.8
5. 5:	4.3	19.2	1.8
6. 6:	8.8	25.3	1.8
7. 7:	18.0	37.5	1.8
8. 8:	37.2	35.1	1.8
9. 9:	28.0	22.9	1.8
10. 10:	23.5	16.8	1.8
11. 11:	18.9	10.7	1.8
12. 12:	25.0	6.1	1.8
13. 13:	30.8	1.2	1.8
14. 14:	42.7	-8.2	1.8
15. 15:	23.8	-34.1	1.8
16. 16:	11.6	-25.0	1.8
17. 17:	5.5	-20.4	1.8
18. 18:	-.9	-15.8	1.8
19. 19:	-5.5	-21.9	1.8
20. 20:	-10.1	-28.0	1.8
21. 21:	-19.5	-39.9	1.8
22. 22:	-31.1	-27.7	1.8
23. 23:	-21.6	-15.8	1.8
24. 24:	-17.1	-9.8	1.8
25. 25:	-12.5	-3.7	1.8
26. 26:	-18.3	1.2	1.8
27. 27:	-24.1	5.8	1.8
28. 28:	-36.3	15.2	1.8

JOB: CASE:1 BUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3bd.dat>

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	1.0	.7	.4	.5	1.1	.9
2.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.9	.8	.4	.5	1.1	.9
4.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.8	.8	.4	.5	1.2	1.0
6.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.8	.8	.5	.3	1.0	.9
8.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.8	1.1	.5	.4	1.0	.9
10.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.8	1.2	.7	.4	1.1	.9
12.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.7	1.2	.7	.5	1.0	.9
14.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.7	1.2	.6	.4	1.0	.8
16.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.7	1.3	.6	.4	.9	.8
18.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.7	1.4	.7	.4	.8	.8
20.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.7	1.4	.8	.4	.7	.8
22.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.2	.2	.1	.1	.0	.7	1.4	.9	.4	.7	.7
24.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.2	.2	.1	.1	.0	.5	1.4	1.0	.4	.6	.5
26.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.2	.2	.1	.0	.0	.5	1.4	1.0	.4	.6	.5
28.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.2	.2	.1	.0	.0	.5	1.4	1.0	.5	.7	.7
30.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.2	.1	.0	.0	.5	1.3	1.1	.4	.6	.7
32.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.5	1.3	1.2	.5	.6	.7
34.	*	.0	.0	.0	.3	.1	.1	.1	.1	.1	.1	.1	.1	.0	.0	.4	1.3	1.2	.6	.6	.6
36.	*	.0	.0	.0	.4	.2	.2	.2	.1	.1	.1	.1	.1	.0	.0	.4	1.3	1.3	.6	.5	.6
38.	*	.0	.0	.0	.4	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.4	1.3	1.2	.6	.5	.6
40.	*	.0	.0	.0	.4	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.4	1.2	1.2	.7	.7	.7
42.	*	.0	.0	.0	.5	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.4	1.2	1.2	.8	.7	.8
44.	*	.0	.0	.0	.5	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.4	1.2	1.3	.8	.6	.6
46.	*	.0	.0	.1	.5	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.3	1.0	1.4	.8	.5	.6
48.	*	.0	.0	.1	.5	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.3	1.0	1.4	.9	.6	.6
50.	*	.0	.0	.1	.5	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.3	1.0	1.4	.9	.6	.6
52.	*	.0	.0	.1	.6	.2	.2	.2	.0	.1	.1	.1	.0	.0	.0	.3	.9	1.4	.9	.6	.6
54.	*	.0	.0	.1	.6	.2	.2	.2	.0	.0	.0	.0	.0	.0	.0	.3	.9	1.4	.9	.7	.5
56.	*	.0	.0	.1	.6	.2	.2	.2	.0	.0	.0	.0	.0	.0	.0	.3	.8	1.4	1.0	.7	.6
58.	*	.0	.0	.1	.6	.2	.2	.2	.0	.0	.0	.0	.0	.0	.0	.3	.7	1.2	1.0	.7	.6
60.	*	.0	.0	.1	.7	.2	.2	.1	.0	.0	.0	.0	.0	.0	.0	.3	.7	1.2	1.0	.9	.6
62.	*	.0	.0	.1	.6	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.3	.7	1.2	1.1	.9	.5
64.	*	.0	.0	.1	.6	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.3	.6	1.2	1.1	.9	.5
66.	*	.0	.0	.2	.6	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.3	.5	1.2	1.1	.8	.5
68.	*	.0	.0	.2	.6	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.3	.5	1.1	1.1	.7	.5
70.	*	.0	.0	.2	.6	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.4	.5	1.0	1.1	.7	.5
72.	*	.0	.0	.2	.7	.1	.1	.1	.0	.0	.0	.0	.0	.0	.1	.5	.7	1.1	1.1	.7	.4
74.	*	.0	.0	.2	.7	.1	.1	.1	.0	.0	.0	.0	.0	.0	.1	.5	.7	1.1	1.2	.8	.5
76.	*	.0	.0	.1	.7	.1	.1	.1	.0	.0	.0	.0	.0	.1	.1	.6	.6	1.1	1.3	.8	.5
78.	*	.0	.0	.1	.7	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.6	.5	1.1	1.3	.9	.4
80.	*	.0	.0	.1	.8	.1	.1	.1	.0	.1	.1	.1	.1	.1	.2	.6	.6	.9	1.2	.8	.4
82.	*	.0	.0	.3	.8	.2	.2	.1	.1	.1	.1	.1	.1	.1	.2	.6	.6	1.0	1.2	.7	.5

JOB: CASE:1 BUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3bd.dat>

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
84.	*	.0	.1	.3	.9	.2	.2	.2	.1	.1	.1	.1	.1	.2	.2	.5	.6	1.0	1.3	.8	.5
86.	*	.1	.2	.3	1.0	.2	.2	.2	.1	.1	.1	.1	.2	.2	.2	.5	.6	1.0	1.3	.7	.4
88.	*	.1	.2	.3	1.0	.2	.2	.2	.1	.1	.2	.2	.2	.2	.2	.5	.6	.9	1.2	.7	.4
90.	*	.1	.2	.4	1.1	.3	.2	.2	.1	.2	.2	.2	.2	.2	.2	.6	.7	1.0	1.1	.6	.3
92.	*	.1	.2	.4	1.0	.4	.2	.2	.2	.2	.2	.2	.2	.2	.2	.6	.7	.9	1.2	.5	.3
94.	*	.1	.2	.5	1.0	.4	.3	.2	.2	.2	.2	.2	.2	.2	.2	.6	.6	.8	1.2	.5	.3
96.	*	.1	.3	.5	1.1	.4	.3	.3	.2	.2	.2	.2	.2	.2	.2	.6	.6	.8	1.1	.5	.3
98.	*	.1	.4	.6	1.1	.4	.3	.3	.2	.2	.2	.2	.2	.2	.2	.6	.6	.7	1.1	.5	.3
100.	*	.1	.4	.6	1.1	.4	.3	.3	.2	.2	.2	.2	.2	.2	.2	.6	.6	.7	1.1	.5	.3
102.	*	.2	.4	.7	1.0	.5	.3	.3	.2	.2	.2	.2	.2	.2	.2	.7	.6	.7	.8	.4	.3
104.	*	.2	.4	.7	1.1	.5	.3	.3	.2	.2	.2	.3	.2	.2	.2	.7	.6	.6	.8	.4	.3
106.	*	.2	.5	.7	1.1	.6	.3	.3	.2	.2	.2	.3	.3	.2	.2	.7	.6	.6	.8	.4	.3
108.	*	.3	.4	.6	1.1	.7	.3	.3	.2	.2	.2	.4	.3	.2	.2	.7	.6	.6	.8	.4	.3
110.	*	.3	.5	.7	1.0	.7	.3	.3	.2	.2	.2	.4	.4	.3	.2	.7	.6	.6	.7	.4	.3
112.	*	.3	.5	.9	1.2	.8	.3	.3	.2	.2	.2	.5	.4	.3	.3	.7	.6	.6	.7	.4	.3
114.	*	.3	.7	.9	1.3	.8	.3	.3	.2	.2	.2	.5	.4	.4	.3	.7	.6	.6	.7	.4	.3
116.	*	.3	.7	.9	1.2	.9	.4	.3	.2	.2	.2	.5	.5	.4	.3	.6	.6	.6	.7	.4	.3
118.	*	.6	.8	1.0	1.3	1.0	.4	.3	.2	.2	.2	.6	.5	.4	.3	.6	.6	.6	.7	.4	.3
120.	*	.7	.8	1.0	1.3	1.0	.4	.3	.2	.2	.2	.6	.5	.4	.3	.6	.6	.6	.6	.4	.3
122.	*	.7	.8	1.0	1.3	1.1	.4	.3	.2	.2	.2	.7	.6	.4	.4	.6	.6	.6	.6	.3	.3
124.	*	.8	.8	1.0	1.4	1.2	.4	.3	.2	.2	.2	.8	.6	.5	.4	.5	.5	.5	.5	.3	.3
126.	*	.8	.9	1.1	1.4	1.3	.6	.3	.2	.2	.2	1.0	.8	.6	.5	.5	.5	.5	.5	.3	.3
128.	*	.8	1.0	1.1	1.3	1.6	.7	.3	.2	.2	.3	1.1	.9	.8	.5	.5	.5	.5	.5	.3	.3
130.	*	.7	1.0	1.1	1.2	1.6	.7	.3	.2	.2	.4	1.1	1.0	.9	.5	.5	.5	.5	.5	.3	.3
132.	*	.7	1.1	1.1	1.1	1.6	.7	.3	.2	.2	.5	1.2	1.1	.9	.6	.4	.4	.4	.4	.3	.2
134.	*	.8	1.1	1.2	1.2	1.8	.8	.3	.2	.3	.5	1.3	1.1	1.0	.6	.4	.4	.4	.4	.3	.2
136.	*	.8	1.0	1.2	1.3	1.8	.8	.4	.2	.3	.5	1.3	1.2	1.0	.6	.4	.4	.4	.4	.3	.2
138.	*	.9	1.0	1.1	1.2	1.8	.8	.4	.2	.3	.6	1.4	1.3	1.0	.6	.4	.4	.4	.4	.2	.2
140.	*	.9	.8	1.0	1.2	2.0	.9	.5	.2	.3	.6	1.5	1.4	1.1	.7	.4	.4	.4	.3	.2	.2
142.	*	1.0	.6	1.0	1.2	2.0	.9	.5	.3	.3	.6	1.5	1.5	1.2	.7	.3	.3	.3	.3	.2	.2
144.	*	1.1	.7	.9	1.2	1.9	.9	.5	.3	.4	.7	1.6	1.6	1.2	.7	.3	.3	.3	.3	.2	.2
146.	*	1.0	.7	.9	1.1	1.8	.9	.5	.3	.5	.7	1.7	1.6	1.3	.6	.3	.3	.3	.3	.2	.2
148.	*	1.1	.8	.7	1.1	1.8	1.0	.5	.3	.5	.7	1.7	1.7	1.3	.6	.3	.3	.3	.3	.2	.2
150.	*	1.2	.7	.7	.9	1.8	.9	.6	.3	.5	.8	1.7	1.7	1.4	.6	.3	.3	.3	.3	.2	.2
152.	*	1.2	.7	.7	.9	1.7	.9	.7	.3	.5	.8	1.7	1.7	1.4	.6	.3	.3	.3	.3	.2	.2
154.	*	1.4	.8	.6	.9	1.7	1.1	.7	.3	.5	.9	1.7	1.8	1.4	.6	.3	.3	.3	.2	.2	.2
156.	*	1.3	.8	.6	.6	1.6	1.1	.7	.3	.6	.9	1.7	1.8	1.5	.6	.2	.2	.2	.2	.2	.2
158.	*	1.5	.9	.6	.6	1.6	1.1	.7	.3	.6	.9	1.7	1.7	1.5	.6	.2	.2	.2	.2	.2	.2
160.	*	1.5	1.0	.5	.5	1.5	1.1	.8	.3	.6	1.0	1.7	1.7	1.5	.6	.2	.2	.2	.2	.2	.2
162.	*	1.6	1.0	.7	.5	1.5	1.1	.8	.3	.7	1.1	1.6	1.9	1.5	.5	.2	.2	.2	.2	.2	.2
164.	*	1.6	.9	.7	.4	1.5	1.0	.8	.3	.7	1.1	1.6	1.9	1.5	.5	.2	.2	.2	.2	.1	.1
166.	*	1.6	1.0	.7	.3	1.4	.9	.8	.4	.7	1.1	1.7	1.9	1.6	.5	.2	.2	.2	.1	.1	.1
168.	*	1.6	.9	.8	.3	1.4	1.0	.7	.4	.7	1.1	1.6	1.9	1.6	.5	.2	.2	.1	.1	.1	.1
170.	*	1.5	1.0	.7	.3	1.3	1.0	.7	.4	.9	1.1	1.5	1.9	1.6	.5	.2	.1	.1	.1	.1	.1
172.	*	1.5	1.0	.7	.6	1.2	.9	.7	.4	.8	1.1	1.5	1.9	1.6	.5	.2	.1	.1	.1	.1	.1
174.	*	1.5	1.0	.6	.6	1.1	.9	.7	.4	.8	1.1	1.5	1.9	1.6	.5	.1	.1	.1	.1	.1	.1
176.	*	1.6	1.1	.5	.6	.8	.9	.7	.4	.8	1.1	1.5	1.9	1.6	.5	.1	.1	.1	.0	.0	.0
178.	*	1.5	1.2	.6	.5	.8	.8	.6	.5	.8	1.1	1.5	1.9	1.6	.4	.1	.1	.0	.0	.0	.0
180.	*	1.5	1.2	.6	.5	.8	.9	.6	.5	.8	1.0	1.3	2.0	1.6	.4	.1	.0	.0	.0	.0	.0
182.	*	1.5	1.3	.6	.5	.9	.8	.6	.5	.7	1.0	1.3	1.9	1.6	.4	.1	.0	.0	.0	.0	.0
184.	*	1.5	1.3	.7	.5	.8	.6	.6	.5	.8	1.0	1.2	1.9	1.6	.4	.0	.0	.0	.0	.0	.0
186.	*	1.5	1.4	.7	.5	.9	.5	.6	.5	.8	1.0	1.2	1.9	1.6	.3	.0	.0	.0	.0	.0	.0

JOB: CASE:1 BUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3bd.dat>

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28														
188.	*	1.5	1.4	.7	.5	.9	.5	.5	.5	.8	1.0	1.1	1.8	1.5	.2	.0	.0	.0	.0	.0	.0
190.	*	1.5	1.3	.9	.5	.8	.6	.5	.5	.8	1.0	1.0	1.8	1.5	.2	.0	.0	.0	.0	.0	.0
192.	*	1.5	1.4	.9	.4	.9	.7	.5	.5	.8	1.0	1.0	1.8	1.5	.2	.0	.0	.0	.0	.0	.0
194.	*	1.5	1.4	1.0	.4	.8	.7	.4	.5	.8	.9	.9	1.8	1.6	.2	.0	.0	.0	.0	.0	.0
196.	*	1.6	1.4	1.0	.4	.7	.5	.4	.5	.8	.9	.9	1.9	1.6	.2	.0	.0	.0	.0	.0	.0
198.	*	1.5	1.4	1.2	.5	.7	.5	.5	.5	.7	.9	.8	1.9	1.6	.2	.0	.0	.0	.0	.0	.0
200.	*	1.6	1.5	1.2	.5	.7	.5	.3	.4	.7	.8	.7	1.9	1.6	.2	.0	.0	.0	.0	.0	.0
202.	*	1.6	1.5	1.1	.6	.7	.7	.3	.4	.7	.8	.7	1.9	1.7	.2	.0	.0	.0	.0	.0	.0
204.	*	1.6	1.5	1.2	.6	.7	.7	.4	.4	.7	.8	.6	1.9	1.7	.2	.0	.0	.0	.0	.0	.0
206.	*	1.6	1.5	1.1	.6	.8	.7	.3	.4	.7	.7	.6	1.8	1.7	.2	.0	.0	.0	.0	.0	.0
208.	*	1.6	1.5	1.2	.6	.8	.6	.3	.4	.8	.7	.7	1.8	1.8	.2	.0	.0	.0	.0	.0	.0
210.	*	1.6	1.5	1.2	.6	.7	.6	.3	.5	.8	.8	.7	1.8	1.8	.2	.0	.0	.0	.1	.1	.1
212.	*	1.4	1.5	1.3	.7	.8	.7	.3	.5	.8	.9	.8	1.8	1.8	.2	.0	.0	.0	.2	.1	.1
214.	*	1.4	1.5	1.3	.7	.8	.6	.5	.4	.7	.8	.7	1.9	1.8	.2	.0	.0	.0	.3	.1	.1
216.	*	1.4	1.5	1.3	.7	.7	.6	.5	.4	.6	.7	.7	1.8	2.0	.3	.0	.0	.1	.3	.2	.2
218.	*	1.4	1.5	1.4	.7	.7	.7	.5	.4	.5	.7	.7	1.8	2.0	.3	.0	.0	.1	.3	.2	.2
220.	*	1.4	1.5	1.4	.7	.6	.7	.5	.5	.6	.7	.7	1.9	2.1	.3	.0	.1	.1	.4	.2	.2
222.	*	1.5	1.4	1.4	.8	.6	.6	.6	.5	.6	.7	.7	1.8	2.0	.3	.0	.1	.1	.4	.2	.2
224.	*	1.5	1.4	1.5	.8	.7	.6	.6	.5	.7	.5	.6	1.7	2.0	.2	.0	.1	.1	.4	.2	.2
226.	*	1.5	1.4	1.5	.8	.6	.7	.6	.4	.7	.5	.5	1.7	2.0	.2	.0	.1	.1	.5	.2	.2
228.	*	1.5	1.5	1.4	.9	.6	.7	.5	.4	.5	.5	.5	1.7	2.0	.4	.0	.1	.1	.6	.2	.2
230.	*	1.5	1.5	1.4	.9	.7	.7	.6	.4	.5	.5	.5	1.6	2.0	.5	.1	.1	.1	.6	.3	.3
232.	*	1.5	1.4	1.4	1.0	.7	.8	.5	.5	.5	.6	.4	1.5	2.1	.5	.1	.1	.1	.7	.3	.3
234.	*	1.5	1.4	1.4	1.0	.7	.7	.5	.5	.5	.7	.6	1.4	2.1	.5	.1	.1	.1	.7	.3	.3
236.	*	1.5	1.4	1.4	1.1	.7	.6	.5	.5	.6	.6	.6	1.4	2.1	.6	.1	.1	.1	.8	.3	.3
238.	*	1.5	1.4	1.5	1.1	.7	.7	.6	.5	.6	.7	.6	1.2	2.1	.6	.1	.1	.1	.8	.3	.3
240.	*	1.5	1.4	1.5	1.1	.8	.7	.6	.6	.6	.7	.6	1.2	2.0	.7	.1	.1	.1	.8	.3	.3
242.	*	1.5	1.5	1.5	1.1	.8	.7	.6	.6	.7	.7	.5	1.3	2.0	.8	.1	.1	.1	.9	.3	.3
244.	*	1.5	1.5	1.5	1.1	.8	.7	.6	.6	.6	.7	.6	1.2	2.0	.8	.1	.1	.1	.8	.2	.2
246.	*	1.5	1.5	1.5	1.2	.9	.8	.6	.5	.6	.8	.6	1.2	2.0	.8	.1	.1	.1	.8	.2	.2
248.	*	1.5	1.5	1.5	1.2	.9	.8	.6	.6	.6	.7	.6	1.1	1.9	1.0	.1	.1	.1	.8	.2	.2
250.	*	1.5	1.5	1.5	1.2	.9	.8	.6	.6	.7	.7	.8	1.0	2.0	1.1	.1	.1	.2	.9	.2	.2
252.	*	1.5	1.5	1.5	1.3	.9	.8	.6	.6	.7	.9	.8	1.0	2.1	1.1	.1	.1	.2	.9	.2	.2
254.	*	1.5	1.5	1.5	1.3	.9	.8	.6	.6	.7	.8	.8	1.0	2.0	1.2	.1	.1	.2	.9	.2	.2
256.	*	1.5	1.5	1.5	1.3	1.0	.8	.7	.6	.8	.8	.8	1.0	2.0	1.3	.1	.1	.2	.9	.2	.2
258.	*	1.6	1.5	1.6	1.4	1.0	.8	.7	.7	.8	.9	.8	1.1	2.1	1.3	.1	.1	.2	1.0	.2	.2
260.	*	1.6	1.6	1.6	1.4	1.0	.9	.7	.7	.8	.9	.9	1.1	2.1	1.5	.1	.1	.2	1.0	.1	.1
262.	*	1.6	1.6	1.6	1.5	1.0	.9	.7	.7	.9	1.0	.9	.9	1.9	1.5	.1	.1	.3	.9	.1	.1
264.	*	1.6	1.6	1.6	1.5	1.0	.9	.7	.7	.9	1.0	1.0	1.1	1.9	1.6	.1	.1	.3	.9	.1	.1
266.	*	1.6	1.6	1.6	1.5	1.1	.9	.7	.7	.9	1.0	1.1	1.1	1.9	1.5	.1	.2	.3	.9	.1	.1
268.	*	1.6	1.6	1.6	1.6	1.1	.9	.7	.7	.9	1.1	1.2	1.3	1.8	1.6	.1	.2	.3	.9	.1	.1
270.	*	1.7	1.6	1.7	1.6	1.2	.9	.7	.7	.9	1.1	1.2	1.2	1.9	1.6	.1	.2	.3	.9	.1	.1
272.	*	1.7	1.7	1.7	1.6	1.2	.9	.7	.7	1.0	1.1	1.3	1.3	1.9	1.7	.1	.2	.4	.9	.1	.1
274.	*	1.7	1.7	1.7	1.6	1.2	.9	.7	.7	.9	1.0	1.3	1.3	1.9	1.9	.1	.2	.4	.9	.1	.1
276.	*	1.7	1.7	1.7	1.7	1.2	.9	.7	.7	.9	1.1	1.3	1.4	1.8	1.9	.1	.2	.4	.9	.2	.1
278.	*	1.7	1.7	1.7	1.7	1.2	.9	.7	.7	.9	1.1	1.4	1.4	1.9	1.9	.1	.2	.4	.9	.2	.1
280.	*	1.8	1.7	1.8	1.7	1.3	1.0	.7	.7	.9	1.1	1.4	1.4	1.9	1.9	.1	.2	.5	1.0	.2	.1
282.	*	1.8	1.8	1.8	1.7	1.3	1.0	.7	.7	.9	1.1	1.5	1.3	2.0	2.0	.2	.4	.5	1.0	.2	.1
284.	*	1.8	1.8	1.8	1.7	1.3	1.0	.7	.7	.9	1.1	1.6	1.4	2.0	2.0	.4	.4	.5	.9	.2	.1
286.	*	1.8	1.8	1.8	1.8	1.3	1.0	.7	.7	.9	1.1	1.6	1.4	2.0	2.1	.4	.4	.6	1.0	.3	.1
288.	*	1.8	1.8	1.9	1.8	1.3	1.0	.7	.7	.9	1.1	1.7	1.4	2.0	2.1	.4	.6	.6	1.0	.3	.1
290.	*	1.8	1.8	1.9	1.8	1.3	.9	.7	.7	.9	1.1	1.7	1.4	2.0	2.1	.4	.6	.7	1.1	.4	.2

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28														
292.	*	1.8	1.8	1.8	1.8	1.3	.9	.6	.6	.8	1.0	1.6	1.4	2.0	2.1	.5	.8	.9	1.2	.5	.2
294.	*	1.8	1.8	1.8	1.8	1.2	.9	.6	.6	.8	.9	1.6	1.4	1.9	2.0	.6	.9	1.0	1.3	.5	.2
296.	*	1.8	1.8	1.8	1.7	1.2	.8	.6	.6	.8	.9	1.4	1.3	1.9	2.1	.7	1.0	1.1	1.4	.7	.2
298.	*	1.7	1.7	1.7	1.7	1.1	.8	.5	.4	.7	.9	1.4	1.3	1.7	2.0	.8	1.1	1.2	1.4	.8	.3
300.	*	1.6	1.6	1.7	1.6	1.1	.7	.5	.4	.7	.8	1.3	1.2	1.6	1.8	.9	1.2	1.3	1.5	.9	.4
302.	*	1.6	1.6	1.6	1.5	.9	.7	.3	.3	.6	.8	1.3	1.1	1.4	1.8	.9	1.3	1.5	1.6	1.1	.4
304.	*	1.5	1.5	1.5	1.4	.8	.6	.3	.3	.6	.7	1.2	1.1	1.4	1.6	1.1	1.4	1.7	1.8	1.2	.6
306.	*	1.4	1.3	1.4	1.2	.8	.6	.2	.3	.4	.6	1.1	1.0	1.2	1.6	1.2	1.5	1.7	2.0	1.4	.7
308.	*	1.2	1.2	1.2	1.1	.7	.5	.2	.2	.4	.6	.9	.9	1.1	1.3	1.3	1.6	1.7	2.0	1.5	.7
310.	*	1.0	1.1	1.1	1.0	.6	.3	.2	.2	.3	.4	.9	.9	1.0	1.2	1.3	1.6	1.8	2.0	1.6	.8
312.	*	.9	.9	1.0	.9	.5	.3	.1	.2	.3	.3	.7	.8	.9	1.1	1.3	1.7	1.8	2.0	1.8	.9
314.	*	.8	.8	.9	.8	.3	.2	.1	.2	.2	.3	.5	.6	.7	.8	1.3	1.7	1.8	2.1	2.0	1.0
316.	*	.7	.7	.7	.7	.3	.2	.1	.1	.2	.2	.4	.5	.6	.8	1.3	1.7	1.7	2.2	2.0	1.0
318.	*	.6	.6	.6	.6	.2	.1	.0	.1	.2	.2	.4	.5	.4	.6	1.4	1.6	1.7	2.1	2.2	1.1
320.	*	.4	.4	.6	.3	.2	.1	.0	.1	.1	.2	.3	.2	.3	.6	1.2	1.6	1.7	2.0	2.2	1.1
322.	*	.4	.3	.4	.2	.1	.1	.0	.1	.1	.2	.2	.2	.3	.4	1.2	1.5	1.6	2.0	2.2	1.1
324.	*	.2	.2	.2	.2	.1	.0	.0	.1	.1	.1	.2	.2	.2	.4	1.1	1.3	1.5	1.9	2.3	1.2
326.	*	.1	.1	.1	.1	.1	.0	.0	.1	.1	.1	.1	.1	.1	.3	1.1	1.2	1.6	1.8	2.3	1.2
328.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.0	.1	1.0	.9	1.3	1.6	2.2	1.2
330.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.0	.1	1.0	.9	1.2	1.4	2.2	1.2
332.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.1	1.0	.9	1.2	1.3	2.1	1.2
334.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.1	.9	.8	1.0	1.2	2.2	1.2
336.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.9	.7	.9	1.2	2.1	1.2
338.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.9	.7	.8	1.1	2.1	1.1
340.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.8	.6	.7	1.0	2.0	1.1
342.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.8	.7	.6	.9	1.9	1.2
344.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.9	.5	.5	.8	1.9	1.1
346.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.9	.5	.5	.8	1.6	1.1
348.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.9	.7	.5	.6	1.5	1.0
350.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	1.0	.7	.5	.6	1.5	1.1
352.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	1.0	.6	.5	.5	1.4	1.0
354.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	1.0	.8	.4	.5	1.4	1.0
356.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	1.0	.8	.4	.4	1.3	1.0
358.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	1.0	.7	.3	.5	1.2	.9
360.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	1.0	.7	.4	.5	1.1	.9
MAX DEGR.	*	1.8 280	1.8 282	1.9 288	1.8 286	2.0 140	1.1 154	.8 160	.7 258	1.0 272	1.1 162	1.7 146	2.0 180	2.1 232	2.1 286	1.4 318	1.7 312	1.8 310	2.2 316	2.3 324	1.2 324

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	.7	.7	.9	1.2	1.4	2.2	2.2	2.2
2.	.8	.7	.9	1.2	1.3	2.1	2.1	2.1
4.	.8	.7	.9	1.1	1.2	2.1	2.1	2.1
6.	.8	.7	.9	1.1	1.1	2.0	2.0	2.0
8.	.7	.7	.8	1.0	1.1	2.0	2.0	2.0
10.	.7	.7	.9	1.0	1.0	2.0	2.0	2.0
12.	.7	.7	.9	1.1	.9	2.0	2.0	2.0
14.	.6	.7	.9	1.0	.9	2.0	2.0	2.0
16.	.6	.7	.8	1.0	.8	2.0	1.9	1.9
18.	.6	.7	.8	.9	.9	2.0	2.0	2.0
20.	.5	.7	.7	.9	.8	2.0	2.0	2.0
22.	.4	.6	.7	.8	.8	1.9	2.0	2.0
24.	.4	.6	.7	.8	.7	1.9	2.0	2.0
26.	.4	.6	.6	.8	.7	1.9	1.9	1.9
28.	.5	.5	.6	.7	.7	1.9	1.9	1.9
30.	.6	.6	.6	.7	.6	1.9	1.9	1.9
32.	.5	.6	.6	.7	.6	1.9	1.9	1.9
34.	.3	.6	.6	.7	.7	1.9	2.0	2.0
36.	.4	.5	.6	.8	.6	1.8	2.0	2.0
38.	.4	.6	.6	.7	.6	1.8	2.0	2.0
40.	.4	.6	.6	.7	.6	1.8	1.9	2.0
42.	.4	.6	.7	.6	.6	1.8	1.9	1.9
44.	.4	.5	.5	.6	.5	1.8	1.9	1.9
46.	.4	.6	.5	.6	.5	1.9	1.9	1.9
48.	.4	.5	.5	.6	.5	1.9	1.9	1.9
50.	.4	.6	.6	.6	.5	1.8	1.9	1.9
52.	.3	.6	.6	.6	.5	1.8	1.9	1.9
54.	.3	.6	.6	.6	.5	1.7	1.9	1.9
56.	.3	.6	.6	.6	.6	1.6	1.9	1.9
58.	.3	.5	.6	.5	.7	1.6	1.9	1.9
60.	.3	.6	.7	.5	.7	1.5	2.0	1.9
62.	.3	.6	.7	.4	.7	1.5	2.0	2.0
64.	.3	.6	.6	.5	.7	1.4	2.0	2.0
66.	.3	.6	.8	.6	.7	1.3	2.0	2.0
68.	.3	.6	.8	.7	.7	1.4	2.0	2.0
70.	.3	.6	.8	.7	.8	1.2	2.0	2.0
72.	.4	.6	.9	.8	.9	1.2	2.0	2.0
74.	.4	.6	.9	.8	.8	1.2	2.1	2.1
76.	.2	.7	1.0	.9	.8	1.1	2.2	2.2
78.	.2	.7	1.1	1.0	1.0	1.2	2.2	2.2
80.	.2	.7	1.1	1.1	1.0	1.4	2.2	2.3
82.	.3	.7	1.1	1.1	1.0	1.4	2.3	2.3

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
84.	.3	.7	1.1	1.0	1.2	1.4	2.2	2.4
86.	.3	.8	1.0	1.0	1.2	1.4	2.2	2.5
88.	.3	.8	1.1	1.1	1.3	1.4	2.3	2.5
90.	.3	.6	1.1	1.1	1.3	1.4	2.2	2.5
92.	.3	.6	1.1	1.2	1.3	1.4	2.3	2.5
94.	.3	.5	1.1	1.2	1.3	1.5	2.3	2.5
96.	.3	.5	1.0	1.2	1.4	1.4	2.3	2.5
98.	.3	.5	1.0	1.1	1.4	1.4	2.2	2.6
100.	.3	.5	1.0	1.2	1.4	1.4	2.3	2.6
102.	.3	.5	.9	1.2	1.4	1.3	2.3	2.6
104.	.3	.5	.9	1.2	1.4	1.3	2.2	2.6
106.	.3	.5	.9	1.2	1.4	1.4	2.3	2.6
108.	.3	.5	.8	1.3	1.3	1.3	2.1	2.6
110.	.3	.5	.8	1.2	1.2	1.3	1.9	2.5
112.	.3	.5	.7	1.2	1.2	1.2	1.9	2.4
114.	.3	.5	.7	1.1	1.1	1.2	1.8	2.3
116.	.3	.5	.7	1.1	1.2	1.2	1.8	2.2
118.	.3	.5	.6	1.1	1.2	1.2	1.7	2.1
120.	.3	.5	.6	1.1	1.2	1.2	1.6	2.0
122.	.3	.5	.6	1.1	1.2	1.2	1.6	1.9
124.	.2	.5	.6	1.0	1.2	1.0	1.5	1.9
126.	.2	.4	.6	1.0	1.1	1.0	1.2	1.6
128.	.2	.4	.6	.9	1.1	.8	1.2	1.5
130.	.2	.4	.5	.9	1.0	.8	1.1	1.4
132.	.2	.4	.5	.9	1.0	.8	1.0	1.3
134.	.2	.4	.4	.9	1.0	.9	.8	1.2
136.	.2	.4	.4	.9	.9	.9	.8	1.1
138.	.2	.4	.4	.9	.8	.7	.7	.9
140.	.2	.4	.4	.8	.9	.7	.7	.8
142.	.2	.4	.4	.7	.8	.7	.7	.8
144.	.2	.4	.4	.7	.8	.7	.5	.6
146.	.2	.4	.4	.7	.8	.6	.5	.6
148.	.2	.4	.4	.6	.8	.6	.5	.5
150.	.2	.4	.4	.6	.8	.5	.4	.5
152.	.2	.4	.4	.6	.9	.5	.3	.4
154.	.2	.4	.4	.6	.8	.5	.3	.3
156.	.2	.3	.4	.5	.8	.5	.3	.2
158.	.2	.3	.3	.5	.8	.4	.3	.2
160.	.2	.3	.3	.4	.7	.4	.3	.2
162.	.1	.3	.3	.4	.7	.4	.3	.2
164.	.1	.3	.3	.4	.6	.3	.3	.2
166.	.1	.3	.3	.4	.6	.3	.3	.2
168.	.1	.3	.3	.3	.6	.3	.2	.1
170.	.1	.2	.3	.3	.6	.3	.2	.1

174.	*	.0	.2	.2	.2	.5	.2	.1	.1
176.	*	.0	.2	.2	.2	.5	.2	.1	.1
178.	*	.0	.2	.2	.2	.4	.2	.1	.1
180.	*	.0	.2	.2	.2	.4	.1	.1	.1
182.	*	.0	.2	.2	.2	.4	.1	.1	.1
184.	*	.0	.2	.2	.2	.4	.1	.1	.1

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
186.	*	.0	.2	.3	.3	.4	.1	.1	.1
188.	*	.0	.3	.3	.3	.4	.1	.1	.1
190.	*	.0	.3	.3	.3	.4	.2	.1	.1
192.	*	.0	.3	.3	.3	.4	.2	.1	.1
194.	*	.0	.3	.3	.3	.4	.2	.1	.1
196.	*	.0	.3	.3	.3	.4	.2	.1	.1
198.	*	.0	.3	.3	.3	.4	.2	.1	.1
200.	*	.0	.3	.3	.3	.3	.2	.1	.1
202.	*	.0	.3	.3	.3	.3	.2	.1	.1
204.	*	.0	.3	.3	.3	.3	.2	.1	.1
206.	*	.0	.3	.3	.3	.3	.2	.1	.1
208.	*	.1	.3	.3	.3	.3	.1	.1	.1
210.	*	.1	.3	.3	.3	.3	.1	.1	.0
212.	*	.2	.3	.3	.3	.3	.1	.1	.0
214.	*	.2	.3	.3	.3	.3	.1	.1	.0
216.	*	.2	.3	.3	.3	.3	.1	.1	.0
218.	*	.2	.3	.3	.3	.3	.1	.1	.0
220.	*	.2	.3	.3	.3	.3	.1	.1	.0
222.	*	.2	.2	.3	.3	.3	.1	.0	.0
224.	*	.2	.2	.2	.2	.2	.1	.0	.0
226.	*	.2	.2	.2	.2	.2	.1	.0	.0
228.	*	.3	.2	.2	.2	.2	.0	.0	.0
230.	*	.3	.2	.2	.2	.2	.0	.0	.0
232.	*	.3	.1	.2	.2	.2	.0	.0	.0
234.	*	.3	.1	.1	.1	.1	.0	.0	.0
236.	*	.3	.1	.1	.1	.1	.0	.0	.0
238.	*	.3	.1	.1	.1	.1	.0	.0	.0
240.	*	.3	.1	.1	.1	.1	.0	.0	.0
242.	*	.3	.1	.1	.1	.1	.0	.0	.0
244.	*	.3	.1	.1	.1	.1	.0	.0	.0
246.	*	.2	.0	.1	.1	.1	.0	.0	.0
248.	*	.2	.0	.0	.0	.0	.0	.0	.0
250.	*	.2	.0	.0	.0	.0	.0	.0	.0
252.	*	.2	.0	.0	.0	.0	.0	.0	.0
254.	*	.2	.0	.0	.0	.0	.0	.0	.0
256.	*	.2	.0	.0	.0	.0	.0	.0	.0
258.	*	.2	.0	.0	.0	.0	.0	.0	.0
260.	*	.2	.0	.0	.0	.0	.0	.0	.0
262.	*	.1	.0	.0	.0	.0	.0	.0	.0
264.	*	.1	.0	.0	.0	.0	.0	.0	.0
266.	*	.1	.0	.0	.0	.0	.0	.0	.0
268.	*	.1	.0	.0	.0	.0	.0	.0	.0
270.	*	.1	.0	.0	.0	.0	.0	.0	.0
272.	*	.1	.0	.0	.0	.0	.0	.0	.0
274.	*	.1	.0	.0	.0	.0	.0	.0	.0
276.	*	.1	.0	.0	.0	.1	.1	.1	.1
278.	*	.1	.0	.0	.0	.1	.1	.1	.1
280.	*	.1	.0	.0	.0	.1	.2	.2	.2
282.	*	.1	.0	.0	.0	.3	.3	.3	.3
284.	*	.1	.0	.0	.1	.3	.4	.4	.4
286.	*	.1	.0	.0	.1	.4	.4	.4	.4

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
288.	*	.1	.0	.0	.1	.5	.5	.5	.5
290.	*	.1	.0	.1	.1	.6	.6	.6	.6
292.	*	.1	.0	.1	.2	.7	.8	.8	.8
294.	*	.1	.0	.1	.3	1.0	1.0	1.0	1.0
296.	*	.2	.1	.2	.4	1.1	1.2	1.2	1.2
298.	*	.2	.1	.2	.5	1.3	1.4	1.4	1.4
300.	*	.2	.1	.3	.6	1.5	1.5	1.6	1.5
302.	*	.2	.1	.5	.7	1.8	1.8	1.8	1.8
304.	*	.3	.2	.5	.8	1.9	2.0	2.0	2.0
306.	*	.3	.2	.6	.9	2.1	2.2	2.2	2.2
308.	*	.4	.3	.7	1.1	2.3	2.5	2.5	2.4
310.	*	.4	.3	.8	1.3	2.5	2.6	2.6	2.6
312.	*	.6	.5	.9	1.4	2.6	2.8	2.8	2.7
314.	*	.6	.5	.9	1.4	2.7	2.9	2.9	2.9
316.	*	.7	.6	1.0	1.5	2.8	3.0	3.1	3.0
318.	*	.7	.7	1.0	1.6	2.9	3.1	3.2	3.1
320.	*	.8	.7	1.1	1.6	3.0	3.2	3.2	3.2
322.	*	.8	.7	1.1	1.7	3.0	3.2	3.2	3.2
324.	*	.8	.8	1.2	1.7	2.9	3.2	3.2	3.2
326.	*	.9	.8	1.2	1.7	2.9	3.2	3.2	3.2
328.	*	.9	.8	1.2	1.7	2.8	3.1	3.1	3.1
330.	*	.9	.8	1.2	1.7	2.7	3.1	3.1	3.1
332.	*	.9	.8	1.2	1.6	2.5	3.0	3.0	3.0
334.	*	.9	.8	1.2	1.6	2.5	2.9	2.9	2.9
336.	*	.9	.8	1.1	1.6	2.4	2.8	2.8	2.8
338.	*	.9	.8	1.1	1.6	2.3	2.8	2.8	2.8
340.	*	.9	.8	1.1	1.5	2.1	2.7	2.7	2.7
342.	*	.9	.8	1.1	1.5	2.1	2.6	2.7	2.7
344.	*	.8	.8	1.1	1.5	2.0	2.5	2.5	2.5
346.	*	.8	.8	1.1	1.5	1.9	2.5	2.5	2.5
348.	*	.8	.8	1.1	1.4	1.8	2.4	2.4	2.4
350.	*	.8	.8	1.0	1.4	1.8	2.4	2.4	2.4
352.	*	.8	.8	1.0	1.4	1.7	2.3	2.4	2.4
354.	*	.7	.8	1.0	1.3	1.6	2.3	2.3	2.3
356.	*	.7	.7	1.0	1.3	1.6	2.3	2.3	2.3

358.	*	.8	.7	1.0	1.2	1.5	2.2	2.2	2.2
360.	*	.7	.7	.9	1.2	1.4	2.2	2.2	2.2
MAX	*	.9	.8	1.2	1.7	3.0	3.2	3.2	3.2
DEGR.	*	326	86	324	322	320	320	318	320

THE HIGHEST CONCENTRATION OF 3.20 PPM OCCURRED AT RECEPTOR REC27.

JOB: CASE:1 BUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3bd.dat>

DATE : 8/18/99
TIME : 15: 4:53

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 280	REC2 282	REC3 288	REC4 286	REC5 140	REC6 154	REC7 160	REC8 258	REC9 272	REC10 162	REC11 146	REC12 180	REC13 232	REC14 286	REC15 318	REC16 312	REC17 310	REC18 316	REC19 324	REC20 324
1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.1	.1	.2	.2	.8	.0
5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.1	.1	.1	.1	.1
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.7	.1	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	.0	.0	.0	.0	.1	.1	.1	.0	.0	.1	.1	.1	.1	.0	.2	.2	.1	.1	.0	.0
10	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	.2	.2	.2	.2	.0	.0	.0	.1	.1	.0	.0	.0	.0	.1	.1	.2	.2	.3	.2	.1
12	1.5	1.5	1.6	1.5	.0	.0	.0	.5	.7	.0	.0	.0	.0	.6	.8	1.1	1.2	1.5	1.2	1.0
13	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	.0	.0	.0	.0	.2	.2	.1	.0	.0	.1	.1	.3	.5	.2	.2	.0	.0	.0	.0	.0
17	.0	.0	.0	.0	.2	.1	.1	.0	.0	.1	.2	.2	.1	.2	.0	.0	.0	.0	.0	.0
18	.0	.0	.0	.0	.4	.3	.2	.0	.0	.6	1.0	1.3	1.2	1.0	.0	.0	.0	.0	.0	.0
19	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	.0	.0	.0	.0	.1	.1	.1	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	.0	.0	.0	.0	.1	.1	.1	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0
28	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 BUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3bd.dat>

DATE : 8/18/99
TIME : 15: 4:53

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC21 326	REC22 86	REC23 324	REC24 322	REC25 320	REC26 320	REC27 318	REC28 320
1	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0
4	.0	.1	.0	.0	.0	.0	.0	.0
5	.1	.2	.0	.0	.0	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0
9	.0	.1	.0	.0	.0	.0	.0	.0
10	.0	.0	.0	.0	.0	.0	.0	.0
11	.1	.0	.1	.2	.4	.4	.4	.4
12	.7	.0	1.1	1.5	2.5	2.7	2.7	2.7
13	.0	.0	.0	.0	.1	.1	.1	.1
14	.0	.0	.0	.0	.0	.0	.0	.0
15	.0	.0	.0	.0	.0	.0	.0	.0
16	.0	.1	.0	.0	.0	.0	.0	.0
17	.0	.0	.0	.0	.0	.0	.0	.0
18	.0	.1	.0	.0	.0	.0	.0	.0
19	.0	.0	.0	.0	.0	.0	.0	.0
20	.0	.0	.0	.0	.0	.0	.0	.0
21	.0	.0	.0	.0	.0	.0	.0	.0
22	.0	.0	.0	.0	.0	.0	.0	.0
23	.0	.0	.0	.0	.0	.0	.0	.0
24	.0	.0	.0	.0	.0	.0	.0	.0
25	.0	.1	.0	.0	.0	.0	.0	.0
26	.0	.0	.0	.0	.0	.0	.0	.0
27	.0	.1	.0	.0	.0	.0	.0	.0
28	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3nb.dat>

DATE : 8/18/99
TIME : 15: 4:24

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. Link 1A	184.1	245.7	3.0	-2.1	307.	216.	AG	173.	11.0	.0	10.1		
2. Link 1B	184.1	245.7	3.0	-2.1	307.	216.	AG	173.	.0	.0	6.4		
3. Link 2A	3.0	-2.1	-184.1	-244.1	306.	218.	AG	111.	11.0	.0	10.1		
4. Link 2B	-5.8	-13.7	-9.3	-18.3	6.	218.	AG	410.	100.0	.0	6.4	.20	1.0
5. Link 3A	-185.3	-240.5	-2.4	2.4	304.	37.	AG	378.	11.1	.0	10.1		
6. Link 3B	-185.3	-240.5	-2.4	2.4	304.	37.	AG	378.	.0	.0	6.4		
7. Link 4A	-2.4	2.4	181.7	247.5	307.	37.	AG	61.	11.1	.0	10.1		
8. Link 4B	4.9	12.5	6.7	14.9	3.	37.	AG	391.	100.0	.0	6.4	.10	.5
9. Link 5A	238.7	-187.1	-2.1	-5.8	301.	307.	AG	296.	11.0	.0	14.6		
10. Link 5B	238.7	-187.1	-2.1	-5.8	301.	307.	AG	296.	.0	.0	8.5		
11. Link 6A	-1.5	-4.3	-247.2	186.5	311.	308.	AG	331.	11.0	.0	11.3		
12. Link 6B	-11.6	4.0	-33.3	20.8	27.	308.	AG	467.	100.0	.0	7.6	.87	4.6
13. Link 7A	-242.0	190.8	2.7	3.0	308.	127.	AG	109.	10.8	.0	11.3		
14. Link 7B	-242.0	190.8	2.7	3.0	308.	127.	AG	109.	.0	.0	7.6		
15. Link 8A	1.5	.6	241.7	-181.4	301.	127.	AG	120.	10.8	.0	15.8		
16. Link 8B	12.2	-7.6	17.9	-12.0	7.	127.	AG	466.	100.0	.0	9.8	.32	1.2
17. Link 9A	8.5	11.6	67.1	-34.7	75.	128.	AG	333.	11.1	.0	11.0		
18. Link 9B	19.2	3.4	32.4	-7.2	17.	129.	AG	399.	100.0	.0	7.3	.57	2.8
19. Link 10A	67.1	-34.7	164.3	-110.6	123.	128.	BR	333.	11.1	4.6	11.0		
20. Link 10B	67.1	-34.7	164.3	-110.6	123.	128.	BR	333.	.0	4.6	7.3		
21. Link 11A	164.3	-110.6	194.2	-112.2	30.	93.	BR	333.	11.1	9.1	11.0		
22. Link 11B	164.3	-110.6	194.2	-112.2	30.	93.	BR	333.	.0	9.1	7.3		
23. Link 12A	194.2	-112.2	232.3	-82.3	48.	52.	BR	333.	11.1	9.1	11.0		
24. Link 12B	194.2	-112.2	232.3	-82.3	48.	52.	BR	333.	.0	9.1	7.3		
25. Link 13A	390.1	103.0	20.4	-377.6	606.	218.	BR	3694.	4.4	9.1	17.4		
26. Link 13B	390.1	103.0	20.4	-377.6	606.	218.	BR	3694.	.0	9.1	13.7		
27. Link 14A	3.4	-375.8	384.4	112.8	620.	38.	BR	4570.	4.4	9.1	17.4		
28. Link 14B	3.4	-375.8	384.4	112.8	620.	38.	BR	4570.	.0	9.1	13.7		

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3nb.dat>

DATE : 8/18/99
TIME : 15: 4:24

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
4. Link 2B	95	63	1.0	111	900	115.26	1	3
8. Link 4B	95	60	1.0	61	900	115.48	1	3
12. Link 6B	95	72	1.0	331	900	114.82	1	3
16. Link 8B	95	72	1.0	120	900	114.61	1	3
18. Link 9B	95	61	1.0	333	900	115.75	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. 1:	-25.0	31.1	1.8
2. 2:	-12.8	21.9	1.8
3. 3:	-7.0	17.1	1.8
4. 4:	-.3	13.1	1.8
5. 5:	4.3	19.2	1.8
6. 6:	8.8	25.3	1.8
7. 7:	18.0	37.5	1.8
8. 8:	37.2	35.1	1.8
9. 9:	28.0	22.9	1.8
10. 10:	23.5	16.8	1.8
11. 11:	18.9	10.7	1.8
12. 12:	25.0	6.1	1.8
13. 13:	30.8	1.2	1.8
14. 14:	42.7	-8.2	1.8
15. 15:	23.8	-34.1	1.8
16. 16:	11.6	-25.0	1.8
17. 17:	5.5	-20.4	1.8
18. 18:	-.9	-15.8	1.8
19. 19:	-5.5	-21.9	1.8
20. 20:	-10.1	-28.0	1.8
21. 21:	-19.5	-39.9	1.8
22. 22:	-31.1	-27.7	1.8
23. 23:	-21.6	-15.8	1.8
24. 24:	-17.1	-9.8	1.8
25. 25:	-12.5	-3.7	1.8
26. 26:	-18.3	1.2	1.8
27. 27:	-24.1	5.8	1.8
28. 28:	-36.3	15.2	1.8

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3nb.dat>

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.6	.2	.3	1.1	.8
2.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.6	.2	.2	1.1	.7
4.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.6	.2	.2	.9	.8
6.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.6	.2	.2	.8	.8
8.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.7	.2	.2	.8	.8
10.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.8	.4	.2	.8	.7
12.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.5	.8	.4	.2	.7	.7
14.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.5	.8	.4	.2	.5	.7
16.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.4	.9	.5	.2	.5	.7
18.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.4	.9	.6	.3	.4	.7
20.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.4	.8	.6	.3	.5	.6
22.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.4	.9	.7	.2	.5	.4
24.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.4	.9	.8	.2	.4	.3
26.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.3	.9	.8	.2	.5	.3
28.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.3	.9	.8	.3	.7	.5
30.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.3	.8	.8	.4	.6	.5
32.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.3	.8	.9	.4	.6	.5
34.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.3	.8	1.0	.4	.6	.4
36.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.3	.8	1.0	.4	.5	.4
38.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.3	.7	1.0	.4	.5	.4
40.	*	.0	.0	.0	.2	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.2	.7	1.0	.5	.6	.5
42.	*	.0	.0	.0	.3	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.2	.7	1.0	.6	.6	.5
44.	*	.0	.0	.0	.3	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.2	.7	1.0	.5	.5	.6
46.	*	.0	.0	.0	.3	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.2	.6	1.0	.5	.5	.6
48.	*	.0	.0	.0	.3	.1	.1	.1	.0	.1	.1	.1	.0	.0	.0	.2	.6	1.0	.7	.5	.6
50.	*	.0	.0	.0	.4	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.5	1.0	.8	.5	.6
52.	*	.0	.0	.0	.4	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.5	1.0	.8	.5	.6
54.	*	.0	.0	.0	.4	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.5	.9	.8	.6	.5
56.	*	.0	.0	.0	.4	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.4	.9	.7	.6	.5
58.	*	.0	.0	.0	.4	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.4	.9	.8	.6	.5
60.	*	.0	.0	.0	.4	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.3	.9	.9	.6	.5
62.	*	.0	.0	.0	.5	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.3	.8	.9	.6	.5
64.	*	.0	.0	.0	.5	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.3	.7	.9	.6	.5
66.	*	.0	.0	.0	.5	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.3	.7	.9	.5	.3
68.	*	.0	.0	.0	.5	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.3	.7	.9	.5	.3
70.	*	.0	.0	.0	.5	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.3	.6	.9	.5	.3
72.	*	.0	.0	.1	.5	.1	.1	.1	.0	.0	.0	.0	.0	.0	.1	.2	.3	.6	.9	.5	.3
74.	*	.0	.0	.1	.5	.1	.1	.1	.0	.0	.0	.0	.0	.0	.1	.2	.3	.6	.9	.6	.4
76.	*	.0	.0	.1	.5	.1	.1	.1	.0	.0	.0	.0	.0	.1	.1	.3	.3	.6	.9	.5	.4
78.	*	.0	.0	.1	.6	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.3	.3	.5	.9	.5	.4
80.	*	.0	.0	.1	.7	.1	.1	.1	.0	.1	.1	.1	.1	.1	.2	.3	.4	.5	.9	.4	.4
82.	*	.0	.0	.2	.7	.2	.2	.1	.1	.1	.1	.1	.1	.1	.2	.3	.4	.6	.8	.4	.3

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
84.	*	.0	.1	.2	.6	.1	.1	.2	.1	.1	.1	.1	.1	.2	.2	.3	.3	.6	.9	.5	.3
86.	*	.1	.1	.2	.8	.1	.1	.1	.1	.1	.1	.1	.2	.2	.2	.3	.3	.5	.8	.5	.3
88.	*	.1	.1	.2	.8	.1	.1	.1	.1	.1	.2	.2	.2	.2	.2	.3	.3	.5	.8	.4	.3
90.	*	.1	.1	.2	.9	.1	.1	.1	.1	.2	.2	.2	.2	.2	.2	.3	.3	.3	.7	.4	.3
92.	*	.1	.2	.4	.9	.2	.1	.1	.2	.2	.2	.2	.2	.2	.2	.3	.3	.3	.7	.4	.3
94.	*	.1	.2	.5	.9	.2	.2	.1	.2	.2	.2	.2	.2	.2	.2	.3	.3	.3	.6	.3	.3
96.	*	.1	.3	.5	.9	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.3	.3	.3	.6	.3	.3
98.	*	.1	.4	.5	.9	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.3	.3	.3	.5	.3	.3
100.	*	.1	.4	.6	.9	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.4	.4	.4	.5	.3	.3
102.	*	.1	.4	.6	.9	.3	.2	.2	.2	.2	.2	.2	.2	.2	.2	.4	.4	.4	.5	.3	.3
104.	*	.2	.4	.7	.9	.3	.2	.2	.2	.2	.2	.3	.2	.2	.2	.4	.4	.4	.5	.3	.3
106.	*	.2	.4	.7	1.0	.3	.2	.2	.2	.2	.2	.3	.2	.2	.2	.4	.4	.4	.5	.3	.3
108.	*	.2	.3	.6	.9	.4	.2	.2	.2	.2	.2	.3	.2	.2	.2	.4	.4	.4	.5	.3	.3
110.	*	.2	.4	.7	.9	.4	.2	.2	.2	.2	.2	.3	.3	.2	.2	.4	.4	.4	.5	.3	.3
112.	*	.2	.5	.7	.9	.5	.2	.2	.2	.2	.2	.4	.4	.3	.2	.4	.4	.4	.4	.3	.3
114.	*	.2	.6	.7	.9	.5	.2	.2	.2	.2	.2	.5	.4	.3	.3	.4	.4	.4	.4	.3	.3
116.	*	.2	.6	.8	.9	.6	.2	.2	.2	.2	.2	.5	.4	.3	.3	.4	.4	.4	.4	.3	.3
118.	*	.2	.7	.8	1.0	.6	.3	.2	.2	.2	.2	.6	.4	.3	.3	.4	.4	.4	.4	.3	.3
120.	*	.2	.7	.7	1.0	.7	.3	.2	.2	.2	.2	.6	.5	.3	.3	.4	.4	.4	.4	.3	.3
122.	*	.2	.7	.7	.8	.7	.3	.2	.2	.2	.2	.7	.5	.3	.3	.4	.4	.4	.4	.3	.3
124.	*	.3	.7	.8	.8	.7	.3	.2	.2	.2	.2	.7	.5	.4	.3	.4	.4	.4	.4	.3	.2
126.	*	.4	.8	.8	.9	.8	.3	.2	.2	.2	.2	.8	.6	.4	.4	.4	.4	.4	.4	.3	.2
128.	*	.5	.8	.8	.9	.8	.5	.2	.2	.2	.2	.8	.6	.4	.4	.4	.4	.4	.4	.3	.2
130.	*	.5	.8	.8	.9	.8	.5	.2	.2	.2	.2	1.0	.7	.4	.4	.3	.3	.3	.3	.3	.2
132.	*	.5	.8	.8	.9	1.0	.5	.2	.2	.2	.3	1.0	.7	.5	.4	.3	.3	.3	.3	.2	.2
134.	*	.6	.7	.8	1.0	1.2	.5	.2	.2	.2	.3	1.2	.9	.6	.4	.3	.3	.3	.3	.2	.2
136.	*	.7	.7	.8	.9	1.2	.5	.2	.2	.2	.4	1.2	1.1	.7	.5	.3	.3	.3	.3	.2	.2
138.	*	.7	.5	.6	.9	1.1	.6	.2	.2	.2	.4	1.3	1.1	.8	.5	.3	.3	.3	.3	.2	.2
140.	*	.8	.5	.6	.9	1.2	.7	.2	.2	.2	.4	1.3	1.2	.8	.6	.3	.3	.3	.3	.2	.2
142.	*	.8	.4	.6	.9	1.2	.7	.3	.2	.2	.5	1.4	1.3	.8	.5	.3	.3	.3	.3	.2	.2
144.	*	.9	.4	.5	.7	1.2	.7	.3	.2	.2	.6	1.4	1.3	.9	.5	.3	.3	.3	.3	.2	.2
146.	*	.9	.5	.5	.7	1.2	.8	.3	.2	.2	.6	1.4	1.4	.9	.5	.3	.3	.3	.2	.2	.2
148.	*	.9	.5	.5	.6	1.3	.8	.3	.2	.3	.7	1.4	1.4	1.0	.5	.2	.2	.2	.2	.2	.2
150.	*	.8	.5	.4	.6	1.3	.8	.3	.2	.4	.7	1.4	1.5	1.0	.5	.2	.2	.2	.2	.2	.2
152.	*	.9	.5	.4	.6	1.3	.8	.3	.2	.4	.7	1.5	1.5	1.0	.5	.2	.2	.2	.2	.2	.2
154.	*	1.0	.5	.4	.5	1.3	.8	.3	.2	.4	.8	1.5	1.6	1.1	.5	.2	.2	.2	.2	.2	.2
156.	*	1.1	.5	.4	.5	1.3	.8	.5	.2	.4	.8	1.5	1.6	1.1	.5	.2	.2	.2	.2	.2	.2
158.	*	1.1	.6	.4	.5	1.2	.8	.5	.2	.4	.8	1.5	1.6	1.1	.5	.2	.2	.2	.2	.2	.2
160.	*	1.1	.5	.3	.5	1.2	.8	.5	.2	.5	.9	1.5	1.7	1.2	.5	.2	.2	.2	.2	.2	.2
162.	*	1.2	.6	.4	.4	1.2	.8	.5	.2	.5	.9	1.5	1.7	1.2	.5	.2	.2	.2	.2	.2	.2
164.	*	1.2	.7	.3	.3	1.2	.8	.5	.2	.5	.9	1.5	1.7	1.2	.5	.2	.2	.2	.2	.1	.1
166.	*	1.1	.7	.4	.3	1.1	.7	.6	.2	.5	.8	1.5	1.7	1.3	.5	.2	.2	.2	.1	.1	.1
168.	*	1.1	.8	.4	.3	1.1	.6	.5	.3	.6	1.0	1.5	1.8	1.3	.5	.2	.2	.1	.1	.1	.1
170.	*	1.1	.8	.5	.3	.9	.6	.5	.3	.6	1.0	1.3	1.7	1.2	.4	.2	.1	.1	.1	.1	.1
172.	*	1.1	.8	.5	.4	.8	.5	.6	.3	.5	.9	1.3	1.6	1.3	.4	.2	.1	.1	.1	.1	.1
174.	*	1.1	.8	.4	.4	.8	.5	.6	.2	.5	.9	1.2	1.7	1.2	.4	.1	.1	.1	.1	.1	.1
176.	*	1.1	.8	.4	.2	.6	.5	.6	.2	.6	.9	1.2	1.7	1.2	.4	.1	.1	.1	.0	.0	.0
178.	*	1.1	.8	.4	.2	.6	.5	.5	.2	.7	.9	1.2	1.7	1.2	.3	.1	.1	.0	.0	.0	.0
180.	*	1.1	.9	.5	.2	.5	.4	.4	.2	.7	.8	1.1	1.7	1.3	.3	.1	.0	.0	.0	.0	.0
182.	*	1.1	.9	.5	.2	.6	.4	.3	.2	.6	.7	1.1	1.6	1.3	.3	.1	.0	.0	.0	.0	.0
184.	*	1.1	.9	.5	.2	.6	.3	.2	.2	.6	.8	1.0	1.6	1.2	.3	.0	.0	.0	.0	.0	.0
186.	*	1.1	1.0	.5	.2	.6	.3	.2	.2	.6	.8	1.0	1.7	1.2	.2	.0	.0	.0	.0	.0	.0

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28														
188.	*	1.1	1.0	.6	.2	.6	.3	.2	.2	.6	.8	.9	1.7	1.2	.2	.0	.0	.0	.0	.0	.0
190.	*	1.1	.9	.6	.3	.6	.4	.2	.3	.6	.8	.9	1.6	1.3	.2	.0	.0	.0	.0	.0	.0
192.	*	1.0	1.0	.6	.3	.5	.4	.2	.3	.6	.7	.9	1.6	1.3	.2	.0	.0	.0	.0	.0	.0
194.	*	1.0	1.0	.7	.3	.5	.5	.3	.3	.6	.7	.8	1.6	1.3	.2	.0	.0	.0	.0	.0	.0
196.	*	1.0	1.0	.7	.3	.5	.4	.3	.3	.6	.7	.8	1.7	1.3	.2	.0	.0	.0	.0	.0	.0
198.	*	1.0	1.0	.7	.3	.5	.4	.3	.3	.5	.7	.7	1.7	1.4	.2	.0	.0	.0	.0	.0	.0
200.	*	1.0	1.0	.8	.3	.5	.4	.2	.3	.5	.6	.7	1.7	1.4	.2	.0	.0	.0	.0	.0	.0
202.	*	.9	1.1	.7	.4	.5	.4	.3	.3	.5	.6	.7	1.7	1.5	.2	.0	.0	.0	.0	.0	.0
204.	*	.9	1.1	.8	.5	.5	.5	.3	.3	.5	.6	.6	1.7	1.5	.2	.0	.0	.0	.0	.0	.0
206.	*	.8	1.1	.8	.5	.5	.5	.3	.3	.5	.6	.4	1.7	1.5	.2	.0	.0	.0	.0	.0	.0
208.	*	.8	1.1	.8	.5	.5	.5	.3	.3	.4	.5	.5	1.7	1.5	.2	.0	.0	.0	.0	.0	.0
210.	*	.7	1.1	.9	.5	.5	.5	.3	.3	.4	.6	.6	1.7	1.6	.2	.0	.0	.0	.2	.1	.1
212.	*	.7	1.1	.9	.5	.6	.5	.3	.4	.5	.7	.6	1.7	1.6	.2	.0	.0	.0	.3	.1	.1
214.	*	.6	1.1	.9	.6	.6	.4	.3	.4	.6	.6	.5	1.7	1.6	.2	.0	.0	.0	.3	.2	.2
216.	*	.6	1.1	.9	.6	.6	.4	.4	.4	.5	.6	.4	1.8	1.6	.2	.0	.0	.0	.3	.2	.2
218.	*	.6	1.1	1.0	.5	.5	.4	.4	.4	.5	.6	.5	1.7	1.6	.2	.0	.0	.1	.3	.2	.2
220.	*	.5	1.0	1.0	.4	.5	.4	.4	.4	.6	.6	.5	1.7	1.7	.2	.0	.0	.1	.4	.2	.2
222.	*	.5	1.0	1.0	.5	.6	.5	.3	.5	.6	.6	.5	1.7	1.8	.2	.0	.0	.1	.4	.2	.2
224.	*	.5	1.0	1.0	.5	.6	.5	.3	.4	.6	.6	.5	1.6	1.8	.2	.0	.1	.1	.4	.2	.2
226.	*	.4	1.0	1.0	.6	.5	.5	.3	.4	.5	.5	.4	1.6	1.8	.2	.0	.1	.1	.5	.2	.2
228.	*	.4	1.0	1.0	.6	.6	.5	.3	.3	.3	.4	.4	1.6	1.8	.2	.0	.1	.1	.5	.2	.2
230.	*	.4	1.0	1.0	.6	.6	.5	.3	.3	.4	.5	.4	1.4	1.8	.2	.0	.1	.1	.5	.2	.2
232.	*	.3	1.0	1.0	.7	.6	.4	.3	.3	.4	.5	.4	1.4	2.0	.2	.0	.1	.1	.6	.2	.2
234.	*	.3	1.0	1.0	.7	.5	.4	.3	.2	.4	.5	.4	1.3	1.9	.2	.0	.1	.1	.6	.2	.2
236.	*	.3	1.0	1.0	.7	.6	.4	.3	.3	.4	.5	.5	1.3	1.9	.3	.0	.1	.1	.7	.2	.2
238.	*	.2	1.0	1.0	.7	.6	.4	.3	.3	.4	.5	.5	1.3	1.8	.4	.0	.1	.1	.7	.2	.2
240.	*	.2	1.0	1.0	.7	.6	.4	.3	.3	.5	.5	.5	1.1	1.8	.5	.1	.1	.1	.7	.2	.2
242.	*	.2	1.0	1.0	.7	.6	.4	.3	.3	.4	.6	.4	1.1	1.8	.5	.1	.1	.1	.8	.2	.2
244.	*	.2	.9	1.0	.7	.7	.5	.3	.3	.4	.6	.4	1.1	1.8	.5	.1	.1	.1	.8	.2	.2
246.	*	.2	.9	1.0	.8	.7	.5	.3	.3	.4	.5	.5	1.1	1.8	.5	.1	.1	.1	.8	.2	.2
248.	*	.1	.9	1.0	.8	.7	.5	.2	.3	.4	.4	.5	1.1	1.8	.5	.1	.1	.1	.8	.2	.2
250.	*	.1	.9	1.0	.8	.7	.5	.2	.3	.4	.4	.5	1.0	1.8	.4	.0	.1	.2	.9	.2	.2
252.	*	.1	.9	1.0	.8	.7	.5	.2	.3	.5	.5	.5	.8	1.8	.6	.0	.1	.2	.9	.2	.2
254.	*	.1	.8	1.0	.9	.7	.5	.2	.3	.5	.5	.6	.8	1.8	.5	.0	.1	.2	.9	.2	.2
256.	*	.1	.8	1.0	.9	.7	.5	.2	.3	.5	.5	.7	.8	1.8	.6	.0	.1	.2	.9	.2	.2
258.	*	.1	.8	1.0	.9	.7	.5	.2	.3	.5	.5	.7	.7	1.8	.7	.0	.1	.2	1.0	.2	.2
260.	*	.1	.8	1.0	.9	.7	.5	.1	.3	.5	.5	.7	.7	1.6	.7	.0	.1	.2	1.0	.1	.1
262.	*	.1	.7	1.0	.9	.6	.4	.1	.2	.5	.5	.7	.7	1.5	.7	.0	.1	.3	.9	.1	.1
264.	*	.1	.7	.9	.9	.6	.4	.1	.2	.5	.6	.8	.7	1.6	.9	.0	.1	.3	.9	.1	.1
266.	*	.1	.6	.9	.9	.6	.4	.1	.2	.3	.6	.8	.8	1.6	.9	.0	.2	.3	.9	.1	.1
268.	*	.2	.7	1.0	.9	.6	.3	.1	.2	.3	.6	.8	.8	1.5	1.0	.0	.2	.3	.9	.1	.1
270.	*	.2	.7	.9	.9	.5	.3	.1	.2	.3	.6	.9	.9	1.5	1.0	.0	.2	.3	.9	.1	.1
272.	*	.2	.6	.9	1.0	.5	.3	.0	.2	.3	.6	.9	.8	1.5	1.0	.0	.2	.4	.9	.1	.1
274.	*	.2	.6	.9	1.0	.5	.3	.0	.2	.3	.6	.9	.8	1.5	1.1	.0	.2	.4	.9	.1	.1
276.	*	.2	.5	.8	.9	.4	.2	.0	.1	.3	.6	.9	.8	1.5	1.2	.0	.2	.4	.9	.2	.1
278.	*	.2	.5	.8	.9	.4	.2	.0	.1	.2	.5	.9	.8	1.5	1.2	.0	.2	.4	.9	.2	.1
280.	*	.2	.5	.7	.9	.4	.2	.0	.1	.2	.5	.9	.8	1.5	1.3	.0	.2	.4	.9	.2	.1
282.	*	.2	.4	.7	.8	.3	.2	.0	.1	.2	.5	.8	.7	1.4	1.2	.0	.3	.4	.9	.2	.1
284.	*	.2	.4	.7	.8	.3	.2	.0	.1	.2	.5	.8	.7	1.5	1.2	.1	.3	.4	.8	.2	.1
286.	*	.2	.4	.6	.7	.3	.1	.0	.1	.2	.3	.8	.7	1.4	1.3	.1	.3	.4	.8	.2	.1
288.	*	.2	.3	.5	.7	.2	.1	.0	.1	.1	.3	.7	.7	1.4	1.3	.1	.3	.4	.8	.2	.1
290.	*	.2	.3	.5	.6	.2	.1	.0	.1	.1	.3	.7	.6	1.2	1.3	.1	.4	.5	.9	.3	.1

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28														
292.	*	.2	.3	.5	.6	.2	.1	.0	.1	.1	.3	.7	.6	1.2	1.3	.2	.4	.5	.8	.3	.1
294.	*	.2	.3	.4	.5	.2	.1	.0	.1	.1	.3	.7	.6	1.1	1.3	.3	.4	.5	.8	.3	.1
296.	*	.2	.3	.4	.5	.2	.1	.0	.1	.1	.2	.6	.5	1.1	1.3	.3	.4	.5	.9	.4	.1
298.	*	.2	.2	.4	.4	.1	.1	.0	.1	.1	.1	.5	.4	1.0	1.2	.3	.5	.7	.9	.4	.1
300.	*	.2	.2	.3	.4	.1	.0	.0	.1	.1	.1	.5	.4	.9	1.0	.3	.7	.7	.9	.4	.1
302.	*	.2	.2	.3	.4	.1	.0	.0	.1	.1	.1	.5	.4	.8	.9	.4	.7	.7	.8	.6	.1
304.	*	.2	.2	.3	.3	.1	.0	.0	.1	.1	.1	.4	.3	.8	.8	.5	.7	.9	.9	.6	.1
306.	*	.2	.2	.3	.3	.0	.0	.0	.1	.1	.1	.3	.3	.6	.7	.5	.7	.9	.9	.8	.1
308.	*	.2	.2	.2	.3	.0	.0	.0	.1	.1	.1	.3	.2	.6	.7	.5	.8	.8	.9	.8	.1
310.	*	.2	.2	.2	.3	.0	.0	.0	.1	.1	.1	.2	.2	.3	.6	.6	.7	.8	.9	.9	.1
312.	*	.2	.2	.2	.1	.0	.0	.0	.1	.1	.1	.2	.2	.3	.5	.6	.7	.9	.8	1.0	.3
314.	*	.1	.0	.1	.0	.0	.0	.0	.1	.1	.1	.2	.1	.3	.5	.6	.6	.9	.9	1.0	.3
316.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.2	.4	.6	.6	.8	.9	1.1	.3
318.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.2	.4	.6	.6	.8	.9	1.2	.3
320.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.2	.3	.5	.6	.8	.8	1.2	.3
322.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.1	.3	.5	.6	.8	.8	1.2	.4
324.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.1	.3	.6	.6	.8	.8	1.4	.4
326.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.1	.5	.5	.8	.8	1.4	.4
328.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.1	.5	.5	.7	.8	1.4	.5
330.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.1	.4	.5	.6	.7	1.4	.5
332.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.1	.5	.5	.6	.7	1.5	.6
334.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.5	.5	.8	1.6	.6
336.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.4	.5	.7	1.6	.6
338.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.3	.4	.7	1.6	.7
340.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.3	.4	.7	1.5	.7
342.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.4	.4	.4	.6	1.5	.8
344.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.4	.2	.6	1.5	.8
346.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.4	.2	.5	1.4	.8
348.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.4	.2	.5	1.4	.8
350.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.4	.2	.5	1.3	.9
352.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.4	.2	.5	1.3	.9
354.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.5	.1	.4	1.3	.8
356.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.6	.5	.1	.4	1.2	.8
358.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.6	.2	.4	1.1	.8
360.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.6	.2	.3	1.1	.8
MAX	*	1.2	1.1	1.0	1.0	1.3	.8	.6	.5	.7	1.0	1.5	1.8	2.0	1.3	.6	.9	1.0	1.0	1.6	.9
DEGR.	*	162	202	218	106	148	146	166	222	178	168	152	216	232	280	0	16	34	258	334	350

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	.5	.3	.7	.9	1.0	1.6	1.6	.3
2.	.6	.3	.7	.8	.9	1.6	1.6	.3
4.	.5	.3	.7	.8	.9	1.6	1.6	.3
6.	.5	.3	.7	.8	.8	1.6	1.5	.3
8.	.5	.3	.7	.8	.8	1.5	1.5	.4
10.	.5	.4	.6	.7	.7	1.5	1.5	.4
12.	.5	.4	.6	.7	.7	1.5	1.5	.4
14.	.5	.4	.7	.7	.6	1.5	1.5	.5
16.	.5	.5	.7	.7	.6	1.5	1.5	.5
18.	.4	.4	.6	.7	.6	1.5	1.5	.5
20.	.4	.4	.6	.7	.5	1.5	1.5	.6
22.	.4	.4	.6	.6	.6	1.5	1.5	.6
24.	.4	.4	.6	.6	.5	1.5	1.5	.7
26.	.4	.4	.5	.6	.5	1.4	1.5	.7
28.	.4	.4	.5	.5	.4	1.4	1.5	.8
30.	.4	.3	.5	.5	.4	1.4	1.5	.9
32.	.4	.3	.5	.5	.4	1.4	1.5	.9
34.	.3	.4	.4	.4	.4	1.4	1.5	1.0
36.	.3	.4	.5	.4	.4	1.4	1.5	1.0
38.	.3	.5	.5	.4	.4	1.4	1.5	1.0
40.	.3	.4	.4	.3	.5	1.4	1.5	1.1
42.	.3	.4	.4	.4	.4	1.4	1.5	1.1
44.	.3	.4	.3	.6	.4	1.3	1.5	1.1
46.	.3	.5	.3	.6	.4	1.3	1.5	1.2
48.	.3	.5	.3	.5	.4	1.3	1.5	1.2
50.	.3	.5	.4	.4	.4	1.3	1.5	1.3
52.	.2	.5	.4	.4	.4	1.3	1.5	1.3
54.	.2	.5	.4	.4	.4	1.2	1.4	1.3
56.	.2	.5	.4	.4	.4	1.2	1.4	1.3
58.	.2	.5	.5	.4	.5	1.1	1.4	1.4
60.	.2	.5	.5	.4	.5	1.1	1.4	1.4
62.	.2	.5	.5	.4	.4	1.0	1.4	1.4
64.	.2	.5	.5	.5	.3	1.0	1.5	1.5
66.	.2	.5	.6	.4	.3	1.0	1.5	1.5
68.	.2	.5	.7	.5	.3	1.0	1.6	1.5
70.	.1	.5	.7	.5	.3	1.0	1.6	1.5
72.	.1	.5	.7	.5	.4	.9	1.6	1.5
74.	.1	.5	.7	.5	.5	.9	1.6	1.6
76.	.1	.6	.8	.5	.6	.9	1.7	1.6
78.	.1	.6	1.0	.6	.7	.7	1.7	1.6
80.	.1	.6	.9	.8	.7	.8	1.6	1.6
82.	.2	.6	.9	.9	.7	1.0	1.7	1.7

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
84.	.2	.6	.9	.9	.7	1.0	1.6	1.8
86.	.2	.6	.9	.9	.7	1.0	1.6	1.9
88.	.2	.5	1.0	1.0	.9	1.1	1.5	1.9
90.	.2	.4	1.0	1.0	1.0	1.1	1.5	1.9
92.	.2	.4	1.0	1.0	1.0	1.1	1.6	2.0
94.	.2	.4	1.0	.9	1.0	1.1	1.7	2.0
96.	.2	.4	.9	.9	1.0	1.1	1.7	2.0
98.	.2	.4	.8	.9	1.0	1.0	1.6	2.0
100.	.2	.4	.8	.9	1.0	1.0	1.7	2.0
102.	.2	.4	.8	.9	1.0	1.1	1.7	2.0
104.	.2	.4	.8	.9	.9	1.1	1.5	2.1
106.	.2	.4	.7	.9	.8	.8	1.3	2.0
108.	.2	.4	.6	.8	.8	.7	1.4	2.0
110.	.2	.3	.6	.9	.8	.8	1.3	1.9
112.	.2	.3	.6	.9	.8	.8	1.3	1.9
114.	.2	.3	.6	.9	.8	.8	1.3	1.9
116.	.2	.3	.6	.9	.7	.8	1.3	1.8
118.	.2	.3	.5	.8	.6	.8	1.2	1.6
120.	.2	.3	.5	.8	.7	.8	1.2	1.5
122.	.2	.3	.5	.8	.6	.7	1.2	1.4
124.	.2	.3	.5	.8	.6	.7	1.0	1.4
126.	.2	.3	.5	.8	.6	.7	1.0	1.2
128.	.2	.3	.4	.8	.6	.7	.9	1.2
130.	.2	.3	.3	.8	.7	.7	.9	1.0
132.	.2	.3	.3	.8	.7	.7	.8	.9
134.	.2	.3	.3	.8	.6	.7	.7	.8
136.	.2	.3	.3	.7	.6	.6	.7	.8
138.	.2	.3	.3	.7	.6	.6	.7	.6
140.	.2	.3	.3	.6	.7	.6	.6	.5
142.	.2	.3	.3	.6	.7	.6	.4	.5
144.	.2	.3	.3	.6	.7	.5	.3	.4
146.	.2	.3	.3	.6	.7	.5	.3	.3
148.	.2	.3	.3	.5	.6	.5	.4	.3
150.	.2	.3	.3	.5	.6	.5	.4	.3
152.	.2	.3	.3	.5	.7	.5	.3	.2
154.	.2	.3	.3	.5	.7	.5	.3	.1
156.	.2	.2	.3	.4	.7	.5	.3	.1
158.	.2	.2	.2	.4	.7	.4	.3	.2
160.	.2	.3	.3	.4	.7	.4	.3	.2
162.	.1	.3	.3	.4	.7	.4	.3	.2
164.	.1	.3	.3	.4	.6	.3	.3	.2
166.	.1	.3	.3	.4	.6	.3	.3	.2
168.	.1	.3	.3	.3	.6	.3	.2	.1
170.	.1	.2	.3	.3	.6	.3	.2	.1
172.	.1	.2	.2	.3	.6	.2	.1	.1

174.	*	.0	.2	.2	.2	.5	.2	.1	.1
176.	*	.0	.2	.2	.2	.5	.2	.1	.1
178.	*	.0	.2	.2	.2	.4	.2	.1	.1
180.	*	.0	.2	.2	.2	.4	.1	.1	.1
182.	*	.0	.2	.2	.2	.4	.1	.1	.1
184.	*	.0	.2	.2	.2	.4	.1	.1	.1

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3nb.dat>

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
186.	*	.0	.2	.2	.2	.3	.1	.1	.1
188.	*	.0	.2	.2	.2	.3	.1	.1	.1
190.	*	.0	.2	.2	.2	.3	.1	.1	.1
192.	*	.0	.2	.2	.2	.3	.1	.1	.1
194.	*	.0	.2	.2	.2	.3	.1	.1	.1
196.	*	.0	.2	.2	.2	.3	.1	.1	.1
198.	*	.0	.2	.3	.3	.4	.1	.1	.1
200.	*	.0	.3	.3	.3	.3	.1	.1	.1
202.	*	.0	.3	.3	.3	.3	.1	.1	.1
204.	*	.0	.3	.3	.3	.3	.1	.1	.1
206.	*	.0	.3	.3	.3	.3	.1	.1	.0
208.	*	.0	.3	.3	.3	.3	.1	.1	.0
210.	*	.1	.3	.3	.3	.3	.1	.1	.0
212.	*	.2	.3	.3	.3	.3	.1	.1	.0
214.	*	.2	.3	.3	.3	.3	.1	.1	.0
216.	*	.2	.2	.3	.3	.3	.1	.1	.0
218.	*	.2	.2	.2	.2	.2	.1	.1	.0
220.	*	.2	.2	.2	.2	.2	.1	.0	.0
222.	*	.2	.2	.2	.2	.2	.1	.0	.0
224.	*	.2	.2	.2	.2	.2	.1	.0	.0
226.	*	.2	.2	.2	.2	.2	.0	.0	.0
228.	*	.2	.1	.2	.2	.2	.0	.0	.0
230.	*	.2	.1	.1	.1	.1	.0	.0	.0
232.	*	.2	.1	.1	.1	.1	.0	.0	.0
234.	*	.2	.1	.1	.1	.1	.0	.0	.0
236.	*	.2	.1	.1	.1	.1	.0	.0	.0
238.	*	.2	.1	.1	.1	.1	.0	.0	.0
240.	*	.2	.1	.1	.1	.1	.0	.0	.0
242.	*	.2	.1	.1	.1	.1	.0	.0	.0
244.	*	.2	.0	.1	.1	.1	.0	.0	.0
246.	*	.2	.0	.0	.0	.0	.0	.0	.0
248.	*	.2	.0	.0	.0	.0	.0	.0	.0
250.	*	.2	.0	.0	.0	.0	.0	.0	.0
252.	*	.2	.0	.0	.0	.0	.0	.0	.0
254.	*	.2	.0	.0	.0	.0	.0	.0	.0
256.	*	.2	.0	.0	.0	.0	.0	.0	.0
258.	*	.2	.0	.0	.0	.0	.0	.0	.0
260.	*	.2	.0	.0	.0	.0	.0	.0	.0
262.	*	.1	.0	.0	.0	.0	.0	.0	.0
264.	*	.1	.0	.0	.0	.0	.0	.0	.0
266.	*	.1	.0	.0	.0	.0	.0	.0	.0
268.	*	.1	.0	.0	.0	.0	.0	.0	.0
270.	*	.1	.0	.0	.0	.0	.0	.0	.0
272.	*	.1	.0	.0	.0	.0	.0	.0	.0
274.	*	.1	.0	.0	.0	.0	.0	.0	.0
276.	*	.1	.0	.0	.0	.0	.0	.0	.0
278.	*	.1	.0	.0	.0	.0	.0	.0	.0
280.	*	.1	.0	.0	.0	.0	.0	.0	.0
282.	*	.1	.0	.0	.0	.0	.0	.0	.0
284.	*	.1	.0	.0	.0	.1	.1	.0	.0
286.	*	.1	.0	.0	.0	.1	.1	.0	.0

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3nb.dat>

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
288.	*	.1	.0	.0	.0	.1	.2	.2	.1
290.	*	.1	.0	.0	.0	.2	.2	.2	.1
292.	*	.1	.0	.0	.0	.3	.2	.2	.1
294.	*	.1	.0	.0	.0	.3	.3	.2	.1
296.	*	.1	.0	.0	.0	.4	.3	.2	.1
298.	*	.1	.0	.0	.0	.4	.4	.3	.1
300.	*	.1	.0	.0	.0	.5	.4	.3	.1
302.	*	.1	.0	.0	.0	.6	.5	.4	.1
304.	*	.1	.0	.0	.2	.6	.7	.5	.2
306.	*	.1	.0	.0	.2	.8	.7	.6	.2
308.	*	.1	.0	.0	.2	.9	.8	.6	.2
310.	*	.1	.0	.1	.2	1.0	.9	.7	.2
312.	*	.1	.0	.1	.2	1.1	1.0	.8	.2
314.	*	.1	.0	.1	.3	1.1	1.1	.8	.2
316.	*	.1	.0	.1	.3	1.2	1.2	.9	.2
318.	*	.1	.0	.2	.4	1.3	1.2	1.0	.2
320.	*	.1	.0	.2	.4	1.3	1.3	1.1	.2
322.	*	.1	.0	.2	.4	1.4	1.4	1.1	.2
324.	*	.1	.0	.2	.5	1.4	1.5	1.2	.2
326.	*	.1	.0	.2	.5	1.5	1.5	1.3	.2
328.	*	.1	.1	.3	.6	1.5	1.6	1.3	.2
330.	*	.2	.1	.3	.6	1.5	1.6	1.4	.2
332.	*	.2	.1	.3	.7	1.5	1.7	1.4	.2
334.	*	.2	.1	.4	.7	1.5	1.7	1.5	.2
336.	*	.2	.1	.4	.8	1.5	1.7	1.5	.2
338.	*	.2	.2	.4	.8	1.5	1.7	1.6	.2
340.	*	.3	.2	.5	.8	1.5	1.8	1.6	.2
342.	*	.3	.1	.5	.9	1.5	1.8	1.6	.3
344.	*	.3	.1	.5	.9	1.4	1.8	1.6	.3
346.	*	.3	.1	.6	.9	1.4	1.8	1.7	.3
348.	*	.3	.1	.6	.9	1.3	1.8	1.7	.3
350.	*	.3	.2	.6	.9	1.2	1.7	1.6	.2
352.	*	.4	.2	.6	.9	1.2	1.6	1.6	.2
354.	*	.4	.2	.7	.9	1.1	1.6	1.6	.2
356.	*	.4	.2	.7	.9	1.1	1.6	1.6	.2

358.	*	.5	.3	.7	.9	1.0	1.6	1.6	.3
360.	*	.5	.3	.7	.9	1.0	1.6	1.6	.3
MAX	*	.6	.6	1.0	1.0	1.5	1.8	1.7	2.1
DEGR.	*	2	76	88	88	326	340	94	104

THE HIGHEST CONCENTRATION OF 2.10 PPM OCCURRED AT RECEPTOR REC28.

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3nb.dat>

DATE : 8/18/99
TIME : 15: 4:24

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

LINK #	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
	*	CO/LINK (PPM) ANGLE (DEGREES)																			
	*	162	202	218	106	148	146	166	222	178	168	152	216	232	280	0	16	34	258	334	350
1	*	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0
4	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.8	.9	.3
5	*	.0	.1	.1	.0	.0	.0	.0	.1	.0	.0	.0	.1	.1	.0	.0	.0	.0	.1	.1	.1
6	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	*	.0	.0	.0	.4	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.1	.1	.1	.0	.1	.1	.1	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1
12	*	.8	.9	.8	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.2	.0	.0	.0	.0	.5	.4
13	*	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.4	.4	.2	.1	.5	.5	.0	.0	.0
17	*	.0	.0	.0	.1	.1	.1	.1	.0	.1	.1	.2	.1	.1	.2	.1	.0	.1	.0	.0	.0
18	*	.0	.0	.0	.3	.3	.3	.2	.1	.4	.6	1.0	1.1	1.2	.7	.3	.3	.3	.0	.0	.0
19	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	*	.0	.0	.0	.1	.1	.1	.1	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	*	.1	.0	.0	.1	.1	.1	.1	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
28	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqb3nb.dat>

DATE : 8/18/99
TIME : 15: 4:24

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

LINK #	*	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
	*	CO/LINK (PPM) ANGLE (DEGREES)							
	*	2	76	88	88	326	340	94	104
1	*	.0	.0	.0	.0	.0	.0	.0	.0
2	*	.0	.0	.0	.0	.0	.0	.0	.0
3	*	.1	.0	.0	.0	.0	.0	.0	.0
4	*	.1	.1	.3	.1	.0	.0	.0	.0
5	*	.1	.2	.2	.2	.0	.0	.0	.0
6	*	.0	.0	.0	.0	.0	.0	.0	.0
7	*	.0	.0	.0	.0	.0	.0	.0	.0
8	*	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.0	.0	.1	.1	.0	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.0	.0	.2	.2	.1	.2
12	*	.3	.0	.0	.0	1.3	1.6	1.1	1.6
13	*	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.1	.1	.2	.0	.0	.1	.1
17	*	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.0	.1	.1	.2	.0	.0	.2	.1
19	*	.0	.0	.0	.0	.0	.0	.0	.0
20	*	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.0	.0	.0	.0	.0	.0	.0
24	*	.0	.0	.0	.0	.0	.0	.0	.0
25	*	.0	.0	.1	.1	.0	.0	.1	.0
26	*	.0	.0	.0	.0	.0	.0	.0	.0
27	*	.0	.1	.1	.1	.0	.0	.1	.1
28	*	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 BUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqbkbd.dat>

DATE : 8/11/99
TIME : 11: 0: 1

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. Link 1A	184.1	245.7	3.0	-2.1	307.	216.	AG	255.	10.6	.0	10.1		
2. Link 1B	184.1	245.7	3.0	-2.1	307.	216.	AG	255.	.0	.0	6.4		
3. Link 2A	3.0	-2.1	-184.1	-244.1	306.	218.	AG	120.	11.0	.0	10.1		
4. Link 2B	-5.8	-13.7	-9.6	-18.7	6.	218.	AG	410.	100.0	.0	6.4	.22	1.1
5. Link 3A	-185.3	-240.5	-2.4	2.4	304.	37.	AG	456.	11.8	.0	10.1		
6. Link 3B	-185.3	-240.5	-2.4	2.4	304.	37.	AG	456.	.0	.0	6.4		
7. Link 4A	-2.4	2.4	181.7	247.5	307.	37.	AG	96.	10.1	.0	10.1		
8. Link 4B	4.9	12.5	7.8	16.3	5.	37.	AG	360.	100.0	.0	6.4	.16	.8
9. Link 5A	238.7	-187.1	-2.1	-5.8	301.	307.	AG	467.	13.1	.0	14.6		
10. Link 5B	238.7	-187.1	-2.1	-5.8	301.	307.	AG	467.	.0	.0	8.5		
11. Link 6A	-1.5	-4.3	-247.2	186.5	311.	308.	AG	522.	13.7	.0	11.3		
12. Link 6B	-11.6	4.0	-247.2	186.5	298.	308.	AG	522.	112.0	.0	7.6		
13. Link 7A	-242.0	190.8	2.7	3.0	308.	127.	AG	195.	10.2	.0	11.3		
14. Link 7B	-242.0	190.8	-235.6	185.9	8.	127.	AG	195.	301.0	.0	7.6		
15. Link 8A	1.5	.6	241.7	-181.4	301.	127.	AG	212.	9.7	.0	15.8		
16. Link 8B	12.2	-7.6	22.3	-15.3	13.	127.	AG	424.	100.0	.0	9.8	.56	2.1
17. Link 9A	8.5	11.6	67.1	-34.7	75.	128.	AG	423.	11.1	.0	11.0		
18. Link 9B	19.2	3.4	36.8	-10.7	22.	129.	AG	394.	100.0	.0	7.3	.72	3.7
19. Link 10A	67.1	-34.7	164.3	-110.6	123.	128.	BR	423.	11.1	4.6	11.0		
20. Link 10B	67.1	-34.7	164.3	-110.6	123.	128.	BR	423.	.0	4.6	7.3		
21. Link 11A	164.3	-110.6	194.2	-112.2	30.	93.	BR	423.	11.1	9.1	11.0		
22. Link 11B	164.3	-110.6	194.2	-112.2	30.	93.	BR	423.	.0	9.1	7.3		
23. Link 12A	194.2	-112.2	232.3	-82.3	48.	52.	BR	423.	11.1	9.1	11.0		
24. Link 12B	194.2	-112.2	232.3	-82.3	48.	52.	BR	423.	.0	9.1	7.3		
25. Link 13A	390.1	103.0	20.4	-377.6	606.	218.	BR	4005.	4.4	9.1	17.4		
26. Link 13B	390.1	103.0	20.4	-377.6	606.	218.	BR	4005.	.0	9.1	13.7		
27. Link 14A	3.4	-375.8	384.4	112.8	620.	38.	BR	4954.	4.4	9.1	17.4		
28. Link 14B	3.4	-375.8	384.4	112.8	620.	38.	BR	4954.	.0	9.1	13.7		

JOB: CASE:1 BUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqbkbd.dat>

DATE : 8/11/99
TIME : 11: 0: 1

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
4. Link 2B	95	63	1.0	120	900	115.26	1	3
8. Link 4B	95	60	1.0	96	900	106.19	1	3
16. Link 8B	95	72	1.0	212	900	104.23	1	3
18. Link 9B	95	61	1.0	423	900	114.27	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. 1:	-25.0	31.1	1.8
2. 2:	-12.8	21.9	1.8
3. 3:	-7.0	17.1	1.8
4. 4:	-.3	13.1	1.8
5. 5:	4.3	19.2	1.8
6. 6:	8.8	25.3	1.8
7. 7:	18.0	37.5	1.8
8. 8:	37.2	35.1	1.8
9. 9:	28.0	22.9	1.8
10. 10:	23.5	16.8	1.8
11. 11:	18.9	10.7	1.8
12. 12:	25.0	6.1	1.8
13. 13:	30.8	1.2	1.8
14. 14:	42.7	-8.2	1.8
15. 15:	23.8	-34.1	1.8
16. 16:	11.6	-25.0	1.8
17. 17:	5.5	-20.4	1.8
18. 18:	-.9	-15.8	1.8
19. 19:	-5.5	-21.9	1.8
20. 20:	-10.1	-28.0	1.8
21. 21:	-19.5	-39.9	1.8
22. 22:	-31.1	-27.7	1.8
23. 23:	-21.6	-15.8	1.8
24. 24:	-17.1	-9.8	1.8
25. 25:	-12.5	-3.7	1.8
26. 26:	-18.3	1.2	1.8
27. 27:	-24.1	5.8	1.8
28. 28:	-36.3	15.2	1.8

JOB: CASE:1 BUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqbkbd.dat>

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	1.0	.9	.4	.5	1.3	1.0
2.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	1.1	.8	.4	.5	1.2	1.0
4.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	1.0	.8	.5	.5	1.3	1.0
6.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	1.0	1.0	.5	.4	1.2	.9
8.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	1.0	1.2	.5	.4	1.2	.9
10.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.9	1.2	.7	.5	1.2	.9
12.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.9	1.2	.7	.5	1.2	.9
14.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.8	1.2	.7	.4	1.1	.8
16.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.8	1.4	.7	.4	.9	.8
18.	*	.0	.0	.0	.0	.0	.0	.0	.1	.2	.2	.2	.1	.1	.0	.7	1.4	.8	.4	.9	.9
20.	*	.0	.0	.0	.0	.0	.0	.0	.2	.2	.2	.2	.1	.1	.0	.7	1.4	.8	.4	.8	.9
22.	*	.0	.0	.0	.0	.0	.0	.0	.2	.2	.2	.2	.1	.1	.0	.7	1.4	.9	.4	.7	.9
24.	*	.0	.0	.0	.1	.0	.0	.0	.2	.2	.2	.2	.1	.1	.0	.6	1.4	1.0	.4	.6	.8
26.	*	.0	.0	.0	.1	.0	.0	.0	.2	.2	.2	.2	.1	.1	.0	.6	1.5	1.0	.4	.6	.7
28.	*	.0	.0	.0	.1	.0	.0	.0	.2	.2	.2	.2	.1	.0	.0	.5	1.5	1.0	.5	.8	.7
30.	*	.0	.0	.0	.1	.0	.0	.0	.1	.2	.2	.2	.1	.0	.0	.5	1.4	1.1	.5	.6	.7
32.	*	.0	.0	.0	.1	.0	.0	.0	.1	.2	.2	.2	.1	.0	.0	.5	1.4	1.2	.6	.6	.7
34.	*	.0	.0	.0	.4	.2	.2	.2	.1	.1	.1	.2	.1	.0	.0	.5	1.3	1.2	.6	.5	.7
36.	*	.0	.0	.0	.4	.2	.2	.2	.1	.1	.1	.1	.1	.0	.0	.5	1.3	1.3	.6	.5	.6
38.	*	.0	.0	.0	.4	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.4	1.3	1.3	.6	.5	.6
40.	*	.0	.0	.0	.4	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.4	1.3	1.2	.7	.7	.7
42.	*	.0	.0	.0	.5	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.4	1.2	1.3	.8	.7	.8
44.	*	.0	.0	.1	.5	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.4	1.2	1.4	.8	.7	.6
46.	*	.0	.0	.1	.5	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.4	1.2	1.4	.8	.7	.6
48.	*	.0	.0	.1	.5	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.4	1.1	1.4	.9	.7	.6
50.	*	.0	.0	.1	.6	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.3	1.1	1.4	.9	.7	.6
52.	*	.0	.0	.1	.6	.2	.2	.2	.1	.1	.1	.1	.0	.0	.0	.3	1.0	1.4	.9	.8	.6
54.	*	.0	.0	.1	.6	.2	.2	.2	.0	.0	.0	.0	.0	.0	.0	.3	.9	1.4	1.0	.8	.7
56.	*	.0	.0	.1	.6	.2	.2	.2	.0	.0	.0	.0	.0	.0	.0	.3	.9	1.4	1.0	.8	.6
58.	*	.0	.0	.1	.7	.2	.2	.2	.0	.0	.0	.0	.0	.0	.0	.3	.9	1.4	1.0	.8	.6
60.	*	.0	.0	.1	.7	.2	.2	.2	.0	.0	.0	.0	.0	.0	.0	.3	.7	1.3	1.0	.9	.6
62.	*	.0	.0	.1	.7	.2	.2	.2	.0	.0	.0	.0	.0	.0	.0	.3	.7	1.3	1.2	.9	.6
64.	*	.0	.0	.1	.7	.2	.2	.2	.0	.0	.0	.0	.0	.0	.0	.3	.7	1.2	1.3	.9	.6
66.	*	.0	.0	.2	.6	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.4	.7	1.3	1.3	.9	.5
68.	*	.0	.0	.2	.7	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.5	.7	1.3	1.3	.9	.5
70.	*	.0	.0	.2	.7	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.5	.6	1.2	1.3	.8	.5
72.	*	.0	.0	.2	.7	.1	.1	.1	.0	.0	.0	.0	.0	.0	.1	.5	.7	1.3	1.2	.7	.6
74.	*	.0	.0	.2	.7	.1	.1	.1	.0	.0	.0	.0	.0	.1	.1	.6	.7	1.2	1.3	.8	.5
76.	*	.0	.0	.2	.7	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.6	.7	1.1	1.3	.8	.5
78.	*	.0	.0	.2	.7	.1	.1	.1	.0	.1	.1	.1	.1	.1	.2	.6	.7	1.1	1.3	.9	.4
80.	*	.0	.0	.4	.8	.2	.2	.1	.1	.1	.1	.1	.1	.1	.2	.6	.7	1.2	1.3	1.0	.5
82.	*	.0	.1	.4	.9	.2	.2	.2	.1	.1	.1	.1	.2	.2	.2	.6	.6	1.1	1.4	.8	.5

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
84.	*	.1	.1	.4	.9	.3	.2	.2	.1	.1	.1	.2	.2	.2	.2	.6	.6	1.0	1.3	.8	.5
86.	*	.1	.2	.3	1.0	.3	.2	.2	.1	.2	.2	.2	.2	.2	.2	.5	.6	1.0	1.3	.8	.5
88.	*	.1	.2	.4	1.1	.4	.3	.2	.2	.2	.2	.2	.2	.2	.2	.5	.6	.9	1.3	.8	.4
90.	*	.1	.3	.5	1.1	.4	.3	.3	.2	.2	.2	.2	.2	.2	.2	.6	.7	1.0	1.2	.7	.4
92.	*	.1	.3	.5	1.1	.4	.3	.3	.2	.2	.2	.2	.2	.2	.2	.6	.7	1.0	1.2	.6	.3
94.	*	.2	.3	.5	1.0	.4	.3	.3	.2	.2	.2	.2	.2	.2	.2	.6	.7	1.0	1.2	.5	.3
96.	*	.2	.4	.7	1.1	.4	.3	.3	.2	.2	.2	.2	.2	.2	.2	.6	.6	.8	1.1	.5	.3
98.	*	.2	.4	.7	1.1	.4	.3	.3	.2	.2	.2	.2	.2	.2	.2	.6	.6	.8	1.1	.5	.3
100.	*	.2	.4	.7	1.1	.5	.3	.3	.2	.2	.2	.2	.2	.2	.2	.7	.6	.7	1.1	.5	.3
102.	*	.3	.4	.8	1.1	.5	.3	.3	.2	.2	.2	.2	.2	.2	.2	.7	.6	.7	1.1	.5	.3
104.	*	.3	.5	.8	1.1	.6	.3	.3	.2	.2	.2	.3	.3	.2	.2	.7	.6	.7	.8	.4	.3
106.	*	.4	.5	.8	1.1	.7	.3	.3	.2	.2	.2	.3	.3	.2	.2	.7	.6	.6	.8	.4	.3
108.	*	.4	.6	.8	1.1	.7	.3	.3	.2	.2	.2	.4	.3	.3	.2	.7	.6	.6	.8	.4	.3
110.	*	.4	.6	.8	1.2	.8	.3	.3	.2	.2	.2	.4	.4	.4	.3	.7	.6	.6	.7	.4	.3
112.	*	.4	.6	.9	1.3	.9	.3	.3	.2	.2	.2	.5	.4	.4	.3	.7	.6	.6	.7	.4	.3
114.	*	.4	.7	.9	1.3	.9	.3	.3	.2	.2	.2	.5	.4	.4	.3	.7	.6	.6	.7	.4	.3
116.	*	.6	.7	.9	1.2	.9	.4	.3	.2	.2	.2	.6	.5	.4	.3	.7	.6	.6	.7	.4	.3
118.	*	.7	.8	1.0	1.3	1.1	.4	.3	.2	.2	.2	.6	.5	.4	.3	.6	.6	.6	.7	.4	.3
120.	*	.9	.8	1.0	1.3	1.1	.4	.3	.2	.2	.2	.7	.6	.5	.4	.6	.6	.6	.6	.4	.3
122.	*	.9	.8	1.1	1.3	1.1	.4	.3	.2	.2	.2	.7	.6	.5	.4	.6	.6	.6	.6	.4	.3
124.	*	1.0	.8	1.0	1.4	1.5	.5	.3	.2	.2	.2	.9	.7	.5	.4	.6	.6	.6	.6	.3	.3
126.	*	1.0	1.0	1.1	1.4	1.5	.6	.3	.2	.2	.2	1.1	.9	.9	.5	.5	.5	.5	.5	.3	.3
128.	*	.9	1.0	1.2	1.4	1.7	.7	.3	.2	.2	.3	1.1	1.0	.9	.5	.5	.5	.5	.5	.3	.3
130.	*	.9	1.0	1.2	1.4	1.7	.7	.3	.2	.2	.4	1.2	1.0	1.0	.6	.5	.5	.5	.5	.3	.3
132.	*	.9	1.1	1.1	1.1	1.7	.8	.3	.2	.2	.5	1.3	1.1	1.0	.6	.4	.4	.4	.4	.3	.2
134.	*	.9	1.1	1.2	1.3	1.9	.8	.3	.2	.3	.5	1.3	1.2	1.1	.6	.4	.4	.4	.4	.3	.2
136.	*	.9	1.1	1.2	1.3	1.9	.8	.4	.2	.3	.6	1.4	1.3	1.1	.6	.4	.4	.4	.4	.3	.2
138.	*	1.0	1.0	1.1	1.3	1.9	.8	.5	.2	.3	.6	1.5	1.3	1.3	.7	.4	.4	.4	.4	.2	.2
140.	*	1.0	.9	1.0	1.2	2.0	.9	.5	.2	.3	.6	1.6	1.5	1.3	.7	.4	.4	.4	.3	.2	.2
142.	*	1.1	.8	1.0	1.2	2.0	1.0	.5	.3	.4	.7	1.6	1.6	1.3	.7	.3	.3	.3	.3	.2	.2
144.	*	1.2	.8	.9	1.2	2.1	1.0	.5	.3	.4	.7	1.6	1.6	1.4	.7	.3	.3	.3	.3	.2	.2
146.	*	1.1	.8	.9	1.1	2.0	1.0	.5	.3	.5	.7	1.8	1.7	1.4	.7	.3	.3	.3	.3	.2	.2
148.	*	1.2	.8	.7	1.1	1.9	1.0	.6	.3	.5	.8	1.8	1.7	1.5	.6	.3	.3	.3	.3	.2	.2
150.	*	1.2	.7	.7	1.0	1.9	1.0	.7	.3	.5	.8	1.8	1.8	1.5	.6	.3	.3	.3	.3	.2	.2
152.	*	1.4	.7	.7	1.0	1.8	1.0	.7	.3	.5	.9	1.8	1.8	1.6	.6	.3	.3	.3	.3	.2	.2
154.	*	1.5	.8	.7	.9	1.9	1.1	.7	.3	.6	.9	1.8	1.8	1.6	.6	.3	.3	.3	.2	.2	.2
156.	*	1.6	1.0	.6	.6	1.9	1.1	.7	.3	.6	.9	1.8	1.9	1.6	.6	.2	.2	.2	.2	.2	.2
158.	*	1.6	1.0	.6	.6	1.8	1.1	.8	.3	.6	1.0	1.8	1.9	1.7	.6	.2	.2	.2	.2	.2	.2
160.	*	1.5	1.1	.8	.6	1.7	1.1	.8	.3	.7	1.1	1.8	2.0	1.7	.6	.2	.2	.2	.2	.2	.2
162.	*	1.6	1.1	.8	.5	1.6	1.1	.9	.4	.7	1.1	1.8	1.9	1.7	.6	.2	.2	.2	.2	.2	.2
164.	*	1.6	1.0	.8	.5	1.6	1.0	.9	.4	.7	1.1	1.7	1.9	1.8	.6	.2	.2	.2	.2	.2	.2
166.	*	1.6	1.0	.7	.5	1.5	1.1	.9	.4	.7	1.1	1.7	1.9	1.7	.6	.2	.2	.2	.2	.2	.2
168.	*	1.7	.9	.8	.4	1.5	1.1	.9	.4	.9	1.2	1.7	1.9	1.7	.5	.2	.2	.2	.2	.1	.1
170.	*	1.6	1.0	.7	.4	1.3	1.0	.9	.5	.9	1.2	1.6	1.9	1.7	.5	.2	.2	.2	.1	.1	.1
172.	*	1.5	1.0	.7	.6	1.3	.9	.8	.5	.9	1.3	1.7	2.0	1.7	.5	.2	.2	.1	.1	.1	.1
174.	*	1.5	1.1	.7	.7	1.2	.9	.7	.5	.8	1.2	1.5	1.9	1.8	.5	.2	.1	.1	.1	.1	.1
176.	*	1.6	1.1	.5	.7	1.1	1.0	.7	.5	.8	1.1	1.5	1.9	1.7	.5	.1	.1	.1	.1	.1	.0
178.	*	1.5	1.2	.6	.5	.8	1.0	.7	.5	.9	1.1	1.5	2.0	1.7	.5	.1	.1	.1	.0	.0	.0
180.	*	1.5	1.2	.6	.5	.8	.9	.6	.5	.9	1.1	1.4	2.0	1.7	.4	.1	.1	.0	.0	.0	.0
182.	*	1.5	1.3	.6	.5	.9	.9	.6	.6	.9	1.1	1.3	2.0	1.8	.4	.1	.0	.0	.0	.0	.0
184.	*	1.5	1.3	.7	.5	.9	.7	.6	.5	.9	1.1	1.2	1.9	1.6	.4	.0	.0	.0	.0	.0	.0
186.	*	1.5	1.3	.7	.5	.9	.6	.6	.5	.9	1.0	1.2	2.0	1.6	.4	.0	.0	.0	.0	.0	.0

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
188.	*	1.5	1.4	.8	.5	.9	.6	.6	.8	1.0	1.1	2.0	1.6	.3	.0	.0	.0	.0	.0	.0									
190.	*	1.5	1.4	.9	.5	.9	.6	.5	.6	.8	1.0	1.1	1.9	1.6	.3	.0	.0	.0	.0	.0	.0								
192.	*	1.5	1.4	.9	.4	.9	.7	.5	.6	.8	1.0	1.1	1.9	1.6	.3	.0	.0	.0	.0	.0	.0								
194.	*	1.5	1.4	1.1	.4	.9	.7	.4	.6	.8	.9	1.0	1.9	1.7	.3	.0	.0	.0	.0	.0	.0								
196.	*	1.5	1.4	1.1	.5	.7	.5	.4	.6	.8	.9	1.0	1.9	1.6	.2	.0	.0	.0	.0	.0	.0								
198.	*	1.5	1.4	1.2	.5	.7	.5	.5	.6	.8	.9	.8	1.9	1.6	.2	.0	.0	.0	.0	.0	.0								
200.	*	1.5	1.5	1.2	.5	.7	.5	.4	.5	.7	.8	.8	1.9	1.7	.2	.0	.0	.0	.0	.0	.0								
202.	*	1.5	1.5	1.2	.6	.7	.7	.3	.5	.7	.8	.8	1.9	1.7	.2	.0	.0	.0	.0	.0	.0								
204.	*	1.5	1.5	1.2	.6	.8	.7	.4	.5	.7	.8	.8	1.9	1.7	.2	.0	.0	.0	.0	.0	.0								
206.	*	1.5	1.5	1.2	.6	.8	.7	.3	.5	.7	.7	.7	1.8	1.8	.2	.0	.0	.0	.0	.0	.0								
208.	*	1.5	1.5	1.3	.6	.8	.7	.3	.4	.8	.8	.8	1.9	1.9	.3	.0	.0	.0	.1	.1	.1								
210.	*	1.5	1.5	1.2	.6	.7	.7	.3	.5	.8	.8	.9	1.9	1.9	.3	.0	.0	.0	.2	.1	.1								
212.	*	1.4	1.5	1.3	.7	.8	.7	.3	.5	.8	.9	.9	1.9	1.9	.3	.0	.0	.0	.3	.2	.2								
214.	*	1.4	1.5	1.3	.7	.8	.7	.5	.5	.7	.8	.8	2.0	2.0	.4	.0	.0	.1	.3	.2	.2								
216.	*	1.4	1.5	1.3	.7	.7	.6	.5	.4	.7	.7	.7	1.9	2.0	.4	.0	.0	.1	.3	.2	.2								
218.	*	1.4	1.5	1.4	.7	.7	.7	.5	.4	.7	.7	.7	1.9	2.1	.4	.0	.0	.1	.4	.2	.2								
220.	*	1.4	1.5	1.4	.7	.7	.7	.5	.5	.6	.7	.7	2.0	2.1	.4	.0	.1	.1	.4	.2	.2								
222.	*	1.4	1.4	1.4	.9	.6	.6	.6	.5	.6	.7	.7	1.9	2.1	.4	.0	.1	.1	.4	.2	.2								
224.	*	1.4	1.4	1.5	.9	.7	.6	.6	.5	.7	.5	.7	1.8	2.1	.5	.0	.1	.1	.5	.2	.2								
226.	*	1.5	1.4	1.5	.8	.6	.7	.6	.6	.8	.5	.6	1.8	2.1	.6	.0	.1	.1	.6	.3	.3								
228.	*	1.5	1.4	1.4	.9	.6	.7	.6	.4	.6	.5	.6	1.8	2.1	.7	.0	.1	.1	.6	.3	.3								
230.	*	1.5	1.4	1.4	.9	.7	.7	.6	.4	.5	.5	.6	1.6	2.0	.8	.1	.1	.1	.7	.3	.3								
232.	*	1.5	1.4	1.4	1.0	.7	.8	.5	.5	.5	.6	.4	1.5	2.1	.7	.1	.1	.1	.7	.3	.3								
234.	*	1.4	1.4	1.4	1.0	.7	.8	.5	.5	.6	.7	.6	1.4	2.1	.8	.1	.1	.1	.8	.3	.3								
236.	*	1.4	1.4	1.4	1.1	.8	.6	.5	.5	.6	.7	.6	1.4	2.1	.8	.1	.1	.1	.8	.3	.3								
238.	*	1.5	1.4	1.4	1.1	.7	.7	.6	.5	.6	.7	.6	1.2	2.1	.9	.1	.1	.1	.8	.3	.3								
240.	*	1.5	1.4	1.5	1.0	.8	.7	.6	.6	.6	.7	.6	1.2	2.0	1.0	.1	.1	.1	.9	.3	.3								
242.	*	1.5	1.4	1.5	1.1	.8	.7	.6	.6	.7	.7	.6	1.3	2.0	1.1	.1	.1	.1	.9	.3	.3								
244.	*	1.5	1.4	1.5	1.1	.8	.7	.6	.6	.7	.7	.6	1.2	2.1	1.2	.1	.1	.1	.9	.3	.3								
246.	*	1.5	1.5	1.5	1.2	.9	.7	.6	.6	.6	.8	.6	1.2	2.1	1.3	.1	.1	.1	1.0	.3	.3								
248.	*	1.5	1.5	1.5	1.2	.9	.8	.6	.6	.6	.8	.6	1.2	2.0	1.4	.1	.1	.2	1.0	.3	.3								
250.	*	1.5	1.5	1.5	1.2	.9	.8	.6	.6	.7	.8	.8	1.1	2.1	1.4	.1	.1	.2	1.0	.3	.3								
252.	*	1.5	1.5	1.5	1.3	.9	.8	.6	.6	.7	.9	.8	1.2	2.1	1.4	.1	.1	.2	1.0	.2	.2								
254.	*	1.5	1.5	1.5	1.3	.9	.8	.6	.6	.7	.8	.8	1.1	2.1	1.6	.1	.1	.2	1.0	.2	.2								
256.	*	1.5	1.5	1.5	1.3	1.0	.8	.7	.6	.8	.8	.9	1.0	2.0	1.6	.1	.1	.2	1.0	.2	.2								
258.	*	1.5	1.5	1.6	1.4	1.0	.8	.7	.7	.8	.9	.8	1.1	2.1	1.6	.1	.1	.2	1.0	.2	.2								
260.	*	1.6	1.5	1.6	1.4	1.0	.9	.7	.7	.8	.9	.9	1.2	2.2	1.9	.1	.1	.3	1.0	.2	.2								
262.	*	1.6	1.6	1.6	1.5	1.0	.9	.7	.7	.9	1.0	.9	1.1	1.9	1.9	.1	.1	.3	1.1	.2	.2								
264.	*	1.6	1.6	1.6	1.5	1.0	.9	.7	.7	.9	1.0	1.1	1.1	1.9	2.0	.1	.2	.3	1.1	.2	.2								
266.	*	1.6	1.6	1.6	1.5	1.1	.9	.7	.7	.9	1.0	1.1	1.1	2.0	2.0	.1	.2	.3	1.1	.3	.2								
268.	*	1.6	1.6	1.6	1.5	1.2	.9	.7	.7	.9	1.1	1.2	1.3	1.8	2.0	.1	.2	.3	1.0	.2	.1								
270.	*	1.7	1.6	1.7	1.6	1.2	.9	.7	.7	.9	1.1	1.2	1.2	1.9	1.9	.1	.2	.4	1.0	.2	.1								
272.	*	1.7	1.7	1.7	1.6	1.2	.9	.7	.7	1.0	1.1	1.3	1.3	1.9	2.0	.1	.2	.4	1.0	.2	.1								
274.	*	1.7	1.7	1.7	1.6	1.2	.9	.7	.7	.9	1.1	1.3	1.3	1.9	2.1	.1	.2	.4	1.0	.2	.1								
276.	*	1.7	1.7	1.7	1.7	1.2	.9	.7	.7	.9	1.1	1.3	1.4	1.8	2.1	.1	.2	.4	.9	.2	.1								
278.	*	1.7	1.7	1.7	1.7	1.2	.9	.7	.7	.9	1.1	1.5	1.4	1.9	2.2	.1	.2	.4	.9	.2	.1								
280.	*	1.8	1.7	1.8	1.7	1.3	1.0	.7	.8	.9	1.1	1.5	1.5	1.9	2.1	.1	.4	.5	1.0	.2	.1								
282.	*	1.8	1.8	1.8	1.7	1.3	1.0	.7	.7	.9	1.1	1.5	1.4	2.0	2.2	.3	.4	.6	1.0	.2	.1								
284.	*	1.8	1.8	1.8	1.7	1.3	1.0	.7	.7	.9	1.1	1.7	1.5	2.1	2.2	.4	.4	.6	1.0	.3	.1								
286.	*	1.8	1.8	1.8	1.8	1.3	1.0	.7	.7	.9	1.1	1.7	1.4	2.0	2.3	.4	.4	.7	1.0	.4	.1								
288.	*	1.8	1.8	1.9	1.8	1.3	1.0	.7	.7	.9	1.1	1.7	1.4	2.1	2.3	.5	.6	.7	1.0	.4	.1								
290.	*	1.8	1.8	1.9	1.8	1.3	1.0	.7	.7	.9	1.1	1.7	1.5	2.0	2.2	.5	.7	.8	1.1	.5	.2								

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
292.	*	1.8	1.8	1.9	1.8	1.3	.9	.7	.7	.9	1.1	1.7	1.6	2.0	2.2	.6	.8	1.1	1.2	.6	.2								
294.	*	1.8	1.8	1.8	1.8	1.2	.9	.6	.6	.8	1.0	1.7	1.4	1.9	2.3	.7	.9	1.1	1.3	.6	.2								
296.	*	1.8	1.8	1.8	1.7	1.2	.9	.6	.6	.8	.9	1.6	1.3	1.9	2.2	.8	1.0	1.2	1.4	.8	.3								
298.	*	1.7	1.7	1.8	1.7	1.2	.8	.6	.5	.8	.9	1.4	1.3	1.8	2.2	.9	1.1	1.3	1.4	1.0	.3								
300.	*	1.7	1.7	1.7	1.6	1.1	.8	.5	.4	.7	.8	1.3	1.2	1.7	2.0	1.0	1.2	1.4	1.5	1.2	.4								
302.	*	1.6	1.6	1.6	1.6	.9	.7	.4	.4	.6	.8	1.3	1.2	1.5	2.0	1.1	1.3	1.6	1.7	1.2	.4								
304.	*	1.5	1.5	1.5	1.5	.9	.7	.3	.3	.6	.7	1.2	1.1	1.4	1.9	1.1	1.4	1.7	1.8	1.3	.6								
306.	*	1.4	1.4	1.4	1.3	.8	.6	.3	.3	.4	.7	1.1	1.0	1.2	1.6	1.2	1.6	1.8	2.0	1.5	.7								
308.	*	1.2	1.2	1.2	1.2	.7	.5	.2	.3	.4	.6	1.1	1.0	1.2	1.5	1.3	1.6	1.7	2.0	1.6	.8								
310.	*	1.1	1.1	1.1	1.1	.6	.4	.2	.2	.3	.4	.9	.9	1.0	1.3	1.4	1.8	1.8	2.1	1.8	.8								
312.	*	1.0	1.0	1.0	.9	.5	.3	.1	.2	.3	.4	.8	.8	.9	1.1	1.4	1.7	1.8	2.1	1.9	.9								
314.	*	.9	.9	.9	.8	.4	.2	.1	.2	.2	.3	.5	.6	.7	.9	1.4	1.7	1.9	2.2	2.1	1.0								
316.	*	.7	.7	.8	.7	.3	.2	.1	.1	.2	.3	.5	.6	.6	.8	1.3	1.7	1.8	2.2	2.2	1.0								
318.	*	.6	.6	.7	.6	.2	.1	.1	.1	.2	.2	.4	.5	.5	.6	1.4	1.6	1.7	2.2	2.3	1.1								
320.	*	.5	.5	.6	.3	.2	.1	.0	.1	.2	.2	.4	.4	.4	.6	1.2	1.6	1.7	2.0	2.3	1.1								
322.	*	.4	.3	.4	.3	.1	.1	.0	.1	.1	.2	.3	.2	.3	.4	1.2	1.5	1.6	2.0	2.3	1.2								
324.	*	.2	.2	.2	.2	.1	.0	.0	.1	.1	.1	.2	.2	.3	.4	1.1	1.4	1.5	2.0	2.4	1.2								
326.	*	.1	.1	.2	.1	.1	.0	.0	.1	.1	.1	.2	.2	.1	.3	1.1	1.2	1.6	1.9	2.4	1.2								
328.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.0	.1	1.0	.9	1.3	1.6	2.3	1.3								
330.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.0	.1	1.0	.9	1.3	1.4	2.3	1.3								
332.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.1	1.0	.9	1.2	1.3	2.2	1.2								
334.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.1	1.1	.8	1.0	1.2	2.2	1.2								
336.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.9	.7	.9	1.1	2.1	1.2								
338.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.9	.7	.8	1.1	2.1	1.1								
340.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.8	.6	.7	1.0	2.0	1.2								
342.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.9	.7	.6	.9	1.9	1.2								
344.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	1.0	.5	.5	.8	1.9	1.1								
346.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.9	.6	.5	.8	1.7	1.1								
348.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	1.0	.7	.6	.6	1.6	1.1								
350.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	1.0	.7	.5	.6	1.6	1.1								
352.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	1.1	.6	.5	.5	1.5	1.1								
354.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	1.1	.8	.4	.5	1.5	1.1								
356.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	1.0	.8	.4	.4	1.4	1.2								
358.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	1.0	.8	.3	.5	1.4	1.1								
360.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	1.0	.9	.4	.5	1.3	1.0								
MAX	*	1.8	1.8	1.9	1.8	2.1	1.1	.9	.8	1.0	1.3	1.8	2.0	2.2	2.3	1.4	1.8	1.9	2.2	2.4	1.3								
DEGR.	*	280	282	288	286	144	154	162	280	272	172	146	160	260	286	318	310	314	314	324	328								

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) * REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	* .8	.7	.9	1.2	1.4	2.2	2.2	2.2
2.	* .8	.7	.9	1.2	1.3	2.2	2.2	2.2
4.	* .8	.7	.9	1.1	1.2	2.1	2.0	2.1
6.	* .8	.7	.9	1.1	1.1	2.0	2.0	2.0
8.	* .7	.7	.8	1.0	1.1	2.0	2.0	2.0
10.	* .7	.7	.9	1.0	1.0	2.0	2.0	2.0
12.	* .7	.7	.9	1.1	.9	2.0	2.0	2.0
14.	* .6	.7	.9	1.0	.9	2.0	1.9	1.9
16.	* .6	.7	.8	1.0	.9	2.0	1.9	1.9
18.	* .6	.7	.7	.9	.9	2.0	2.0	2.0
20.	* .5	.7	.7	.9	.8	1.9	2.0	2.0
22.	* .4	.6	.7	.8	.8	1.9	1.9	1.9
24.	* .5	.6	.7	.8	.7	1.9	1.9	1.9
26.	* .5	.6	.6	.8	.7	1.9	1.9	1.9
28.	* .6	.5	.6	.7	.7	1.9	1.9	1.9
30.	* .6	.6	.7	.8	.6	1.9	1.9	1.9
32.	* .5	.6	.6	.7	.6	1.9	1.9	1.9
34.	* .5	.6	.6	.9	.6	1.9	1.9	1.9
36.	* .4	.5	.7	.8	.6	1.8	1.9	1.9
38.	* .4	.6	.7	.8	.6	1.8	1.9	1.9
40.	* .4	.6	.7	.8	.6	1.8	1.9	1.9
42.	* .4	.6	.7	.6	.5	1.9	1.9	1.9
44.	* .4	.5	.6	.6	.5	1.9	1.9	1.9
46.	* .4	.7	.6	.6	.5	1.9	1.9	1.9
48.	* .5	.6	.6	.6	.5	1.9	1.9	1.9
50.	* .6	.7	.6	.6	.6	1.8	1.9	1.9
52.	* .6	.7	.6	.6	.6	1.8	1.9	1.9
54.	* .5	.6	.6	.6	.6	1.7	1.9	1.9
56.	* .4	.6	.7	.6	.6	1.6	1.9	1.9
58.	* .3	.6	.6	.6	.7	1.6	2.0	1.9
60.	* .3	.8	.7	.5	.7	1.5	2.0	1.9
62.	* .3	.8	.7	.5	.7	1.5	2.0	2.0
64.	* .3	.8	.9	.5	.7	1.4	2.0	2.0
66.	* .3	.8	.8	.7	.8	1.3	2.0	2.0
68.	* .3	.8	.8	.8	.7	1.4	2.0	2.0
70.	* .3	.6	.9	.8	.8	1.3	2.0	2.0
72.	* .4	.6	.9	.8	.9	1.3	2.0	2.0
74.	* .4	.7	1.0	.8	.8	1.2	2.2	2.2
76.	* .4	.7	1.1	1.0	.8	1.2	2.2	2.2
78.	* .3	.7	1.1	1.0	1.0	1.4	2.2	2.2
80.	* .3	.7	1.2	1.1	1.0	1.5	2.3	2.2
82.	* .3	.8	1.2	1.1	1.1	1.5	2.3	2.4

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) * REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
84.	* .3	.8	1.3	1.1	1.2	1.4	2.2	2.4
86.	* .3	.8	1.3	1.1	1.3	1.5	2.2	2.5
88.	* .3	.8	1.3	1.1	1.3	1.5	2.5	2.6
90.	* .3	.8	1.2	1.1	1.3	1.4	2.5	2.6
92.	* .3	.6	1.2	1.2	1.3	1.5	2.4	2.7
94.	* .3	.5	1.2	1.2	1.4	1.4	2.3	2.7
96.	* .3	.5	1.2	1.3	1.5	1.5	2.3	2.6
98.	* .3	.5	1.1	1.2	1.4	1.4	2.3	2.7
100.	* .3	.5	1.0	1.2	1.5	1.4	2.4	2.7
102.	* .3	.5	1.0	1.3	1.4	1.3	2.3	2.7
104.	* .3	.5	.9	1.3	1.4	1.3	2.2	2.6
106.	* .3	.5	.9	1.3	1.4	1.4	2.3	2.7
108.	* .3	.5	1.0	1.4	1.4	1.4	2.2	2.7
110.	* .3	.5	1.0	1.4	1.3	1.4	2.1	2.6
112.	* .3	.5	.7	1.2	1.2	1.3	2.0	2.5
114.	* .3	.5	.7	1.2	1.3	1.2	1.9	2.4
116.	* .3	.5	.7	1.1	1.2	1.2	1.8	2.3
118.	* .3	.5	.7	1.2	1.2	1.2	1.8	2.2
120.	* .3	.5	.6	1.2	1.2	1.2	1.7	2.1
122.	* .3	.5	.6	1.2	1.2	1.2	1.6	2.0
124.	* .2	.5	.6	1.1	1.2	1.1	1.5	2.0
126.	* .2	.4	.6	1.1	1.1	1.0	1.2	1.8
128.	* .2	.4	.6	1.0	1.1	.9	1.2	1.6
130.	* .2	.4	.6	1.0	1.0	.8	1.1	1.5
132.	* .2	.4	.5	1.0	1.0	.9	1.1	1.4
134.	* .2	.4	.5	.9	1.0	.9	.8	1.3
136.	* .2	.4	.4	.9	.9	.9	.8	1.2
138.	* .2	.4	.4	.9	.8	.7	.7	1.0
140.	* .2	.4	.4	.9	.9	.7	.7	.9
142.	* .2	.4	.4	.8	.8	.7	.7	.9
144.	* .2	.4	.4	.7	.8	.7	.6	.8
146.	* .2	.4	.4	.7	.8	.7	.6	.7
148.	* .2	.4	.4	.7	.8	.6	.5	.6
150.	* .2	.4	.4	.7	.9	.6	.5	.6
152.	* .2	.4	.4	.6	.9	.5	.4	.6
154.	* .2	.4	.4	.6	.8	.5	.4	.4
156.	* .2	.4	.4	.6	.8	.5	.4	.3
158.	* .2	.4	.4	.6	.8	.5	.4	.2
160.	* .2	.4	.4	.5	.8	.5	.4	.2
162.	* .2	.3	.4	.5	.8	.5	.3	.2
164.	* .2	.3	.3	.4	.8	.4	.3	.2
166.	* .1	.3	.3	.4	.7	.3	.3	.2
168.	* .1	.3	.3	.4	.6	.3	.3	.2
170.	* .1	.3	.3	.4	.6	.3	.2	.1
172.	* .1	.2	.3	.3	.6	.3	.1	.1

176.	*	.0	.2	.2	.2	.5	.2	.1	.1
178.	*	.0	.2	.2	.2	.5	.2	.1	.1
180.	*	.0	.2	.2	.2	.4	.2	.1	.1
182.	*	.0	.3	.3	.3	.5	.2	.1	.1
184.	*	.0	.3	.3	.3	.5	.2	.1	.1

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
186.	*	.0	.3	.3	.3	.5	.2	.1	.1
188.	*	.0	.3	.3	.3	.4	.2	.1	.1
190.	*	.0	.3	.3	.3	.4	.2	.1	.1
192.	*	.0	.3	.3	.3	.4	.2	.1	.1
194.	*	.0	.3	.3	.3	.4	.2	.1	.1
196.	*	.0	.3	.3	.3	.4	.2	.1	.1
198.	*	.0	.3	.3	.3	.4	.2	.1	.1
200.	*	.0	.3	.3	.3	.3	.2	.1	.1
202.	*	.0	.3	.3	.3	.3	.2	.1	.1
204.	*	.0	.3	.3	.3	.3	.2	.1	.1
206.	*	.0	.3	.4	.4	.4	.2	.1	.1
208.	*	.1	.3	.4	.4	.4	.2	.1	.1
210.	*	.1	.3	.4	.4	.4	.2	.1	.1
212.	*	.2	.3	.4	.4	.4	.1	.1	.0
214.	*	.2	.3	.3	.3	.3	.1	.1	.0
216.	*	.2	.3	.3	.3	.3	.1	.1	.0
218.	*	.2	.3	.3	.3	.3	.1	.1	.0
220.	*	.2	.3	.3	.3	.3	.1	.1	.0
222.	*	.2	.3	.3	.3	.3	.1	.0	.0
224.	*	.2	.2	.3	.3	.3	.1	.0	.0
226.	*	.3	.2	.2	.2	.2	.1	.0	.0
228.	*	.3	.2	.2	.2	.2	.0	.0	.0
230.	*	.3	.2	.2	.2	.2	.0	.0	.0
232.	*	.3	.1	.2	.2	.2	.0	.0	.0
234.	*	.3	.1	.1	.1	.1	.0	.0	.0
236.	*	.3	.1	.1	.1	.1	.0	.0	.0
238.	*	.3	.1	.1	.1	.1	.0	.0	.0
240.	*	.3	.1	.1	.1	.1	.0	.0	.0
242.	*	.3	.1	.1	.1	.1	.0	.0	.0
244.	*	.3	.1	.1	.1	.1	.0	.0	.0
246.	*	.3	.1	.1	.1	.1	.0	.0	.0
248.	*	.3	.0	.1	.1	.1	.0	.0	.0
250.	*	.3	.0	.0	.0	.0	.0	.0	.0
252.	*	.3	.0	.0	.0	.0	.0	.0	.0
254.	*	.2	.0	.0	.0	.0	.0	.0	.0
256.	*	.2	.0	.0	.0	.0	.0	.0	.0
258.	*	.2	.0	.0	.0	.0	.0	.0	.0
260.	*	.2	.0	.0	.0	.0	.0	.0	.0
262.	*	.2	.0	.0	.0	.0	.0	.0	.0
264.	*	.2	.0	.0	.0	.0	.0	.0	.0
266.	*	.2	.0	.0	.0	.0	.0	.0	.0
268.	*	.1	.0	.0	.0	.0	.0	.0	.0
270.	*	.1	.0	.0	.0	.0	.0	.0	.0
272.	*	.1	.0	.0	.0	.0	.0	.0	.0
274.	*	.1	.0	.0	.0	.0	.0	.0	.0
276.	*	.1	.0	.0	.0	.1	.1	.1	.1
278.	*	.1	.0	.0	.0	.1	.1	.1	.1
280.	*	.1	.0	.0	.0	.1	.2	.2	.2
282.	*	.1	.0	.0	.0	.3	.3	.3	.3
284.	*	.1	.0	.0	.1	.3	.4	.4	.4
286.	*	.1	.0	.0	.1	.4	.4	.4	.4

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
288.	*	.1	.0	.0	.1	.5	.5	.5	.5
290.	*	.1	.0	.1	.1	.6	.6	.6	.6
292.	*	.1	.0	.1	.2	.7	.8	.8	.8
294.	*	.1	.0	.1	.3	1.0	1.0	1.0	1.0
296.	*	.2	.1	.2	.5	1.1	1.2	1.2	1.2
298.	*	.2	.1	.2	.5	1.3	1.4	1.4	1.4
300.	*	.2	.1	.3	.6	1.5	1.7	1.7	1.7
302.	*	.3	.2	.5	.8	1.8	1.8	1.9	1.8
304.	*	.3	.2	.6	.9	2.0	2.0	2.0	2.0
306.	*	.3	.3	.6	1.0	2.1	2.2	2.2	2.2
308.	*	.4	.3	.7	1.1	2.3	2.5	2.5	2.5
310.	*	.4	.5	.8	1.3	2.5	2.6	2.7	2.6
312.	*	.6	.5	.9	1.4	2.7	2.8	2.8	2.8
314.	*	.7	.6	1.0	1.5	2.7	2.9	2.9	2.9
316.	*	.7	.6	1.0	1.5	2.9	3.1	3.1	3.1
318.	*	.8	.7	1.1	1.6	3.0	3.2	3.2	3.2
320.	*	.8	.7	1.1	1.6	3.0	3.2	3.2	3.2
322.	*	.8	.8	1.2	1.7	3.0	3.2	3.2	3.2
324.	*	.9	.8	1.3	1.7	2.9	3.2	3.2	3.2
326.	*	.9	.8	1.3	1.7	2.9	3.2	3.2	3.2
328.	*	.9	.8	1.3	1.7	2.8	3.1	3.1	3.1
330.	*	.9	.8	1.3	1.7	2.7	3.1	3.1	3.1
332.	*	.9	.8	1.2	1.6	2.6	3.0	3.0	3.0
334.	*	.9	.8	1.2	1.6	2.5	3.0	3.0	3.0
336.	*	.9	.8	1.1	1.6	2.4	2.8	2.8	2.8
338.	*	.9	.8	1.1	1.6	2.3	2.8	2.8	2.8
340.	*	.9	.8	1.1	1.5	2.2	2.7	2.7	2.7
342.	*	.9	.8	1.1	1.5	2.1	2.6	2.7	2.7
344.	*	.8	.8	1.1	1.5	2.1	2.6	2.6	2.6
346.	*	.8	.8	1.1	1.4	1.9	2.6	2.6	2.6
348.	*	.8	.8	1.1	1.4	1.8	2.4	2.4	2.5
350.	*	.9	.8	1.0	1.4	1.8	2.4	2.4	2.4
352.	*	.9	.8	1.0	1.4	1.7	2.3	2.4	2.4
354.	*	.8	.8	1.0	1.3	1.6	2.3	2.3	2.3
356.	*	.8	.7	1.0	1.3	1.6	2.3	2.3	2.3

360.	*	.8	.7	.9	1.2	1.4	2.2	2.2	2.2
MAX	*	.9	.8	1.3	1.7	3.0	3.2	3.2	3.2
DEGR.	*	350	60	84	322	318	318	318	318

THE HIGHEST CONCENTRATION OF 3.20 PPM OCCURRED AT RECEPTOR REC26.

JOB: CASE:1 BUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqbkbd.dat>

DATE : 8/11/99
TIME : 11: 0: 1

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	*	REC1 280	REC2 282	REC3 288	REC4 286	REC5 144	REC6 154	REC7 162	REC8 280	REC9 272	REC10 172	REC11 146	REC12 160	REC13 260	REC14 286	REC15 318	REC16 310	REC17 314	REC18 314	REC19 324	REC20 328
1	*	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.1	.2	.2	.2	.9	.1
5	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.1	.1	.1	.1	.1
6	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	*	.0	.0	.0	.0	.8	.1	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.0	.0	.0	.0	.1	.1	.1	.0	.0	.1	.1	.1	.1	.0	.2	.2	.1	.1	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.2	.2	.2	.2	.0	.0	.0	.1	.1	.0	.0	.0	.1	.1	.1	.2	.2	.3	.2	.1
12	*	1.5	1.5	1.6	1.5	.0	.0	.0	.6	.7	.0	.0	.0	.2	.6	.8	1.1	1.3	1.5	1.2	1.0
13	*	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.0	.0	.0	.2	.2	.1	.0	.0	.2	.1	.1	.2	.2	.2	.0	.0	.0	.0	.0
17	*	.0	.0	.0	.0	.2	.1	.1	.0	.0	.1	.2	.2	.2	.2	.0	.0	.0	.0	.0	.0
18	*	.0	.0	.0	.0	.4	.3	.3	.0	.0	.7	1.1	1.3	1.2	1.2	.0	.0	.0	.0	.0	.0
19	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	*	.0	.0	.0	.0	.1	.1	.1	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0
26	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	*	.0	.0	.0	.0	.1	.1	.1	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0
28	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 BUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqbkbd.dat>

DATE : 8/11/99
TIME : 11: 0: 1

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	*	REC21 350	REC22 60	REC23 84	REC24 322	REC25 318	REC26 318	REC27 318	REC28 318
1	*	.0	.0	.0	.0	.0	.0	.0	.0
2	*	.0	.0	.0	.0	.0	.0	.0	.0
3	*	.1	.0	.0	.0	.0	.0	.0	.0
4	*	.0	.2	.3	.0	.0	.0	.0	.0
5	*	.1	.3	.2	.0	.0	.0	.0	.0
6	*	.0	.0	.0	.0	.0	.0	.0	.0
7	*	.0	.0	.0	.0	.0	.0	.0	.0
8	*	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.0	.1	.1	.0	.0	.0	.0	.0
10	*	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.1	.0	.0	.2	.4	.4	.4	.4
12	*	.6	.0	.0	1.5	2.5	2.7	2.7	2.7
13	*	.0	.0	.0	.0	.1	.1	.1	.1
14	*	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.1	.2	.0	.0	.0	.0	.0
17	*	.0	.0	.1	.0	.0	.0	.0	.0
18	*	.0	.1	.2	.0	.0	.0	.0	.0
19	*	.0	.0	.0	.0	.0	.0	.0	.0
20	*	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.0	.0	.0	.0	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.0	.0	.0	.0	.0	.0	.0
24	*	.0	.0	.0	.0	.0	.0	.0	.0
25	*	.0	.0	.1	.0	.0	.0	.0	.0
26	*	.0	.0	.0	.0	.0	.0	.0	.0
27	*	.0	.0	.1	.0	.0	.0	.0	.0
28	*	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqbknb.dat>

DATE : 8/11/99
TIME : 10:59:32

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. Link 1A	184.1	245.7	3.0	-2.1	307.	216.	AG	185.	11.0	.0	10.1		
2. Link 1B	184.1	245.7	3.0	-2.1	307.	216.	AG	185.	.0	.0	6.4		
3. Link 2A	3.0	-2.1	-184.1	-244.1	306.	218.	AG	120.	11.0	.0	10.1		
4. Link 2B	-5.8	-13.7	-9.6	-18.7	6.	218.	AG	410.	100.0	.0	6.4	.22	1.1
5. Link 3A	-185.3	-240.5	-2.4	2.4	304.	37.	AG	405.	11.1	.0	10.1		
6. Link 3B	-185.3	-240.5	-2.4	2.4	304.	37.	AG	405.	.0	.0	6.4		
7. Link 4A	-2.4	2.4	181.7	247.5	307.	37.	AG	66.	11.1	.0	10.1		
8. Link 4B	4.9	12.5	6.9	15.1	3.	37.	AG	391.	100.0	.0	6.4	.11	.5
9. Link 5A	238.7	-187.1	-2.1	-5.8	301.	307.	AG	305.	11.0	.0	14.6		
10. Link 5B	238.7	-187.1	-2.1	-5.8	301.	307.	AG	305.	.0	.0	8.5		
11. Link 6A	-1.5	-4.3	-247.2	186.5	311.	308.	AG	339.	11.0	.0	11.3		
12. Link 6B	-11.6	4.0	-34.8	22.0	29.	308.	AG	467.	100.0	.0	7.6	.89	4.9
13. Link 7A	-242.0	190.8	2.7	3.0	308.	127.	AG	116.	10.8	.0	11.3		
14. Link 7B	-242.0	190.8	2.7	3.0	308.	127.	AG	116.	.0	.0	7.6		
15. Link 8A	1.5	.6	241.7	-181.4	301.	127.	AG	127.	10.8	.0	15.8		
16. Link 8B	12.2	-7.6	18.2	-12.2	8.	127.	AG	466.	100.0	.0	9.8	.33	1.3
17. Link 9A	8.5	11.6	67.1	-34.7	75.	128.	AG	359.	11.1	.0	11.0		
18. Link 9B	19.2	3.4	33.4	-8.0	18.	129.	AG	399.	100.0	.0	7.3	.61	3.0
19. Link 10A	67.1	-34.7	164.3	-110.6	123.	128.	BR	359.	11.1	4.6	11.0		
20. Link 10B	67.1	-34.7	164.3	-110.6	123.	128.	BR	359.	.0	4.6	7.3		
21. Link 11A	164.3	-110.6	194.2	-112.2	30.	93.	BR	359.	11.1	9.1	11.0		
22. Link 11B	164.3	-110.6	194.2	-112.2	30.	93.	BR	359.	.0	9.1	7.3		
23. Link 12A	194.2	-112.2	232.3	-82.3	48.	52.	BR	359.	11.1	9.1	11.0		
24. Link 12B	194.2	-112.2	232.3	-82.3	48.	52.	BR	359.	.0	9.1	7.3		
25. Link 13A	390.1	103.0	20.4	-377.6	606.	218.	BR	4005.	4.4	9.1	17.4		
26. Link 13B	390.1	103.0	20.4	-377.6	606.	218.	BR	4005.	.0	9.1	13.7		
27. Link 14A	3.4	-375.8	384.4	112.8	620.	38.	BR	4954.	4.4	9.1	17.4		
28. Link 14B	3.4	-375.8	384.4	112.8	620.	38.	BR	4954.	.0	9.1	13.7		

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqbknb.dat>

DATE : 8/11/99
TIME : 10:59:32

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
4. Link 2B	95	63	1.0	120	900	115.26	1	3
8. Link 4B	95	60	1.0	66	900	115.48	1	3
12. Link 6B	95	72	1.0	339	900	114.82	1	3
16. Link 8B	95	72	1.0	127	900	114.61	1	3
18. Link 9B	95	61	1.0	359	900	115.75	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. 1:	-25.0	31.1	1.8
2. 2:	-12.8	21.9	1.8
3. 3:	-7.0	17.1	1.8
4. 4:	-.3	13.1	1.8
5. 5:	4.3	19.2	1.8
6. 6:	8.8	25.3	1.8
7. 7:	18.0	37.5	1.8
8. 8:	37.2	35.1	1.8
9. 9:	28.0	22.9	1.8
10. 10:	23.5	16.8	1.8
11. 11:	18.9	10.7	1.8
12. 12:	25.0	6.1	1.8
13. 13:	30.8	1.2	1.8
14. 14:	42.7	-8.2	1.8
15. 15:	23.8	-34.1	1.8
16. 16:	11.6	-25.0	1.8
17. 17:	5.5	-20.4	1.8
18. 18:	-.9	-15.8	1.8
19. 19:	-5.5	-21.9	1.8
20. 20:	-10.1	-28.0	1.8
21. 21:	-19.5	-39.9	1.8
22. 22:	-31.1	-27.7	1.8
23. 23:	-21.6	-15.8	1.8
24. 24:	-17.1	-9.8	1.8
25. 25:	-12.5	-3.7	1.8
26. 26:	-18.3	1.2	1.8
27. 27:	-24.1	5.8	1.8
28. 28:	-36.3	15.2	1.8

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqbknb.dat>

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0 -360

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.6	.3	.3	1.3	1.0
2.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.6	.3	.3	1.2	.8
4.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.6	.3	.2	1.0	.8
6.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.7	.3	.2	1.0	.8
8.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.8	.2	.2	.9	.8
10.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.8	.4	.2	.9	.7
12.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.8	.4	.2	.9	.7
14.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.5	.9	.5	.2	.7	.7
16.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.5	1.0	.6	.3	.5	.7
18.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.5	1.0	.6	.3	.5	.7
20.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.4	1.0	.6	.3	.5	.7
22.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.4	1.0	.7	.3	.5	.5
24.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.4	.9	.8	.3	.5	.5
26.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.4	.9	.9	.2	.5	.5
28.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.4	1.0	.9	.3	.7	.5
30.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.3	1.0	1.0	.4	.6	.5
32.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.3	.9	1.0	.4	.6	.5
34.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.3	.9	1.0	.4	.5	.5
36.	*	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.3	.9	1.0	.4	.5	.4
38.	*	.0	.0	.0	.2	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.3	.9	1.0	.4	.5	.5
40.	*	.0	.0	.0	.3	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.3	.7	1.0	.6	.7	.5
42.	*	.0	.0	.0	.3	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.2	.7	1.0	.7	.6	.6
44.	*	.0	.0	.0	.3	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.2	.7	1.0	.7	.5	.6
46.	*	.0	.0	.0	.3	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.2	.6	1.1	.6	.5	.6
48.	*	.0	.0	.0	.4	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.2	.6	1.1	.7	.5	.6
50.	*	.0	.0	.0	.4	.1	.1	.1	.0	.0	.0	.1	.0	.0	.0	.2	.6	1.1	.8	.5	.6
52.	*	.0	.0	.0	.4	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.5	1.1	.8	.6	.6
54.	*	.0	.0	.0	.4	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.5	1.0	.8	.6	.6
56.	*	.0	.0	.0	.4	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.5	.9	.9	.6	.5
58.	*	.0	.0	.0	.5	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.4	.9	.9	.6	.5
60.	*	.0	.0	.0	.5	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.4	.9	.9	.6	.5
62.	*	.0	.0	.0	.5	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.3	.9	.9	.6	.5
64.	*	.0	.0	.0	.5	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.3	.8	.9	.6	.5
66.	*	.0	.0	.0	.5	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.2	.3	.7	.9	.6	.5
68.	*	.0	.0	.0	.5	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.3	.3	.7	.9	.5	.3
70.	*	.0	.0	.0	.6	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.3	.3	.6	.9	.5	.3
72.	*	.0	.0	.1	.6	.1	.1	.1	.0	.0	.0	.0	.0	.0	.1	.3	.4	.7	.9	.5	.4
74.	*	.0	.0	.1	.6	.1	.1	.1	.0	.0	.0	.0	.0	.1	.1	.4	.3	.7	1.0	.6	.4
76.	*	.0	.0	.1	.6	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.3	.3	.6	1.0	.6	.4
78.	*	.0	.0	.1	.6	.1	.1	.1	.0	.1	.1	.1	.1	.1	.2	.3	.4	.5	.9	.5	.4
80.	*	.0	.0	.2	.7	.2	.2	.1	.1	.1	.1	.1	.1	.1	.2	.3	.4	.6	.9	.6	.5
82.	*	.0	.1	.2	.7	.2	.2	.2	.1	.1	.1	.1	.2	.2	.2	.3	.4	.6	1.0	.5	.5

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqbknb.dat>

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28														
84.	*	.1	.1	.2	.7	.2	.2	.2	.1	.1	.1	.2	.2	.2	.2	.3	.4	.6	.9	.5	.3
86.	*	.1	.1	.2	.9	.2	.2	.2	.1	.2	.2	.2	.2	.2	.2	.3	.4	.6	.9	.5	.3
88.	*	.1	.1	.4	1.0	.3	.3	.2	.2	.2	.2	.2	.2	.2	.2	.3	.4	.5	.8	.5	.3
90.	*	.1	.3	.4	.9	.3	.3	.3	.2	.2	.2	.2	.2	.2	.2	.3	.3	.4	.8	.4	.3
92.	*	.1	.3	.5	.9	.2	.3	.3	.2	.2	.2	.2	.2	.2	.2	.3	.3	.4	.7	.4	.3
94.	*	.2	.3	.5	.9	.2	.2	.3	.2	.2	.2	.2	.2	.2	.2	.3	.3	.3	.7	.3	.3
96.	*	.2	.4	.5	.9	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.4	.4	.3	.7	.3	.3
98.	*	.2	.4	.6	1.0	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.4	.4	.4	.7	.3	.3
100.	*	.2	.4	.6	.9	.2	.2	.2	.2	.2	.2	.2	.2	.2	.2	.4	.4	.4	.5	.3	.3
102.	*	.3	.4	.7	.9	.3	.2	.2	.2	.2	.2	.2	.2	.2	.2	.4	.4	.4	.5	.3	.3
104.	*	.3	.4	.7	.9	.3	.2	.2	.2	.2	.2	.3	.2	.2	.2	.4	.4	.4	.5	.3	.3
106.	*	.3	.4	.7	1.0	.3	.2	.2	.2	.2	.2	.3	.2	.2	.2	.4	.4	.4	.5	.3	.3
108.	*	.3	.5	.7	1.0	.4	.2	.2	.2	.2	.2	.3	.3	.2	.2	.5	.4	.4	.5	.3	.3
110.	*	.3	.6	.7	.9	.4	.2	.2	.2	.2	.2	.4	.3	.2	.2	.5	.4	.4	.5	.3	.3
112.	*	.3	.6	.7	.9	.6	.2	.2	.2	.2	.2	.4	.4	.3	.3	.4	.4	.4	.4	.3	.3
114.	*	.3	.6	.7	1.0	.6	.2	.2	.2	.2	.2	.5	.4	.3	.3	.4	.4	.4	.4	.3	.3
116.	*	.3	.6	.9	1.0	.6	.3	.2	.2	.2	.2	.5	.4	.3	.3	.4	.4	.4	.4	.3	.3
118.	*	.4	.7	.9	1.0	.6	.3	.2	.2	.2	.2	.6	.5	.4	.3	.4	.4	.4	.4	.3	.3
120.	*	.4	.7	.9	1.0	.7	.3	.2	.2	.2	.2	.6	.5	.4	.3	.4	.4	.4	.4	.3	.3
122.	*	.5	.7	.8	.9	.7	.3	.2	.2	.2	.2	.7	.5	.4	.3	.4	.4	.4	.4	.3	.3
124.	*	.5	.8	.9	1.0	.8	.3	.2	.2	.2	.2	.7	.6	.4	.4	.4	.4	.4	.4	.3	.2
126.	*	.6	.8	.8	.9	.8	.4	.2	.2	.2	.2	.8	.6	.4	.4	.4	.4	.4	.4	.3	.2
128.	*	.6	.8	.8	.9	.8	.5	.2	.2	.2	.2	1.0	.7	.5	.4	.4	.4	.4	.4	.3	.2
130.	*	.6	.8	.8	1.1	1.0	.5	.2	.2	.2	.3	1.0	.8	.6	.4	.3	.3	.3	.3	.3	.2
132.	*	.7	.8	.8	1.0	1.2	.5	.2	.2	.2	.3	1.1	.9	.6	.4	.3	.3	.3	.3	.2	.2
134.	*	.8	.8	.8	1.0	1.2	.5	.2	.2	.2	.4	1.2	1.1	.8	.5	.3	.3	.3	.3	.2	.2
136.	*	.8	.7	.9	.9	1.3	.6	.2	.2	.2	.4	1.3	1.1	.8	.6	.3	.3	.3	.3	.2	.2
138.	*	.8	.5	.7	.9	1.3	.6	.2	.2	.2	.4	1.3	1.2	.9	.6	.3	.3	.3	.3	.2	.2
140.	*	.9	.5	.7	.9	1.3	.7	.2	.2	.2	.5	1.4	1.3	.9	.6	.3	.3	.3	.3	.2	.2
142.	*	.9	.5	.6	.9	1.3	.7	.3	.2	.2	.6	1.4	1.3	1.0	.6	.3	.3	.3	.3	.2	.2
144.	*	1.1	.5	.6	.8	1.3	.7	.3	.2	.2	.6	1.4	1.4	1.0	.5	.3	.3	.3	.3	.2	.2
146.	*	1.0	.6	.6	.7	1.3	.8	.3	.2	.2	.7	1.5	1.4	1.0	.5	.3	.3	.3	.2	.2	.2
148.	*	1.0	.6	.5	.6	1.4	.8	.3	.2	.4	.7	1.5	1.5	1.1	.5	.2	.2	.2	.2	.2	.2
150.	*	.9	.5	.4	.6	1.4	.8	.3	.2	.4	.7	1.5	1.5	1.1	.5	.2	.2	.2	.2	.2	.2
152.	*	1.1	.6	.4	.6	1.4	.8	.4	.2	.4	.8	1.5	1.6	1.2	.5	.2	.2	.2	.2	.2	.2
154.	*	1.1	.6	.4	.5	1.4	.8	.5	.2	.4	.8	1.6	1.6	1.2	.5	.2	.2	.2	.2	.2	.2
156.	*	1.2	.7	.4	.5	1.4	.8	.5	.2	.4	.8	1.6	1.7	1.2	.5	.2	.2	.2	.2	.2	.2
158.	*	1.2	.8	.4	.5	1.4	.8	.5	.2	.5	.9	1.6	1.7	1.3	.5	.2	.2	.2	.2	.2	.2
160.	*	1.1	.9	.5	.5	1.3	.9	.5	.2	.5	.9	1.5	1.7	1.3	.5	.2	.2	.2	.2	.2	.2
162.	*	1.2	.8	.5	.5	1.3	.8	.6	.2	.5	.9	1.5	1.7	1.3	.5	.2	.2	.2	.2	.2	.2
164.	*	1.3	.9	.6	.4	1.3	.8	.6	.2	.5	1.0	1.5	1.8	1.4	.5	.2	.2	.2	.2	.2	.2
166.	*	1.3	.8	.5	.4	1.3	.8	.7	.2	.6	1.0	1.5	1.8	1.4	.5	.2	.2	.2	.2	.2	.2
168.	*	1.4	.8	.4	.3	1.3	.9	.7	.3	.6	1.1	1.5	1.8	1.4	.5	.2	.2	.2	.2	.1	.1
170.	*	1.3	.8	.5	.3	1.0	.8	.7	.3	.6	1.1	1.5	1.8	1.5	.5	.2	.2	.2	.1	.1	.1
172.	*	1.1	.8	.5	.4	.8	.6	.6	.3	.6	1.0	1.5	1.8	1.5	.5	.2	.2	.1	.1	.1	.1
174.	*	1.1	.8	.5	.4	.8	.6	.6	.3	.6	.9	1.3	1.8	1.5	.5	.2	.1	.1	.1	.1	.1
176.	*	1.1	.8	.4	.4	.8	.6	.6	.2	.7	.9	1.3	1.7	1.4	.5	.1	.1	.1	.1	.1	.0
178.	*	1.1	.8	.4	.2	.6	.6	.6	.2	.7	.9	1.3	1.7	1.3	.4	.1	.1	.1	.0	.0	.0
180.	*	1.1	.9	.5	.2	.6	.5	.5	.3	.7	.9	1.2	1.7	1.4	.3	.1	.1	.0	.0	.0	.0
182.	*	1.1	.9	.5	.2	.7	.4	.5	.3	.6	.9	1.1	1.7	1.4	.3	.1	.0	.0	.0	.0	.0
184.	*	1.1	.9	.5	.2	.7	.3	.4	.2	.6	.8	1.0	1.6	1.3	.3	.0	.0	.0	.0	.0	.0
186.	*	1.1	1.0	.5	.2	.6	.3	.3	.2	.6	.8	1.0	1.7	1.3	.3	.0	.0	.0	.0	.0	.0

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
188.	*	1.1	1.0	.6	.2	.6	.3	.3	.2	.6	.8	.9	1.7	1.3	.2	.0	.0	.0	.0	.0	.0
190.	*	1.1	1.0	.6	.3	.6	.4	.2	.3	.6	.8	.9	1.6	1.3	.2	.0	.0	.0	.0	.0	.0
192.	*	1.1	1.0	.6	.3	.6	.4	.3	.3	.6	.8	.9	1.6	1.3	.2	.0	.0	.0	.0	.0	.0
194.	*	1.1	1.0	.7	.3	.6	.5	.3	.3	.6	.7	.8	1.7	1.3	.2	.0	.0	.0	.0	.0	.0
196.	*	1.1	1.0	.7	.3	.5	.4	.3	.3	.6	.7	.8	1.7	1.3	.2	.0	.0	.0	.0	.0	.0
198.	*	1.1	1.0	.7	.3	.5	.4	.3	.3	.6	.7	.8	1.7	1.4	.2	.0	.0	.0	.0	.0	.0
200.	*	1.1	1.0	.8	.4	.5	.4	.3	.3	.6	.6	.7	1.7	1.5	.2	.0	.0	.0	.0	.0	.0
202.	*	1.0	1.1	.8	.4	.5	.4	.3	.3	.6	.6	.7	1.7	1.5	.2	.0	.0	.0	.0	.0	.0
204.	*	1.0	1.1	.8	.5	.6	.5	.3	.3	.6	.6	.6	1.8	1.5	.2	.0	.0	.0	.0	.0	.0
206.	*	1.0	1.1	.8	.5	.5	.5	.3	.3	.6	.6	.5	1.8	1.5	.2	.0	.0	.0	.0	.0	.0
208.	*	.9	1.1	.8	.5	.5	.5	.3	.3	.4	.5	.7	1.7	1.6	.2	.0	.0	.0	.0	.0	.0
210.	*	.9	1.1	.9	.5	.6	.5	.3	.4	.5	.6	.6	1.7	1.6	.2	.0	.0	.0	.2	.1	.1
212.	*	.8	1.1	.9	.5	.6	.5	.3	.5	.6	.7	.6	1.7	1.6	.2	.0	.0	.0	.3	.2	.2
214.	*	.8	1.1	.9	.6	.7	.6	.3	.4	.6	.6	.5	1.7	1.6	.2	.0	.0	.0	.3	.2	.2
216.	*	.8	1.1	.9	.6	.6	.4	.4	.4	.6	.6	.5	1.8	1.6	.2	.0	.0	.1	.3	.2	.2
218.	*	.7	1.1	1.0	.5	.5	.4	.4	.4	.6	.6	.5	1.8	1.7	.2	.0	.0	.1	.4	.2	.2
220.	*	.7	1.0	1.0	.5	.5	.4	.4	.4	.6	.6	.5	1.9	1.7	.2	.0	.0	.1	.4	.2	.2
222.	*	.7	1.0	1.0	.5	.6	.5	.4	.5	.6	.6	.5	1.7	1.8	.2	.0	.1	.1	.4	.2	.2
224.	*	.6	1.0	1.0	.5	.6	.5	.3	.4	.6	.6	.5	1.6	1.8	.2	.0	.1	.1	.5	.2	.2
226.	*	.6	1.0	1.0	.6	.5	.5	.3	.4	.7	.5	.4	1.6	1.8	.2	.0	.1	.1	.5	.2	.2
228.	*	.5	1.0	1.0	.6	.6	.5	.4	.3	.5	.4	.4	1.6	1.9	.2	.0	.1	.1	.5	.2	.2
230.	*	.5	1.0	1.0	.6	.6	.5	.3	.3	.4	.5	.4	1.5	1.9	.2	.0	.1	.1	.6	.2	.2
232.	*	.5	1.0	1.0	.7	.6	.5	.3	.3	.4	.5	.4	1.4	2.0	.3	.0	.1	.1	.6	.2	.2
234.	*	.4	1.0	1.0	.7	.6	.4	.3	.3	.4	.6	.4	1.3	2.0	.4	.0	.1	.1	.7	.2	.2
236.	*	.4	1.0	1.0	.7	.6	.4	.3	.3	.4	.6	.5	1.3	2.0	.4	.1	.1	.1	.7	.2	.2
238.	*	.4	1.0	1.0	.7	.6	.4	.3	.3	.4	.5	.5	1.3	1.9	.5	.1	.1	.1	.7	.2	.2
240.	*	.3	1.0	1.0	.7	.6	.5	.3	.3	.5	.5	.5	1.1	1.9	.5	.1	.1	.1	.8	.2	.2
242.	*	.3	1.0	1.0	.7	.6	.6	.3	.3	.4	.6	.5	1.1	1.8	.5	.1	.1	.1	.8	.2	.2
244.	*	.3	1.0	1.0	.8	.7	.6	.3	.3	.4	.6	.4	1.1	1.8	.5	.1	.1	.1	.8	.2	.2
246.	*	.2	1.0	1.0	.8	.7	.6	.3	.3	.4	.5	.5	1.1	1.8	.6	.1	.1	.1	.9	.2	.2
248.	*	.2	.9	1.0	.8	.7	.6	.3	.3	.4	.5	.5	1.1	1.8	.6	.1	.1	.2	.9	.2	.2
250.	*	.2	.9	1.0	.8	.7	.6	.3	.3	.5	.4	.6	1.0	1.8	.6	.1	.1	.2	.9	.2	.2
252.	*	.2	.9	1.0	.9	.7	.6	.2	.3	.5	.5	.6	.9	1.9	.7	.1	.1	.2	1.0	.2	.2
254.	*	.2	.9	1.0	.9	.7	.5	.2	.3	.5	.5	.6	.8	1.8	.9	.1	.1	.2	1.0	.2	.2
256.	*	.2	.9	1.0	.9	.7	.5	.2	.3	.5	.5	.7	.8	1.8	.9	.1	.1	.2	1.0	.2	.2
258.	*	.1	.8	1.0	.9	.7	.5	.2	.3	.5	.5	.7	.8	1.8	.7	.1	.1	.2	1.0	.2	.2
260.	*	.1	.8	1.0	.9	.7	.5	.2	.3	.5	.6	.7	.7	1.8	.8	.1	.1	.3	1.0	.2	.2
262.	*	.1	.8	1.0	.9	.7	.5	.1	.3	.5	.6	.8	.7	1.5	1.0	.0	.1	.3	1.1	.2	.2
264.	*	.2	.9	1.1	.9	.6	.4	.1	.2	.5	.6	.8	.8	1.7	1.1	.0	.2	.3	1.1	.2	.2
266.	*	.2	.8	1.0	.9	.6	.4	.1	.2	.5	.6	.8	.8	1.7	1.1	.0	.2	.3	1.1	.3	.2
268.	*	.2	.8	1.0	1.0	.6	.4	.1	.2	.3	.6	.9	.8	1.7	1.1	.0	.2	.3	1.0	.2	.1
270.	*	.2	.7	1.0	1.0	.6	.3	.1	.2	.3	.6	.9	.9	1.6	1.1	.0	.2	.4	1.0	.2	.1
272.	*	.2	.7	1.0	1.0	.5	.3	.0	.2	.3	.6	.9	.8	1.6	1.1	.0	.2	.4	1.0	.2	.1
274.	*	.2	.7	.9	1.0	.5	.3	.0	.2	.3	.6	.9	.8	1.7	1.2	.0	.2	.4	1.0	.2	.1
276.	*	.2	.6	.9	1.0	.5	.3	.0	.2	.3	.6	.9	.8	1.6	1.3	.0	.2	.4	.9	.2	.1
278.	*	.2	.6	.8	.9	.4	.2	.0	.1	.2	.6	.9	.8	1.6	1.3	.0	.2	.4	.9	.2	.1
280.	*	.2	.5	.8	.9	.4	.2	.0	.1	.2	.5	.9	.8	1.6	1.4	.0	.3	.4	.9	.2	.1
282.	*	.2	.5	.8	.8	.4	.2	.0	.1	.2	.5	.9	.7	1.6	1.4	.1	.3	.5	.9	.2	.1
284.	*	.2	.5	.7	.8	.3	.2	.0	.1	.2	.5	.8	.7	1.6	1.4	.1	.3	.5	.9	.3	.1
286.	*	.2	.4	.7	.8	.3	.2	.0	.1	.2	.5	.8	.7	1.5	1.4	.1	.3	.5	.8	.3	.1
288.	*	.2	.4	.6	.7	.3	.1	.0	.1	.2	.3	.8	.7	1.5	1.4	.1	.3	.6	.9	.3	.1
290.	*	.2	.4	.6	.6	.2	.1	.0	.1	.1	.3	.7	.7	1.4	1.4	.2	.4	.6	.9	.4	.1

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
292.	*	.2	.3	.5	.6	.2	.1	.0	.1	.1	.3	.7	.6	1.2	1.4	.2	.4	.6	.8	.4	.1
294.	*	.2	.3	.5	.6	.2	.1	.0	.1	.1	.3	.7	.6	1.1	1.4	.3	.4	.6	.8	.4	.1
296.	*	.2	.3	.4	.5	.2	.1	.0	.1	.1	.3	.6	.5	1.1	1.4	.3	.4	.5	.9	.5	.1
298.	*	.2	.3	.4	.5	.2	.1	.0	.1	.1	.1	.6	.5	1.0	1.3	.3	.7	.7	.9	.5	.1
300.	*	.2	.3	.4	.4	.1	.0	.0	.1	.1	.1	.6	.4	.9	1.1	.3	.7	.7	.9	.6	.1
302.	*	.2	.2	.3	.4	.1	.0	.0	.1	.1	.1	.5	.4	.8	1.1	.5	.7	.7	.9	.7	.1
304.	*	.2	.2	.3	.4	.1	.0	.0	.1	.1	.1	.5	.4	.8	1.0	.5	.7	.9	.9	.7	.1
306.	*	.2	.2	.3	.3	.0	.0	.0	.1	.1	.1	.3	.3	.6	.8	.5	.8	.9	.9	.9	.1
308.	*	.2	.2	.3	.3	.0	.0	.0	.1	.1	.1	.3	.2	.6	.7	.5	.8	.8	.9	.9	.1
310.	*	.2	.2	.2	.3	.0	.0	.0	.1	.1	.1	.2	.2	.5	.7	.6	.8	.9	.9	1.1	.1
312.	*	.2	.2	.2	.3	.0	.0	.0	.1	.1	.1	.2	.2	.3	.6	.6	.7	.9	.9	1.1	.3
314.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.2	.2	.3	.5	.6	.7	.9	.9	1.1	.3
316.	*	.0	.0	.1	.0	.0	.0	.0	.1	.1	.1	.2	.1	.2	.4	.6	.7	.9	.9	1.3	.3
318.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.2	.4	.6	.6	.8	.9	1.3	.3
320.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.2	.3	.5	.6	.8	.9	1.3	.3
322.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.2	.3	.5	.6	.8	.9	1.4	.4
324.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.1	.3	.6	.6	.8	.9	1.5	.4
326.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.1	.6	.5	.8	.9	1.5	.4
328.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.1	.5	.5	.7	.8	1.5	.6
330.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.1	.4	.5	.7	.7	1.6	.6
332.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.1	.5	.5	.6	.8	1.6	.6
334.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.1	.5	.5	.6	.8	1.6	.6
336.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.4	.5	.7	1.6	.7
338.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.3	.4	.7	1.6	.7
340.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.3	.4	.7	1.6	.8
342.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.4	.4	.4	.6	1.5	.8
344.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.4	.3	.6	1.5	.8
346.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.4	.2	.6	1.5	.8
348.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.5	.4	.2	.5	1.5	.9
350.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.5	.4	.2	.5	1.4	.9
352.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.5	.4	.2	.5	1.4	1.0
354.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.7	.5	.1	.4	1.4	.9
356.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.7	.6	.2	.4	1.3	1.0
358.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.7	.6	.3	.4	1.3	1.0
360.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.0	.0	.6	.6	.3	.3	1.3	1.0
MAX	*	1.4	1.1	1.1	1.1	1.4	.9	.7	.5	.7	1.1	1.6	1.9	2.0	1.4	.7	1.0	1.1	1.1	1.6	1.0
DEGR.	*	168	202	264	130	148	160	166	212	176	168	154	220	232	280	354	16	46	262	330	0

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	.6	.3	.7	.9	1.0	1.6	1.6	.6
2.	.6	.3	.7	.8	.9	1.6	1.6	.6
4.	.6	.3	.7	.8	.9	1.6	1.6	.6
6.	.5	.4	.7	.8	.8	1.6	1.5	.7
8.	.5	.4	.7	.8	.8	1.5	1.5	.7
10.	.5	.4	.6	.7	.7	1.5	1.5	.8
12.	.5	.4	.7	.7	.7	1.5	1.5	.8
14.	.5	.5	.7	.7	.6	1.5	1.5	.8
16.	.5	.5	.7	.7	.6	1.5	1.5	.9
18.	.4	.4	.6	.7	.6	1.5	1.5	.9
20.	.4	.4	.6	.7	.6	1.5	1.5	1.0
22.	.4	.4	.6	.6	.6	1.5	1.5	1.0
24.	.5	.4	.6	.6	.5	1.5	1.5	1.1
26.	.5	.4	.5	.5	.5	1.4	1.5	1.1
28.	.5	.4	.5	.5	.4	1.4	1.5	1.2
30.	.5	.3	.5	.5	.5	1.4	1.5	1.2
32.	.4	.3	.5	.5	.4	1.4	1.5	1.3
34.	.4	.4	.5	.4	.4	1.4	1.5	1.3
36.	.3	.4	.5	.4	.4	1.4	1.5	1.3
38.	.3	.5	.5	.5	.4	1.4	1.5	1.4
40.	.3	.4	.4	.5	.5	1.4	1.5	1.4
42.	.3	.4	.4	.6	.4	1.4	1.5	1.4
44.	.3	.4	.4	.6	.4	1.3	1.5	1.4
46.	.3	.5	.3	.6	.4	1.3	1.5	1.4
48.	.3	.5	.3	.6	.4	1.4	1.5	1.4
50.	.3	.5	.4	.5	.4	1.3	1.5	1.4
52.	.3	.5	.4	.6	.4	1.3	1.5	1.4
54.	.2	.5	.4	.5	.4	1.2	1.4	1.5
56.	.2	.5	.4	.4	.4	1.2	1.4	1.5
58.	.2	.5	.5	.4	.5	1.1	1.4	1.5
60.	.2	.6	.5	.4	.5	1.1	1.4	1.5
62.	.2	.6	.5	.4	.5	1.0	1.4	1.5
64.	.2	.6	.6	.5	.5	1.0	1.6	1.5
66.	.2	.6	.7	.5	.4	1.0	1.6	1.5
68.	.2	.6	.7	.5	.4	1.0	1.6	1.6
70.	.1	.5	.7	.5	.4	1.0	1.6	1.6
72.	.2	.5	.7	.5	.6	.9	1.6	1.6
74.	.1	.6	.8	.5	.7	.9	1.6	1.6
76.	.1	.6	.9	.6	.7	.9	1.7	1.6
78.	.2	.6	1.0	.6	.8	.9	1.7	1.6
80.	.2	.6	1.0	1.0	.8	.9	1.7	1.7
82.	.2	.7	1.0	1.0	.8	1.0	1.7	1.8

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
84.	.2	.7	1.0	1.1	.8	1.1	1.7	1.8
86.	.2	.7	1.1	1.1	.9	1.2	1.7	1.9
88.	.2	.5	1.1	1.1	1.1	1.2	1.6	2.0
90.	.2	.5	1.1	1.1	1.1	1.1	1.6	2.0
92.	.2	.5	1.1	1.1	1.1	1.1	1.8	2.1
94.	.2	.5	1.1	1.0	1.1	1.1	1.8	2.1
96.	.2	.5	1.1	1.0	1.1	1.1	1.8	2.1
98.	.2	.5	1.1	1.0	1.0	1.0	1.7	2.1
100.	.2	.5	.9	1.1	1.0	1.0	1.7	2.1
102.	.2	.5	.9	1.0	1.0	1.1	1.7	2.2
104.	.2	.4	.8	.9	1.0	1.1	1.6	2.1
106.	.2	.4	.7	.9	.9	1.1	1.7	2.1
108.	.2	.4	.7	.9	.8	1.0	1.6	2.1
110.	.2	.4	.7	.9	.8	.9	1.4	2.0
112.	.2	.3	.6	.9	.8	.9	1.4	2.0
114.	.2	.3	.6	.9	.8	.8	1.3	2.0
116.	.2	.3	.7	1.0	.9	.8	1.3	1.9
118.	.2	.4	.7	1.0	.8	.8	1.3	1.8
120.	.2	.4	.6	1.0	.8	.8	1.2	1.6
122.	.2	.4	.6	1.0	.8	.7	1.2	1.5
124.	.2	.4	.6	1.0	.7	.7	1.0	1.5
126.	.2	.4	.6	1.0	.7	.7	1.0	1.3
128.	.2	.4	.5	1.0	.7	.7	.9	1.3
130.	.2	.4	.5	1.0	.8	.7	.9	1.2
132.	.2	.4	.4	1.0	.8	.8	.8	1.0
134.	.2	.4	.4	.9	.7	.7	.7	.9
136.	.2	.4	.4	.8	.7	.6	.7	.9
138.	.2	.3	.4	.8	.7	.6	.7	.7
140.	.2	.3	.3	.7	.7	.6	.6	.6
142.	.2	.3	.3	.7	.7	.6	.4	.6
144.	.2	.3	.3	.6	.7	.5	.4	.6
146.	.2	.3	.4	.7	.8	.5	.4	.5
148.	.2	.3	.3	.6	.6	.5	.4	.5
150.	.2	.3	.4	.7	.8	.5	.4	.5
152.	.2	.4	.4	.6	.8	.5	.4	.5
154.	.2	.4	.4	.6	.8	.5	.4	.3
156.	.2	.4	.4	.6	.8	.5	.4	.3
158.	.2	.4	.4	.6	.8	.5	.4	.2
160.	.2	.4	.4	.5	.8	.5	.4	.2
162.	.2	.3	.4	.5	.8	.5	.3	.2
164.	.2	.3	.3	.4	.8	.4	.3	.2
166.	.1	.3	.3	.4	.7	.3	.3	.2
168.	.1	.3	.3	.4	.6	.3	.3	.2
170.	.1	.3	.3	.4	.6	.3	.2	.1

174.	*	.0	.2	.2	.2	.6	.2	.1	.1
176.	*	.0	.2	.2	.2	.5	.2	.1	.1
178.	*	.0	.2	.2	.2	.5	.2	.1	.1
180.	*	.0	.2	.2	.2	.4	.2	.1	.1
182.	*	.0	.2	.2	.2	.4	.1	.1	.1
184.	*	.0	.2	.2	.2	.4	.1	.1	.1

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqbknb.dat>

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
186.	*	.0	.2	.2	.2	.4	.1	.1	.1
188.	*	.0	.2	.2	.2	.3	.1	.1	.1
190.	*	.0	.2	.2	.2	.3	.1	.1	.1
192.	*	.0	.2	.2	.2	.3	.1	.1	.1
194.	*	.0	.2	.3	.3	.4	.1	.1	.1
196.	*	.0	.3	.3	.3	.4	.1	.1	.1
198.	*	.0	.3	.3	.3	.4	.1	.1	.1
200.	*	.0	.3	.3	.3	.3	.1	.1	.1
202.	*	.0	.3	.3	.3	.3	.1	.1	.1
204.	*	.0	.3	.3	.3	.3	.1	.1	.1
206.	*	.0	.3	.3	.3	.3	.1	.1	.1
208.	*	.0	.3	.3	.3	.3	.1	.1	.0
210.	*	.1	.3	.3	.3	.3	.1	.1	.0
212.	*	.2	.3	.3	.3	.3	.1	.1	.0
214.	*	.2	.3	.3	.3	.3	.1	.1	.0
216.	*	.2	.3	.3	.3	.3	.1	.1	.0
218.	*	.2	.2	.3	.3	.3	.1	.1	.0
220.	*	.2	.2	.3	.3	.3	.1	.0	.0
222.	*	.2	.2	.2	.2	.2	.1	.0	.0
224.	*	.2	.2	.2	.2	.2	.1	.0	.0
226.	*	.2	.2	.2	.2	.2	.1	.0	.0
228.	*	.2	.2	.2	.2	.2	.0	.0	.0
230.	*	.2	.1	.2	.2	.2	.0	.0	.0
232.	*	.2	.1	.1	.1	.1	.0	.0	.0
234.	*	.2	.1	.1	.1	.1	.0	.0	.0
236.	*	.2	.1	.1	.1	.1	.0	.0	.0
238.	*	.2	.1	.1	.1	.1	.0	.0	.0
240.	*	.2	.1	.1	.1	.1	.0	.0	.0
242.	*	.2	.1	.1	.1	.1	.0	.0	.0
244.	*	.2	.0	.1	.1	.1	.0	.0	.0
246.	*	.2	.0	.1	.1	.0	.0	.0	.0
248.	*	.2	.0	.0	.0	.0	.0	.0	.0
250.	*	.2	.0	.0	.0	.0	.0	.0	.0
252.	*	.2	.0	.0	.0	.0	.0	.0	.0
254.	*	.2	.0	.0	.0	.0	.0	.0	.0
256.	*	.2	.0	.0	.0	.0	.0	.0	.0
258.	*	.2	.0	.0	.0	.0	.0	.0	.0
260.	*	.2	.0	.0	.0	.0	.0	.0	.0
262.	*	.2	.0	.0	.0	.0	.0	.0	.0
264.	*	.2	.0	.0	.0	.0	.0	.0	.0
266.	*	.2	.0	.0	.0	.0	.0	.0	.0
268.	*	.1	.0	.0	.0	.0	.0	.0	.0
270.	*	.1	.0	.0	.0	.0	.0	.0	.0
272.	*	.1	.0	.0	.0	.0	.0	.0	.0
274.	*	.1	.0	.0	.0	.0	.0	.0	.0
276.	*	.1	.0	.0	.0	.0	.0	.0	.0
278.	*	.1	.0	.0	.0	.0	.0	.0	.0
280.	*	.1	.0	.0	.0	.0	.0	.0	.0
282.	*	.1	.0	.0	.0	.0	.0	.0	.0
284.	*	.1	.0	.0	.0	.1	.1	.0	.0
286.	*	.1	.0	.0	.0	.1	.1	.1	.0

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqbknb.dat>

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
288.	*	.1	.0	.0	.0	.1	.2	.2	.1
290.	*	.1	.0	.0	.0	.2	.2	.2	.1
292.	*	.1	.0	.0	.0	.3	.3	.2	.1
294.	*	.1	.0	.0	.0	.3	.3	.2	.1
296.	*	.1	.0	.0	.0	.4	.3	.3	.1
298.	*	.1	.0	.0	.0	.4	.4	.3	.1
300.	*	.1	.0	.0	.0	.5	.5	.3	.1
302.	*	.1	.0	.0	.0	.6	.5	.4	.1
304.	*	.1	.0	.0	.2	.8	.7	.5	.2
306.	*	.1	.0	.0	.2	.8	.8	.6	.2
308.	*	.1	.0	.0	.2	.9	.8	.7	.2
310.	*	.1	.0	.1	.2	1.0	.9	.7	.2
312.	*	.1	.0	.1	.3	1.1	1.0	.8	.2
314.	*	.1	.0	.1	.3	1.2	1.1	.9	.2
316.	*	.1	.0	.1	.3	1.2	1.2	1.0	.2
318.	*	.1	.0	.2	.4	1.3	1.3	1.1	.2
320.	*	.1	.0	.2	.4	1.4	1.4	1.2	.2
322.	*	.1	.0	.2	.5	1.4	1.5	1.2	.2
324.	*	.1	.0	.2	.5	1.5	1.5	1.3	.3
326.	*	.1	.1	.3	.6	1.5	1.6	1.4	.3
328.	*	.2	.1	.3	.6	1.5	1.6	1.4	.3
330.	*	.3	.1	.3	.7	1.5	1.7	1.5	.3
332.	*	.3	.1	.3	.7	1.5	1.7	1.5	.3
334.	*	.3	.1	.4	.8	1.5	1.8	1.6	.3
336.	*	.2	.2	.4	.8	1.5	1.8	1.6	.4
338.	*	.3	.2	.5	.8	1.5	1.8	1.6	.4
340.	*	.3	.2	.5	.9	1.5	1.8	1.6	.4
342.	*	.3	.2	.5	.9	1.5	1.8	1.7	.4
344.	*	.3	.2	.6	.9	1.4	1.8	1.7	.4
346.	*	.3	.1	.6	.9	1.4	1.8	1.7	.5
348.	*	.3	.2	.6	.9	1.4	1.8	1.7	.5
350.	*	.5	.2	.6	.9	1.2	1.7	1.7	.5
352.	*	.5	.2	.7	.9	1.2	1.7	1.6	.5
354.	*	.5	.2	.7	.9	1.1	1.6	1.6	.5
356.	*	.5	.2	.7	.9	1.1	1.6	1.6	.5

358. *	.5	.3	.7	.9	1.0	1.6	1.6	.5
360. *	.6	.3	.7	.9	1.0	1.6	1.6	.6
MAX *	.6	.7	1.1	1.1	1.5	1.8	1.8	2.2
DEGR. *	0	82	86	84	324	334	92	102

THE HIGHEST CONCENTRATION OF 2.20 PPM OCCURRED AT RECEPTOR REC28.

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqbknb.dat>

DATE : 8/11/99
TIME : 10:59:32

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 168	REC2 202	REC3 264	REC4 130	REC5 148	REC6 160	REC7 166	REC8 212	REC9 176	REC10 168	REC11 154	REC12 220	REC13 232	REC14 280	REC15 354	REC16 16	REC17 46	REC18 262	REC19 330	REC20 0
1	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.1
4	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.9	.9	.4
5	.1	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.1	.1	.0	.0	.0	.0	.1	.1	.1
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.1	.5	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	.0	.0	.0	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.0	.1	.1	.1	.0	.0	.0
10	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1
12	.9	.9	.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0	.0	.5	.3
13	.1	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	.0	.0	.0	.2	.2	.1	.1	.1	.1	.1	.1	.4	.4	.2	.2	.5	.5	.0	.0	.0
17	.0	.0	.0	.1	.1	.1	.1	.0	.1	.1	.2	.1	.1	.2	.1	.1	.1	.0	.0	.0
18	.0	.0	.0	.3	.3	.3	.2	.2	.4	.6	1.0	1.1	1.2	.8	.3	.3	.4	.0	.0	.0
19	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
22	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
24	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	.0	.0	.0	.1	.1	.1	.1	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	.1	.0	.0	.1	.1	.1	.1	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
28	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 NOBUILD: 39th St/2nd Ave RUN: CAL3HQ v2.0 (o-s) <cqbknb.dat>

DATE : 8/11/99
TIME : 10:59:32

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC21 0	REC22 82	REC23 86	REC24 84	REC25 324	REC26 334	REC27 92	REC28 102
1	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0
3	.1	.0	.0	.0	.0	.0	.0	.0
4	.1	.1	.4	.1	.0	.0	.0	.0
5	.1	.2	.2	.2	.0	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0
9	.0	.0	.1	.1	.0	.0	.0	.0
10	.0	.0	.0	.0	.0	.0	.0	.0
11	.0	.0	.0	.0	.2	.2	.1	.2
12	.3	.0	.0	.0	1.3	1.6	1.2	1.6
13	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0
15	.0	.0	.0	.0	.0	.0	.0	.0
16	.0	.1	.1	.2	.0	.0	.1	.1
17	.0	.0	.0	.1	.0	.0	.0	.0
18	.0	.1	.1	.2	.0	.0	.2	.1
19	.0	.0	.0	.0	.0	.0	.0	.0
20	.0	.0	.0	.0	.0	.0	.0	.0
21	.0	.0	.0	.0	.0	.0	.0	.0
22	.0	.0	.0	.0	.0	.0	.0	.0
23	.0	.0	.0	.0	.0	.0	.0	.0
24	.0	.0	.0	.0	.0	.0	.0	.0
25	.0	.1	.1	.1	.0	.0	.1	.1
26	.0	.0	.0	.0	.0	.0	.0	.0
27	.0	.1	.1	.1	.0	.0	.1	.1
28	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs3nb.dat>

DATE : 8/18/99
TIME : 15: 3:27

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. Link 1A	206.7	230.1	4.0	-2.1	308.	221.	AG	77.	9.9	.0	7.9		
2. Link 1B	206.7	230.1	4.0	-2.1	308.	221.	AG	77.	.0	.0	4.3		
3. Link 2A	.9	-.6	-19.5	-31.7	37.	213.	AG	0.	.0	.0	10.7		
4. Link 2B	.9	-.6	-19.5	-31.7	37.	213.	AG	0.	.0	.0	7.0		
5. Link 3A	252.4	-253.0	1.2	-79.6	305.	305.	AG	791.	9.7	.0	15.8		
6. Link 3B	252.4	-253.0	1.2	-79.6	305.	305.	AG	791.	.0	.0	12.2		
7. Link 4A	1.2	-79.6	-22.9	-31.7	54.	333.	AG	791.	9.7	.0	15.8		
8. Link 4B	1.2	-79.6	-22.9	-31.7	54.	333.	AG	791.	.0	.0	12.2		
9. Link 5A	-22.9	-31.7	-3.0	1.2	38.	31.	AG	791.	9.7	.0	11.6		
10. Link 5B	-22.9	-31.7	-3.0	1.2	38.	31.	AG	791.	.0	.0	7.9		
11. Link 6A	-.3	.0	204.5	232.6	310.	41.	AG	409.	9.8	.0	7.9		
12. Link 6B	-.3	.0	204.5	232.6	310.	41.	AG	409.	.0	.0	4.3		
13. Link 7A	-2.7	-2.1	-19.2	10.1	20.	307.	AG	127.	24.5	.0	12.5		
14. Link 7B	-2.7	-2.1	-19.2	10.1	20.	307.	AG	127.	.0	.0	8.8		
15. Link 8A	-19.2	10.1	-255.4	181.4	292.	306.	AG	127.	9.8	.0	12.5		
16. Link 8B	-19.2	10.1	-255.4	181.4	292.	306.	AG	127.	.0	.0	8.8		
17. Link 9A	-248.7	191.4	-67.1	49.1	231.	128.	AG	112.	9.7	.0	8.2		
18. Link 9B	-248.7	191.4	-67.1	49.1	231.	128.	AG	112.	.0	.0	4.6		
19. Link 10A	-67.1	49.1	.3	2.1	82.	125.	AG	112.	24.4	.0	15.8		
20. Link 10B	-67.1	49.1	.3	2.1	82.	125.	AG	112.	.0	.0	12.2		
21. Link 11A	.0	.9	16.8	-11.0	21.	125.	AG	444.	9.7	.0	15.8		
22. Link 11B	.0	.9	16.8	-11.0	21.	125.	AG	444.	.0	.0	12.2		
23. Link 12A	16.8	-11.0	256.3	-179.8	293.	125.	AG	444.	9.7	.0	15.8		
24. Link 12B	16.8	-11.0	256.3	-179.8	293.	125.	AG	444.	.0	.0	12.2		
25. Link 13A	-264.0	-199.6	-270.7	152.1	352.	359.	BR	1944.	4.5	9.1	17.4		
26. Link 13B	-264.0	-199.6	-270.7	152.1	352.	359.	BR	1944.	.0	9.1	13.7		
27. Link 14A	47.5	162.8	47.5	-59.7	223.	180.	BR	2438.	4.5	9.1	17.4		
28. Link 14B	47.5	162.8	47.5	-59.7	223.	180.	BR	2438.	.0	9.1	13.7		
29. Link 15A	-19.2	-59.7	248.1	-190.5	298.	116.	BR	2438.	4.5	9.1	17.4		
30. Link 15B	-19.2	-59.7	248.1	-190.5	298.	116.	BR	2438.	.0	9.1	13.7		

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs3nb.dat>

DATE : 8/18/99
TIME : 15: 3:27

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. 1:	-26.5	25.9	1.8
2. 2:	-14.0	17.1	1.8
3. 3:	-7.6	12.8	1.8
4. 4:	-.3	10.7	1.8
5. 5:	6.7	13.7	1.8
6. 6:	11.6	19.2	1.8
7. 7:	21.9	30.8	1.8
8. 8:	32.3	24.4	1.8
9. 9:	22.3	12.8	1.8
10. 10:	17.1	7.0	1.8
11. 11:	12.2	1.5	1.8
12. 12:	18.3	-3.0	1.8
13. 13:	24.7	-7.3	1.8
14. 14:	36.9	-16.5	1.8
15. 15:	5.8	-27.1	1.8
16. 16:	15.5	-17.7	1.8
17. 17:	9.4	-13.4	1.8
18. 18:	2.4	-9.8	1.8
19. 19:	-3.0	-14.6	1.8
20. 20:	-7.6	-21.0	1.8
21. 21:	-13.1	-35.4	1.8
22. 22:	-27.1	-29.3	1.8
23. 23:	-19.8	-15.8	1.8
24. 24:	-16.8	-8.8	1.8
25. 25:	-14.6	-1.5	1.8
26. 26:	-21.0	2.7	1.8
27. 27:	-27.4	7.0	1.8
28. 28:	-39.9	15.5	1.8

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs3nb.dat>

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND * CONCENTRATION
ANGLE * (PPM)

(DEGR)	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	*	.0	.0	.0	.0	.0	.0	.1	.2	.2	.1	.1	.2	.2	.2	.1	.4	.2	.2	.2	.2
2.	*	.0	.0	.0	.0	.0	.0	.1	.2	.2	.2	.1	.2	.2	.2	.2	.4	.2	.2	.2	.2
4.	*	.0	.0	.0	.0	.0	.0	.1	.2	.2	.2	.2	.2	.2	.2	.2	.4	.3	.2	.2	.2
6.	*	.0	.0	.0	.0	.0	.1	.1	.3	.2	.2	.2	.2	.2	.2	.3	.4	.3	.2	.3	.2
8.	*	.0	.0	.0	.0	.1	.1	.1	.3	.2	.2	.2	.2	.2	.2	.3	.4	.3	.3	.2	.2
10.	*	.0	.0	.0	.0	.1	.1	.1	.3	.2	.2	.2	.2	.2	.2	.3	.4	.3	.3	.3	.2
12.	*	.0	.0	.0	.1	.1	.1	.1	.3	.2	.2	.2	.2	.3	.2	.3	.4	.3	.3	.4	.2
14.	*	.0	.0	.0	.1	.1	.1	.1	.3	.2	.2	.2	.2	.3	.2	.3	.4	.3	.3	.4	.4
16.	*	.0	.0	.0	.1	.2	.2	.2	.3	.2	.2	.2	.2	.3	.2	.3	.4	.3	.3	.4	.4
18.	*	.0	.0	.1	.1	.2	.2	.2	.3	.3	.2	.2	.2	.3	.2	.3	.4	.3	.3	.4	.4
20.	*	.0	.0	.1	.1	.2	.2	.2	.3	.3	.2	.2	.2	.3	.2	.3	.4	.3	.3	.4	.4
22.	*	.0	.1	.1	.1	.2	.2	.2	.4	.3	.2	.3	.2	.3	.2	.3	.3	.3	.3	.4	.4
24.	*	.0	.1	.1	.1	.2	.2	.2	.4	.3	.3	.3	.2	.3	.2	.3	.3	.3	.3	.4	.3
26.	*	.0	.1	.1	.1	.2	.2	.2	.3	.3	.3	.3	.2	.3	.2	.3	.3	.3	.3	.4	.4
28.	*	.0	.1	.1	.2	.2	.2	.2	.3	.3	.2	.3	.2	.3	.2	.3	.3	.3	.3	.4	.4
30.	*	.1	.1	.1	.2	.2	.3	.3	.3	.3	.3	.3	.2	.3	.1	.2	.3	.3	.3	.4	.4
32.	*	.1	.1	.1	.2	.3	.3	.3	.2	.2	.3	.3	.2	.3	.1	.2	.3	.3	.3	.3	.4
34.	*	.1	.1	.1	.2	.3	.3	.3	.2	.2	.3	.3	.2	.2	.1	.2	.3	.3	.3	.3	.4
36.	*	.1	.1	.1	.2	.3	.3	.3	.2	.2	.2	.3	.2	.2	.1	.2	.3	.3	.3	.3	.4
38.	*	.1	.1	.2	.2	.3	.3	.3	.2	.2	.2	.2	.2	.1	.1	.2	.2	.3	.3	.3	.4
40.	*	.1	.1	.2	.2	.3	.3	.3	.2	.2	.2	.2	.2	.1	.1	.2	.2	.3	.3	.3	.4
42.	*	.1	.1	.2	.2	.3	.3	.4	.2	.2	.2	.2	.2	.1	.1	.2	.2	.3	.3	.3	.3
44.	*	.1	.2	.2	.2	.4	.4	.4	.2	.2	.2	.2	.2	.1	.1	.2	.2	.3	.3	.3	.3
46.	*	.1	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.1	.1	.1	.2	.2	.2	.3	.3	.3
48.	*	.1	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.1	.1	.1	.2	.2	.2	.3	.3	.3
50.	*	.1	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.1	.1	.1	.2	.2	.2	.3	.3	.3
52.	*	.1	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.1	.1	.1	.2	.2	.2	.3	.3	.2
54.	*	.1	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.2	.2	.2	.2	.2
56.	*	.1	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.2	.2	.2	.2	.2
58.	*	.1	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.2	.2	.2	.2	.2
60.	*	.2	.2	.2	.3	.3	.3	.4	.1	.1	.1	.1	.1	.1	.1	.2	.2	.3	.2	.2	.2
62.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.2	.3	.2	.2	.2
64.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.2	.3	.2	.2	.1
66.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.2	.3	.2	.2	.1
68.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.2	.2	.1
70.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.2	.2	.1
72.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.2	.2	.1
74.	*	.1	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.2	.2	.1
76.	*	.1	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.2	.2	.2
78.	*	.1	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.2	.2	.2
80.	*	.1	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.2	.3	.2
82.	*	.1	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.2	.3	.2

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs3nb.dat>

WIND * CONCENTRATION
ANGLE * (PPM)

(DEGR)	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28														
84.	*	.1	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.3	.2
86.	*	.1	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.3	.2
88.	*	.1	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.2	.2
90.	*	.1	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.2	.2
92.	*	.1	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.2	.2
94.	*	.1	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.2	.2
96.	*	.1	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.2	.2
98.	*	.1	.2	.2	.2	.2	.2	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.4	.3	.2	.2
100.	*	.2	.2	.2	.2	.2	.2	.2	.1	.1	.1	.1	.1	.1	.0	.2	.3	.4	.3	.2	.2
102.	*	.2	.3	.2	.2	.2	.2	.2	.1	.1	.1	.1	.1	.1	.1	.2	.3	.4	.3	.2	.2
104.	*	.2	.3	.2	.2	.2	.2	.2	.1	.1	.1	.1	.1	.2	.1	.2	.3	.4	.3	.2	.2
106.	*	.2	.3	.3	.2	.2	.2	.2	.1	.1	.1	.1	.2	.2	.1	.2	.3	.4	.3	.2	.2
108.	*	.2	.3	.3	.2	.2	.2	.2	.1	.1	.1	.2	.2	.2	.1	.2	.3	.4	.3	.2	.2
110.	*	.2	.3	.3	.2	.2	.2	.2	.1	.1	.1	.2	.2	.2	.1	.2	.3	.3	.4	.2	.2
112.	*	.2	.3	.4	.3	.2	.2	.2	.1	.1	.1	.2	.2	.2	.1	.2	.4	.3	.4	.2	.2
114.	*	.2	.4	.4	.3	.2	.2	.2	.1	.1	.1	.2	.2	.2	.1	.2	.4	.3	.4	.2	.2
116.	*	.2	.4	.4	.3	.2	.2	.2	.1	.1	.1	.2	.2	.2	.1	.3	.4	.3	.4	.2	.3
118.	*	.3	.4	.4	.3	.3	.2	.2	.1	.1	.2	.2	.2	.3	.2	.3	.4	.3	.4	.3	.3
120.	*	.3	.4	.5	.4	.3	.2	.2	.1	.1	.2	.3	.3	.3	.3	.3	.4	.3	.4	.3	.3
122.	*	.3	.4	.5	.4	.3	.2	.2	.1	.1	.2	.3	.3	.3	.3	.3	.5	.4	.5	.3	.3
124.	*	.3	.3	.5	.4	.3	.3	.2	.1	.2	.2	.3	.3	.3	.3	.3	.4	.4	.5	.3	.2
126.	*	.4	.4	.6	.5	.3	.3	.2	.1	.2	.2	.5	.4	.4	.4	.3	.4	.4	.4	.3	.2
128.	*	.4	.4	.6	.5	.3	.3	.2	.1	.2	.2	.5	.4	.4	.4	.2	.4	.4	.4	.3	.2
130.	*	.4	.4	.6	.5	.4	.3	.2	.1	.2	.3	.5	.4	.4	.4	.2	.4	.4	.4	.4	.2
132.	*	.4	.5	.6	.5	.4	.4	.2	.1	.3	.3	.5	.4	.4	.4	.2	.4	.4	.4	.3	.2
134.	*	.4	.5	.6	.5	.4	.4	.2	.1	.3	.3	.5	.4	.4	.4	.2	.5	.4	.5	.2	.2
136.	*	.4	.6	.6	.5	.4	.4	.3	.2	.3	.3	.5	.4	.4	.4	.2	.5	.4	.4	.2	.2
138.	*	.4	.8	.7	.5	.4	.4	.4	.3	.3	.3	.5	.4	.4	.4	.2	.4	.4	.4	.2	.2
140.	*	.4	.7	.7	.6	.4	.4	.4	.3	.3	.3	.6	.5	.5	.4	.2	.4	.4	.3	.2	.2
142.	*	.4	.6	.7	.6	.5	.4	.4	.3	.3	.4	.6	.5	.5	.5	.2	.4	.4	.3	.2	.2
144.	*	.4	.5	.6	.6	.5	.4	.4	.3	.3	.4	.5	.5	.5	.5	.2	.4	.3	.2	.2	.2
146.	*	.4	.5	.6	.6	.5	.5	.4	.3	.4	.4	.5	.5	.5	.5	.2	.4	.3	.2	.2	.2
148.	*	.4	.5	.5	.6	.5	.5	.4	.3	.4	.4	.5	.5	.5	.5	.2	.3	.3	.2	.2	.2
150.	*	.4	.5	.5	.5	.6	.5	.4	.3	.4	.4	.5	.5	.5	.5	.2	.3	.2	.2	.2	.2
152.	*	.4	.5	.6	.5	.6	.5	.4	.3	.4	.4	.5	.5	.5	.5	.2	.3	.2	.2	.2	.2
154.	*	.4	.5	.6	.4	.6	.5	.5	.4	.4	.4	.5	.5	.5	.5	.2	.2	.2	.2	.2	.2
156.	*	.4	.5	.6	.4	.5	.5	.5	.5	.4	.4	.4	.5	.5	.5	.2	.2	.2	.2	.2	.2
158.	*	.3	.5	.6	.4	.5	.5	.5	.5	.4	.4	.4	.4	.5	.5	.2	.2	.2	.2	.2	.3
160.	*	.3	.5	.5	.4	.5	.5	.5	.5	.4	.4	.4	.4	.5	.5	.2	.2	.2	.2	.2	.3
162.	*	.4	.5	.5	.4	.4	.4	.5	.5	.4	.4	.4	.3	.5	.5	.2	.2	.2	.2	.2	.3
164.	*	.4	.4	.5	.4	.4	.4	.5	.4	.4	.3	.4	.3	.5	.5	.2	.2	.2	.2	.2	.3
166.	*	.4	.4	.4	.5	.4	.5	.6	.4	.4	.3	.4	.3	.4	.5	.2	.2	.2	.2	.2	.3
168.	*	.4	.5	.4	.5	.5	.4	.6	.4	.4	.3	.4	.3	.4	.5	.2	.2	.2	.2	.3	.3
170.	*	.4	.5	.5	.5	.5	.4	.5	.4	.4	.3	.4	.4	.4	.5	.2	.2	.2	.2	.3	.3
172.	*	.3	.5	.6	.5	.4	.3	.4	.4	.3	.3	.3	.4	.4	.5	.2	.2	.2	.2	.3	.2
174.	*	.3	.5	.6	.5	.4	.4	.4	.3	.3	.3	.3	.4	.4	.5	.2	.2	.2	.2	.2	.2
176.	*	.3	.5	.6	.5	.4	.4	.3	.3	.2	.3	.2	.4	.4	.5	.2	.2	.2	.2	.2	.2
178.	*	.3	.5	.6	.6	.4	.4	.3	.3	.2	.3	.2	.4	.3	.4	.3	.2	.2	.2	.2	.2
180.	*	.1	.4	.6	.6	.4	.4	.3	.3	.2	.3	.2	.4	.3	.4	.3	.2	.1	.2	.2	.2
182.	*	.1	.4	.6	.6	.4	.4	.3	.3	.2	.2	.2	.3	.3	.3	.3	.2	.1	.2	.2	.3
184.	*	.1	.4	.6	.6	.5	.4	.3	.2	.2	.2	.2	.3	.3	.3	.2	.2	.2	.2	.2	.3
186.	*	.1	.4	.5	.6	.5	.4	.3	.1	.1	.2	.2	.3	.2	.3	.2	.1	.2	.2	.2	.3

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs3nb.dat>

WIND * CONCENTRATION
ANGLE * (PPM)

(DEGR)	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
188.	*	.1	.4	.5	.6	.6	.4	.3	.1	.1	.2	.3	.3	.2	.3	.2	.1	.2	.2	.2	.3								
190.	*	.1	.4	.5	.5	.6	.4	.3	.1	.1	.2	.3	.3	.2	.3	.2	.1	.2	.2	.2	.3								
192.	*	.1	.3	.5	.5	.5	.5	.3	.1	.1	.2	.3	.3	.2	.3	.2	.2	.2	.2	.2	.3								
194.	*	.1	.3	.5	.4	.5	.5	.2	.1	.1	.3	.3	.3	.2	.3	.2	.2	.2	.2	.2	.3								
196.	*	.1	.3	.5	.4	.5	.5	.2	.1	.1	.3	.3	.4	.2	.2	.2	.2	.2	.2	.2	.2								
198.	*	.1	.3	.5	.5	.5	.5	.2	.1	.1	.3	.3	.4	.2	.2	.2	.2	.2	.2	.2	.2								
200.	*	.1	.3	.4	.5	.5	.5	.2	.1	.1	.3	.3	.4	.2	.2	.2	.2	.2	.2	.1	.2								
202.	*	.1	.3	.3	.5	.5	.5	.2	.1	.3	.3	.3	.4	.2	.2	.2	.2	.2	.1	.1	.2								
204.	*	.1	.2	.3	.5	.5	.5	.2	.0	.2	.2	.2	.2	.3	.3	.2	.2	.2	.2	.1	.2								
206.	*	.1	.2	.3	.5	.5	.4	.3	.0	.2	.2	.2	.3	.3	.2	.2	.2	.2	.1	.2	.1								
208.	*	.1	.2	.3	.4	.3	.3	.3	.0	.2	.2	.2	.3	.3	.2	.2	.2	.2	.1	.2	.2								
210.	*	.1	.2	.3	.4	.3	.3	.3	.0	.2	.2	.2	.2	.3	.2	.2	.2	.1	.1	.2	.2								
212.	*	.1	.2	.3	.4	.3	.3	.3	.0	.2	.2	.2	.2	.3	.2	.2	.2	.1	.2	.2	.2								
214.	*	.1	.1	.3	.4	.3	.3	.3	.0	.2	.3	.3	.3	.2	.3	.2	.2	.2	.1	.2	.2								
216.	*	.1	.1	.3	.4	.3	.3	.3	.0	.3	.3	.3	.3	.2	.3	.2	.2	.2	.1	.2	.2								
218.	*	.1	.1	.3	.4	.3	.3	.3	.0	.2	.3	.3	.3	.2	.2	.2	.1	.1	.1	.2	.2								
220.	*	.1	.1	.2	.4	.3	.2	.3	.1	.2	.3	.3	.3	.2	.2	.3	.1	.1	.1	.2	.2								
222.	*	.1	.1	.2	.4	.3	.2	.3	.1	.2	.2	.3	.3	.2	.2	.3	.1	.1	.1	.2	.3								
224.	*	.1	.1	.2	.3	.3	.2	.3	.2	.2	.2	.2	.3	.2	.2	.3	.1	.1	.1	.2	.3								
226.	*	.1	.1	.2	.3	.3	.2	.3	.2	.2	.2	.2	.3	.2	.2	.3	.1	.1	.1	.2	.3								
228.	*	.1	.1	.2	.3	.3	.2	.2	.2	.2	.2	.2	.3	.2	.2	.3	.1	.1	.1	.2	.3								
230.	*	.1	.1	.2	.3	.3	.2	.2	.2	.2	.2	.2	.3	.2	.2	.2	.1	.1	.1	.3	.3								
232.	*	.1	.1	.2	.3	.4	.2	.1	.2	.3	.2	.3	.2	.2	.2	.2	.1	.1	.2	.3	.3								
234.	*	.1	.1	.2	.3	.4	.2	.1	.2	.3	.2	.3	.2	.2	.2	.2	.1	.1	.2	.2	.3								
236.	*	.1	.1	.2	.3	.4	.2	.1	.2	.2	.2	.3	.2	.2	.2	.2	.1	.1	.2	.2	.3								
238.	*	.1	.1	.2	.3	.4	.2	.1	.2	.2	.2	.3	.2	.2	.2	.2	.1	.1	.2	.2	.2								
240.	*	.1	.1	.2	.3	.3	.1	.1	.2	.2	.2	.3	.2	.3	.2	.1	.1	.2	.2	.2	.3								
242.	*	.1	.1	.2	.2	.3	.2	.1	.1	.2	.3	.3	.2	.3	.2	.1	.1	.2	.2	.2	.3								
244.	*	.1	.1	.2	.2	.2	.1	.1	.1	.2	.3	.3	.2	.3	.2	.1	.2	.1	.2	.2	.2								
246.	*	.1	.1	.2	.2	.2	.1	.1	.1	.2	.3	.3	.2	.3	.2	.1	.2	.1	.2	.2	.2								
248.	*	.1	.1	.2	.2	.1	.1	.0	.1	.2	.3	.3	.2	.3	.1	.1	.2	.1	.2	.2	.2								
250.	*	.1	.1	.2	.2	.1	.1	.0	.1	.2	.3	.2	.2	.3	.1	.1	.1	.1	.2	.3	.2								
252.	*	.1	.1	.2	.2	.1	.1	.0	.1	.2	.3	.2	.2	.3	.1	.1	.1	.1	.2	.3	.2								
254.	*	.1	.1	.2	.2	.1	.1	.0	.1	.2	.2	.2	.2	.3	.1	.1	.1	.1	.2	.3	.2								
256.	*	.1	.1	.2	.2	.1	.1	.0	.1	.1	.2	.3	.2	.3	.1	.2	.1	.1	.2	.2	.2								
258.	*	.1	.1	.2	.2	.1	.1	.0	.1	.1	.2	.3	.2	.3	.1	.2	.1	.1	.2	.2	.2								
260.	*	.1	.1	.1	.2	.1	.1	.0	.1	.1	.2	.3	.2	.3	.2	.2	.1	.1	.2	.2	.2								
262.	*	.1	.1	.1	.2	.1	.1	.0	.1	.1	.2	.3	.2	.3	.2	.2	.1	.1	.2	.2	.2								
264.	*	.1	.1	.1	.2	.1	.1	.0	.1	.1	.1	.3	.2	.3	.2	.2	.1	.1	.2	.2	.2								
266.	*	.1	.1	.1	.2	.1	.1	.0	.1	.1	.2	.3	.2	.3	.2	.1	.1	.1	.2	.2	.2								
268.	*	.1	.1	.1	.2	.1	.1	.0	.1	.1	.2	.3	.2	.3	.2	.1	.1	.1	.2	.2	.2								
270.	*	.1	.1	.1	.1	.1	.1	.0	.1	.2	.2	.4	.2	.3	.2	.1	.1	.1	.2	.2	.2								
272.	*	.1	.1	.1	.1	.1	.1	.0	.1	.2	.2	.4	.2	.2	.2	.1	.1	.1	.2	.2	.2								
274.	*	.1	.1	.1	.1	.1	.1	.0	.1	.2	.2	.4	.2	.2	.2	.1	.1	.1	.2	.2	.2								
276.	*	.1	.1	.1	.1	.1	.1	.0	.1	.2	.2	.4	.2	.2	.2	.1	.1	.1	.2	.2	.2								
278.	*	.2	.1	.1	.1	.1	.1	.0	.1	.2	.2	.4	.2	.2	.2	.1	.1	.1	.2	.2	.2								
280.	*	.2	.2	.1	.1	.1	.1	.0	.1	.2	.2	.4	.2	.2	.2	.1	.1	.1	.2	.2	.2								
282.	*	.2	.2	.1	.1	.1	.1	.0	.1	.2	.2	.3	.2	.2	.2	.1	.1	.1	.2	.2	.2								
284.	*	.2	.2	.1	.1	.1	.0	.0	.1	.1	.2	.3	.3	.2	.2	.1	.1	.1	.2	.2	.2								
286.	*	.2	.2	.1	.1	.1	.0	.0	.1	.1	.2	.3	.3	.2	.3	.1	.1	.1	.2	.2	.2								
288.	*	.2	.2	.1	.1	.1	.0	.0	.1	.1	.2	.3	.3	.2	.2	.1	.2	.2	.2	.2	.2								
290.	*	.2	.2	.1	.1	.1	.0	.0	.1	.1	.2	.3	.3	.1	.2	.1	.2	.2	.2	.2	.2								

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
292.	*	.2	.2	.1	.1	.1	.0	.0	.1	.1	.2	.3	.3	.2	.2	.1	.2	.2	.2	.2	.2								
294.	*	.2	.2	.1	.1	.1	.0	.0	.1	.1	.2	.3	.3	.2	.2	.1	.2	.2	.2	.2	.2								
296.	*	.2	.2	.1	.1	.1	.0	.0	.1	.1	.2	.3	.3	.2	.2	.1	.2	.2	.3	.2	.2								
298.	*	.2	.2	.1	.1	.1	.0	.0	.1	.1	.2	.3	.3	.2	.1	.1	.2	.2	.3	.2	.2								
300.	*	.2	.2	.1	.1	.1	.0	.0	.1	.1	.2	.3	.3	.2	.1	.1	.2	.2	.4	.2	.2								
302.	*	.2	.1	.1	.1	.0	.0	.0	.1	.1	.1	.3	.3	.2	.1	.1	.2	.3	.5	.2	.2								
304.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.3	.3	.2	.1	.1	.2	.3	.5	.2	.2								
306.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.3	.3	.1	.1	.1	.3	.3	.5	.2	.2								
308.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.3	.3	.1	.1	.1	.3	.3	.5	.2	.2								
310.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.2	.3	.2	.1	.1	.3	.3	.5	.2	.2								
312.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.2	.2	.2	.1	.1	.3	.3	.5	.2	.2								
314.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.2	.2	.2	.1	.1	.3	.3	.5	.3	.2								
316.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.2	.1	.1	.1	.3	.3	.5	.3	.2								
318.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.1	.3	.3	.5	.3	.2								
320.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.2	.3	.5	.3	.2									
322.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.2	.3	.4	.3	.2								
324.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.1	.3	.4	.4	.2								
326.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.1	.3	.4	.4	.2								
328.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.1	.2	.4	.4	.2								
330.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.1	.1	.4	.4	.2								
332.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.1	.1	.4	.4	.2								
334.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.1	.1	.4	.4	.2								
336.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.1	.2	.4	.4	.3								
338.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.1	.2	.3	.4	.3								
340.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.2	.2	.3	.4	.4								
342.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.1	.2	.2	.3	.4	.4								
344.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.1	.3	.2	.4	.4	.3								
346.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.1	.3	.2	.4	.4	.3								
348.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.2	.3	.2	.3	.4	.3								
350.	*	.0	.0	.0	.0	.0	.0	.0	.2	.1	.1	.1	.1	.1	.1	.1	.3	.2	.3	.4	.3								
352.	*	.0	.0	.0	.0	.0	.0	.0	.2	.1	.1	.1	.1	.1	.1	.1	.3	.2	.3	.4	.3								
354.	*	.0	.0	.0	.0	.0	.0	.0	.2	.1	.1	.1	.1	.1	.1	.1	.3	.2	.2	.4	.3								
356.	*	.0	.0	.0	.0	.0	.0	.0	.2	.1	.1	.1	.1	.2	.1	.1	.3	.2	.2	.2	.3								
358.	*	.0	.0	.0	.0	.0	.0	.0	.2	.2	.1	.1	.1	.2	.2	.1	.3	.2	.2	.2	.3								
360.	*	.0	.0	.0	.0	.0	.0	.1	.2	.2	.1	.1	.2	.2	.2	.1	.4	.2	.2	.2	.2								
MAX	*	.4	.8	.7	.6	.6	.5	.6	.5	.4	.4	.6	.5	.5	.5	.3	.5	.4	.5	.4	.4								
DEGR.	*	126	138	138	140	150	146	166	156	146	142	140	140	140	142	6	122	98	122	12	14								

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	.2	.1	.0	.2	.2	.1	.1	.1
2.	.2	.1	.0	.2	.2	.1	.1	.1
4.	.2	.1	.1	.2	.2	.1	.1	.1
6.	.2	.1	.1	.2	.2	.1	.1	.1
8.	.2	.1	.1	.2	.2	.1	.1	.1
10.	.2	.1	.1	.2	.2	.1	.1	.1
12.	.2	.1	.1	.2	.2	.1	.1	.1
14.	.3	.1	.1	.2	.2	.2	.1	.1
16.	.3	.2	.1	.2	.2	.2	.1	.1
18.	.3	.2	.1	.3	.2	.2	.1	.1
20.	.3	.2	.2	.4	.3	.2	.1	.1
22.	.3	.3	.2	.4	.3	.3	.1	.1
24.	.3	.3	.3	.4	.3	.3	.1	.1
26.	.3	.4	.3	.4	.3	.3	.2	.1
28.	.3	.4	.4	.4	.3	.3	.2	.1
30.	.3	.5	.4	.5	.3	.3	.2	.1
32.	.3	.5	.4	.5	.4	.3	.2	.1
34.	.3	.5	.4	.5	.4	.3	.2	.2
36.	.2	.5	.4	.4	.4	.3	.2	.2
38.	.2	.5	.5	.5	.4	.3	.2	.2
40.	.2	.6	.5	.5	.4	.4	.2	.2
42.	.2	.6	.5	.5	.4	.4	.2	.2
44.	.2	.6	.5	.5	.4	.4	.2	.2
46.	.1	.6	.5	.5	.5	.4	.2	.2
48.	.1	.6	.5	.5	.5	.4	.3	.2
50.	.1	.6	.5	.5	.5	.4	.3	.2
52.	.1	.6	.5	.5	.5	.4	.3	.2
54.	.1	.6	.5	.5	.5	.4	.3	.2
56.	.1	.4	.5	.4	.5	.4	.3	.2
58.	.1	.4	.5	.4	.5	.4	.3	.2
60.	.1	.4	.5	.4	.5	.4	.3	.2
62.	.1	.4	.5	.4	.5	.4	.3	.2
64.	.1	.4	.4	.5	.5	.4	.3	.2
66.	.1	.4	.4	.5	.5	.4	.3	.2
68.	.1	.4	.4	.6	.5	.4	.3	.2
70.	.1	.4	.4	.6	.5	.4	.4	.2
72.	.2	.4	.4	.5	.4	.4	.4	.2
74.	.2	.4	.4	.5	.4	.4	.4	.2
76.	.2	.4	.4	.5	.5	.4	.4	.2
78.	.2	.4	.4	.5	.5	.4	.4	.2
80.	.2	.4	.4	.5	.5	.4	.4	.2
82.	.2	.4	.4	.5	.6	.4	.4	.2

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
84.	.2	.3	.4	.5	.6	.4	.4	.2
86.	.2	.5	.4	.4	.5	.5	.4	.2
88.	.2	.5	.5	.4	.5	.5	.3	.2
90.	.2	.5	.5	.4	.5	.4	.3	.2
92.	.2	.5	.5	.4	.5	.4	.3	.2
94.	.2	.5	.4	.5	.5	.4	.3	.2
96.	.2	.5	.4	.4	.5	.3	.3	.2
98.	.2	.5	.4	.4	.5	.3	.3	.2
100.	.2	.5	.4	.4	.6	.3	.4	.2
102.	.2	.5	.4	.4	.6	.3	.4	.2
104.	.2	.5	.4	.4	.6	.5	.4	.2
106.	.2	.4	.4	.4	.6	.5	.4	.2
108.	.2	.6	.4	.4	.6	.5	.4	.2
110.	.2	.6	.4	.4	.6	.5	.4	.2
112.	.2	.6	.5	.4	.6	.4	.4	.3
114.	.2	.6	.6	.4	.6	.4	.4	.3
116.	.1	.4	.6	.5	.6	.4	.4	.3
118.	.1	.4	.6	.6	.6	.4	.4	.3
120.	.2	.5	.5	.6	.5	.5	.5	.4
122.	.4	.6	.5	.6	.5	.5	.5	.4
124.	.4	.6	.5	.6	.5	.5	.5	.4
126.	.4	.6	.5	.5	.5	.5	.4	.3
128.	.4	.7	.5	.4	.5	.4	.3	.3
130.	.4	.7	.5	.5	.5	.4	.3	.3
132.	.4	.7	.4	.4	.5	.5	.4	.3
134.	.4	.7	.4	.4	.5	.5	.3	.3
136.	.4	.7	.4	.4	.4	.4	.3	.3
138.	.4	.7	.4	.4	.4	.4	.3	.3
140.	.4	.7	.4	.4	.4	.4	.3	.3
142.	.5	.6	.5	.4	.4	.4	.3	.3
144.	.5	.6	.5	.4	.4	.4	.3	.3
146.	.5	.5	.5	.4	.4	.4	.3	.4
148.	.5	.5	.5	.4	.4	.4	.3	.4
150.	.4	.5	.5	.4	.4	.4	.4	.4
152.	.5	.5	.6	.5	.4	.4	.4	.4
154.	.5	.5	.6	.6	.4	.5	.4	.3
156.	.5	.5	.6	.6	.4	.5	.4	.3
158.	.5	.4	.7	.6	.5	.5	.4	.3
160.	.5	.4	.7	.6	.5	.5	.3	.2
162.	.5	.4	.7	.6	.5	.4	.3	.2
164.	.5	.4	.6	.6	.5	.3	.3	.2
166.	.5	.4	.6	.5	.4	.3	.3	.1
168.	.4	.3	.6	.5	.4	.3	.3	.1
170.	.4	.2	.6	.5	.4	.3	.3	.1
172.	.4	.2	.6	.5	.4	.3	.2	.0
174.	.4	.2	.6	.5	.4	.3	.2	.0
176.	.4	.2	.6	.5	.4	.3	.2	.0
178.	.4	.2	.6	.5	.4	.2	.2	.0

180.	*	.4	.2	.5	.5	.4	.2	.2	.0
182.	*	.4	.1	.5	.4	.4	.2	.1	.0
184.	*	.4	.1	.4	.4	.3	.2	.0	.0

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
186.	*	.4	.1	.4	.4	.3	.2	.0	.0
188.	*	.4	.1	.4	.4	.3	.2	.0	.0
190.	*	.4	.1	.3	.4	.3	.2	.0	.0
192.	*	.4	.1	.3	.4	.3	.2	.0	.0
194.	*	.3	.1	.3	.3	.3	.1	.0	.0
196.	*	.3	.1	.3	.3	.3	.0	.0	.0
198.	*	.3	.1	.3	.3	.3	.0	.0	.0
200.	*	.3	.0	.3	.3	.3	.0	.0	.0
202.	*	.3	.0	.3	.3	.3	.0	.0	.0
204.	*	.3	.0	.3	.3	.1	.0	.0	.0
206.	*	.3	.0	.3	.2	.1	.0	.0	.0
208.	*	.3	.0	.3	.2	.1	.0	.0	.0
210.	*	.3	.0	.2	.2	.1	.0	.0	.0
212.	*	.3	.0	.2	.2	.1	.0	.0	.0
214.	*	.3	.0	.2	.1	.1	.0	.0	.0
216.	*	.2	.0	.1	.1	.1	.0	.0	.0
218.	*	.2	.0	.1	.1	.1	.0	.0	.0
220.	*	.2	.0	.1	.1	.0	.0	.0	.0
222.	*	.2	.0	.1	.1	.0	.0	.0	.0
224.	*	.2	.0	.1	.1	.0	.0	.0	.0
226.	*	.2	.0	.1	.1	.0	.0	.0	.0
228.	*	.2	.0	.1	.1	.0	.0	.0	.0
230.	*	.2	.0	.1	.0	.0	.0	.0	.0
232.	*	.2	.0	.1	.0	.0	.0	.0	.0
234.	*	.2	.0	.1	.0	.0	.0	.0	.0
236.	*	.2	.0	.0	.0	.0	.0	.0	.0
238.	*	.2	.0	.0	.0	.0	.0	.0	.0
240.	*	.2	.0	.0	.0	.0	.0	.0	.0
242.	*	.2	.0	.0	.0	.0	.0	.0	.0
244.	*	.2	.0	.0	.0	.0	.0	.0	.0
246.	*	.2	.0	.0	.0	.0	.0	.0	.0
248.	*	.2	.0	.0	.0	.0	.0	.0	.0
250.	*	.2	.0	.0	.0	.0	.0	.0	.0
252.	*	.2	.0	.0	.0	.0	.0	.0	.0
254.	*	.2	.0	.0	.0	.0	.0	.0	.0
256.	*	.2	.0	.0	.0	.0	.0	.0	.0
258.	*	.2	.0	.0	.0	.0	.0	.0	.0
260.	*	.2	.0	.0	.0	.0	.0	.0	.0
262.	*	.2	.0	.0	.0	.0	.0	.0	.0
264.	*	.2	.0	.0	.0	.0	.0	.0	.0
266.	*	.2	.0	.0	.0	.0	.0	.0	.0
268.	*	.2	.0	.0	.0	.0	.0	.0	.0
270.	*	.2	.0	.0	.0	.0	.0	.0	.0
272.	*	.2	.0	.0	.0	.0	.0	.0	.0
274.	*	.2	.0	.0	.0	.0	.0	.0	.0
276.	*	.2	.0	.0	.0	.0	.0	.0	.0
278.	*	.3	.0	.0	.0	.0	.0	.0	.0
280.	*	.3	.0	.0	.0	.0	.0	.0	.0
282.	*	.3	.0	.0	.0	.0	.0	.0	.0
284.	*	.3	.0	.0	.0	.0	.0	.0	.0
286.	*	.3	.0	.0	.0	.0	.0	.0	.0

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
288.	*	.3	.0	.0	.0	.0	.0	.0	.0
290.	*	.3	.0	.0	.0	.0	.0	.0	.0
292.	*	.3	.0	.0	.0	.0	.0	.0	.0
294.	*	.3	.0	.0	.0	.0	.0	.0	.0
296.	*	.3	.0	.0	.0	.0	.0	.0	.0
298.	*	.3	.0	.0	.0	.0	.0	.0	.0
300.	*	.2	.0	.0	.0	.0	.0	.0	.0
302.	*	.2	.0	.0	.0	.0	.0	.0	.0
304.	*	.3	.0	.0	.0	.0	.0	.0	.0
306.	*	.3	.0	.0	.0	.0	.1	.1	.0
308.	*	.3	.0	.0	.0	.1	.2	.1	.1
310.	*	.3	.0	.0	.0	.1	.2	.2	.1
312.	*	.3	.0	.0	.0	.1	.2	.2	.1
314.	*	.3	.0	.0	.0	.2	.2	.2	.1
316.	*	.3	.0	.0	.0	.2	.2	.2	.2
318.	*	.3	.0	.0	.0	.2	.2	.2	.2
320.	*	.3	.0	.0	.0	.2	.2	.2	.2
322.	*	.3	.0	.0	.0	.2	.2	.2	.2
324.	*	.3	.0	.0	.0	.2	.2	.2	.2
326.	*	.3	.0	.0	.1	.2	.2	.2	.2
328.	*	.3	.0	.0	.1	.2	.2	.2	.2
330.	*	.3	.0	.0	.1	.2	.2	.2	.2
332.	*	.3	.0	.0	.1	.2	.2	.2	.2
334.	*	.3	.0	.0	.1	.2	.1	.2	.2
336.	*	.3	.0	.0	.1	.2	.1	.2	.2
338.	*	.3	.0	.0	.1	.2	.1	.2	.2
340.	*	.3	.0	.0	.1	.2	.1	.2	.2
342.	*	.3	.0	.0	.1	.2	.1	.1	.1
344.	*	.3	.0	.0	.1	.2	.1	.1	.1
346.	*	.3	.0	.0	.1	.2	.1	.1	.1
348.	*	.2	.0	.0	.1	.2	.1	.1	.1
350.	*	.2	.0	.0	.1	.2	.1	.1	.1
352.	*	.2	.0	.0	.1	.2	.1	.1	.1
354.	*	.2	.0	.0	.1	.2	.1	.1	.1
356.	*	.2	.1	.0	.1	.2	.1	.1	.1
358.	*	.2	.1	.0	.1	.2	.1	.1	.1
360.	*	.2	.1	.0	.2	.2	.1	.1	.1

```
MAX   *    .5    .7    .7    .6    .6    .5    .5    .4
DEGR. *  142   128   158    68    82    86   120   120

THE HIGHEST CONCENTRATION OF     .80 PPM OCCURRED AT RECEPTOR REC2 .
```


JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs3nb.dat>

DATE : 8/18/99
TIME : 15: 3:27

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 126	REC2 138	REC3 138	REC4 140	REC5 150	REC6 146	REC7 166	REC8 156	REC9 146	REC10 142	REC11 140	REC12 140	REC13 140	REC14 142	REC15 6	REC16 122	REC17 98	REC18 122	REC19 12	REC20 14
1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5	.0	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.2
10	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	.0	.0	.1	.1	.1	.1	.2	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.1	.1
12	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	.0	.1	.1	.1	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.1	.0	.1	.1	.1	.0
22	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.2	.2	.2	.2	.0	.3	.2	.2	.0	.0
24	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	.1	.1	.1	.1	.1	.1	.1	.2	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1
28	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
29	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.1	.0	.1	.0	.1	.0	.0
30	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs3nb.dat>

DATE : 8/18/99
TIME : 15: 3:27

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC21 142	REC22 128	REC23 158	REC24 68	REC25 82	REC26 86	REC27 120	REC28 120
1	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0
4	.0	.0	.0	.0	.0	.0	.0	.0
5	.1	.1	.1	.0	.0	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0	.0
7	.2	.3	.2	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0
9	.0	.1	.3	.3	.2	.1	.1	.1
10	.0	.0	.0	.0	.0	.0	.0	.0
11	.0	.0	.0	.1	.1	.1	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.0	.0	.1	.1	.1	.0
14	.0	.0	.0	.0	.0	.0	.0	.0
15	.0	.0	.0	.0	.0	.0	.0	.0
16	.0	.0	.0	.0	.0	.0	.0	.0
17	.0	.0	.0	.0	.0	.0	.0	.0
18	.0	.0	.0	.0	.0	.0	.0	.0
19	.0	.0	.0	.0	.0	.1	.0	.0
20	.0	.0	.0	.0	.0	.0	.0	.0
21	.0	.0	.0	.1	.1	.0	.0	.0
22	.0	.0	.0	.0	.0	.0	.0	.0
23	.0	.0	.0	.0	.0	.0	.1	.1
24	.0	.0	.0	.0	.0	.0	.0	.0
25	.0	.0	.0	.0	.0	.0	.0	.0
26	.0	.0	.0	.0	.0	.0	.0	.0
27	.0	.0	.0	.1	.1	.1	.1	.1
28	.0	.0	.0	.0	.0	.0	.0	.0
29	.2	.2	.1	.0	.0	.0	.1	.1
30	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 BUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs6bd.dat>

DATE : 8/18/99
TIME : 15: 5:50

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. Link 1A	206.7	230.1	4.0	-2.1	308.	221.	AG	92.	9.9	.0	7.9		
2. Link 1B	206.7	230.1	4.0	-2.1	308.	221.	AG	92.	.0	.0	4.3		
3. Link 2A	.9	-.6	-19.5	-31.7	37.	213.	AG	0.	.0	.0	10.7		
4. Link 2B	.9	-.6	-19.5	-31.7	37.	213.	AG	0.	.0	.0	7.0		
5. Link 3A	252.4	-253.0	1.2	-79.6	305.	305.	AG	1014.	10.2	.0	15.8		
6. Link 3B	252.4	-253.0	1.2	-79.6	305.	305.	AG	1014.	.0	.0	12.2		
7. Link 4A	1.2	-79.6	-22.9	-31.7	54.	333.	AG	1014.	10.2	.0	15.8		
8. Link 4B	1.2	-79.6	-22.9	-31.7	54.	333.	AG	1014.	.0	.0	12.2		
9. Link 5A	-22.9	-31.7	-3.0	1.2	38.	31.	AG	1014.	10.2	.0	11.6		
10. Link 5B	-22.9	-31.7	-3.0	1.2	38.	31.	AG	1014.	.0	.0	7.9		
11. Link 6A	-.3	.0	204.5	232.6	310.	41.	AG	489.	9.8	.0	7.9		
12. Link 6B	-.3	.0	204.5	232.6	310.	41.	AG	489.	.0	.0	4.3		
13. Link 7A	-2.7	-2.1	-19.2	10.1	20.	307.	AG	219.	30.3	.0	12.5		
14. Link 7B	-2.7	-2.1	-19.2	10.1	20.	307.	AG	219.	.0	.0	8.8		
15. Link 8A	-19.2	10.1	-255.4	181.4	292.	306.	AG	219.	12.0	.0	12.5		
16. Link 8B	-19.2	10.1	-255.4	181.4	292.	306.	AG	219.	.0	.0	8.8		
17. Link 9A	-248.7	191.4	-67.1	49.1	231.	128.	AG	246.	9.5	.0	8.2		
18. Link 9B	-248.7	191.4	-67.1	49.1	231.	128.	AG	246.	.0	.0	4.6		
19. Link 10A	-67.1	49.1	.3	2.1	82.	125.	AG	246.	24.1	.0	15.8		
20. Link 10B	-67.1	49.1	.3	2.1	82.	125.	AG	246.	.0	.0	12.2		
21. Link 11A	.0	.9	16.8	-11.0	21.	125.	AG	644.	9.6	.0	15.8		
22. Link 11B	.0	.9	16.8	-11.0	21.	125.	AG	644.	.0	.0	12.2		
23. Link 12A	16.8	-11.0	256.3	-179.8	293.	125.	AG	644.	9.6	.0	15.8		
24. Link 12B	16.8	-11.0	256.3	-179.8	293.	125.	AG	644.	.0	.0	12.2		
25. Link 13A	-264.0	-199.6	-270.7	152.1	352.	359.	BR	2382.	4.5	9.1	17.4		
26. Link 13B	-264.0	-199.6	-270.7	152.1	352.	359.	BR	2382.	.0	9.1	13.7		
27. Link 14A	47.5	162.8	47.5	-59.7	223.	180.	BR	2968.	4.5	9.1	17.4		
28. Link 14B	47.5	162.8	47.5	-59.7	223.	180.	BR	2968.	.0	9.1	13.7		
29. Link 15A	-19.2	-59.7	248.1	-190.5	298.	116.	BR	2968.	4.5	9.1	17.4		
30. Link 15B	-19.2	-59.7	248.1	-190.5	298.	116.	BR	2968.	.0	9.1	13.7		

JOB: CASE:1 BUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs6bd.dat>

DATE : 8/18/99
TIME : 15: 5:50

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. 1:	-26.5	25.9	1.8
2. 2:	-14.0	17.1	1.8
3. 3:	-7.6	12.8	1.8
4. 4:	-.3	10.7	1.8
5. 5:	6.7	13.7	1.8
6. 6:	11.6	19.2	1.8
7. 7:	21.9	30.8	1.8
8. 8:	32.3	24.4	1.8
9. 9:	22.3	12.8	1.8
10. 10:	17.1	7.0	1.8
11. 11:	12.2	1.5	1.8
12. 12:	18.3	-3.0	1.8
13. 13:	24.7	-7.3	1.8
14. 14:	36.9	-16.5	1.8
15. 15:	5.8	-27.1	1.8
16. 16:	15.5	-17.7	1.8
17. 17:	9.4	-13.4	1.8
18. 18:	2.4	-9.8	1.8
19. 19:	-3.0	-14.6	1.8
20. 20:	-7.6	-21.0	1.8
21. 21:	-13.1	-35.4	1.8
22. 22:	-27.1	-29.3	1.8
23. 23:	-19.8	-15.8	1.8
24. 24:	-16.8	-8.8	1.8
25. 25:	-14.6	-1.5	1.8
26. 26:	-21.0	2.7	1.8
27. 27:	-27.4	7.0	1.8
28. 28:	-39.9	15.5	1.8

JOB: CASE:1 BUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs6bd.dat>

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

(DEGR)	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	*	.0	.0	.1	.0	.0	.0	.1	.2	.2	.2	.1	.2	.2	.3	.2	.4	.3	.4	.4	.5
2.	*	.0	.0	.0	.0	.0	.0	.1	.3	.2	.2	.2	.2	.2	.3	.2	.4	.4	.4	.6	.5
4.	*	.0	.0	.0	.0	.0	.1	.1	.4	.3	.3	.3	.2	.2	.4	.3	.4	.4	.4	.6	.5
6.	*	.0	.0	.0	.0	.1	.1	.1	.4	.3	.3	.3	.2	.2	.4	.3	.4	.4	.4	.6	.5
8.	*	.0	.0	.0	.0	.1	.1	.1	.4	.3	.3	.3	.2	.3	.4	.3	.4	.4	.4	.6	.5
10.	*	.0	.0	.0	.1	.1	.1	.1	.4	.3	.3	.3	.2	.3	.4	.3	.4	.4	.4	.7	.6
12.	*	.0	.0	.0	.1	.1	.1	.2	.4	.4	.3	.3	.2	.3	.4	.3	.4	.4	.4	.7	.7
14.	*	.0	.0	.1	.1	.2	.2	.3	.4	.4	.3	.3	.3	.3	.4	.3	.4	.4	.4	.7	.7
16.	*	.0	.0	.1	.1	.2	.2	.3	.5	.4	.5	.4	.3	.3	.4	.3	.5	.4	.5	.6	.7
18.	*	.0	.1	.1	.1	.2	.2	.3	.5	.5	.5	.4	.3	.3	.4	.3	.5	.4	.5	.5	.7
20.	*	.0	.1	.1	.1	.2	.2	.3	.5	.5	.5	.4	.3	.3	.3	.3	.5	.4	.5	.4	.6
22.	*	.0	.1	.1	.1	.2	.2	.3	.5	.5	.5	.5	.3	.3	.3	.3	.5	.4	.5	.4	.5
24.	*	.0	.1	.1	.1	.2	.2	.3	.5	.5	.5	.5	.3	.3	.3	.3	.5	.5	.5	.4	.5
26.	*	.1	.1	.1	.1	.2	.2	.3	.5	.5	.5	.5	.3	.3	.3	.3	.5	.5	.5	.4	.5
28.	*	.1	.1	.1	.2	.3	.4	.4	.5	.5	.5	.5	.3	.3	.3	.4	.4	.5	.5	.5	.5
30.	*	.1	.1	.1	.2	.3	.4	.4	.5	.5	.5	.5	.3	.3	.2	.5	.5	.5	.5	.5	.4
32.	*	.1	.1	.1	.2	.3	.4	.4	.5	.5	.5	.5	.3	.3	.2	.5	.5	.5	.5	.5	.4
34.	*	.1	.1	.1	.2	.3	.4	.4	.5	.5	.5	.5	.3	.3	.2	.4	.5	.5	.5	.4	.4
36.	*	.1	.1	.2	.2	.3	.4	.4	.5	.5	.5	.5	.3	.3	.1	.4	.5	.5	.5	.4	.4
38.	*	.1	.1	.2	.2	.4	.4	.5	.4	.4	.4	.4	.3	.3	.1	.4	.5	.4	.5	.3	.4
40.	*	.1	.1	.2	.2	.4	.4	.5	.3	.4	.4	.3	.3	.3	.1	.3	.5	.4	.4	.3	.4
42.	*	.1	.2	.2	.3	.4	.4	.5	.3	.4	.4	.3	.3	.2	.1	.2	.4	.4	.4	.3	.4
44.	*	.1	.2	.2	.3	.4	.4	.5	.2	.3	.2	.3	.2	.2	.1	.2	.3	.4	.4	.3	.4
46.	*	.1	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.2	.1	.1	.2	.3	.4	.4	.3	.3
48.	*	.1	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.1	.1	.1	.2	.3	.3	.4	.3	.3
50.	*	.1	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.1	.1	.1	.2	.3	.3	.4	.3	.3
52.	*	.1	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.1	.1	.1	.2	.3	.2	.4	.3	.3
54.	*	.2	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.1	.1	.1	.2	.3	.4	.4	.3	.2
56.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.3	.4	.3	.2	.2
58.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.3	.4	.3	.2	.2
60.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.3	.3	.3	.2	.2
62.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.3	.3	.3	.2	.2
64.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.3	.3	.3	.2	.2
66.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.3	.3	.3	.2	.2
68.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.2	.3
70.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.2	.3
72.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.3	.3
74.	*	.2	.3	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.3	.2
76.	*	.3	.3	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.3	.2
78.	*	.3	.3	.3	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.4	.3	.2
80.	*	.3	.3	.3	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.4	.3	.2
82.	*	.3	.3	.3	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.4	.4	.3	.2

WIND * CONCENTRATION
ANGLE * (PPM)

(DEGR)	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
84.	*	.3	.3	.3	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.4	.4	.4	.3	.2
86.	*	.3	.3	.3	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.4	.4	.4	.3	.2
88.	*	.3	.3	.3	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.4	.4	.4	.3	.2
90.	*	.3	.3	.3	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.4	.4	.4	.3	.2
92.	*	.3	.3	.3	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.4	.4	.4	.3	.2
94.	*	.3	.3	.3	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.4	.4	.4	.3	.2
96.	*	.3	.3	.3	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.1	.3	.4	.4	.4	.3	.2
98.	*	.3	.3	.3	.2	.3	.3	.3	.1	.1	.1	.1	.1	.2	.1	.3	.4	.4	.4	.2	.2
100.	*	.3	.3	.3	.2	.3	.3	.3	.1	.1	.1	.1	.1	.2	.1	.3	.4	.4	.4	.3	.2
102.	*	.3	.3	.3	.2	.3	.3	.3	.1	.1	.1	.1	.2	.2	.1	.3	.4	.4	.4	.3	.2
104.	*	.2	.3	.3	.2	.3	.3	.3	.1	.1	.1	.1	.2	.2	.1	.3	.4	.5	.4	.3	.2
106.	*	.3	.3	.3	.2	.3	.3	.3	.1	.1	.1	.2	.2	.2	.1	.3	.4	.5	.4	.3	.2
108.	*	.3	.3	.4	.2	.3	.3	.3	.1	.1	.1	.2	.2	.2	.1	.3	.4	.5	.4	.3	.2
110.	*	.3	.4	.4	.3	.3	.3	.3	.1	.1	.1	.2	.2	.2	.1	.3	.5	.5	.4	.3	.2
112.	*	.4	.5	.5	.3	.3	.3	.3	.1	.1	.1	.2	.2	.3	.2	.3	.5	.5	.4	.3	.2
114.	*	.4	.5	.5	.4	.4	.3	.3	.1	.1	.2	.3	.3	.3	.3	.3	.5	.5	.4	.3	.3
116.	*	.4	.5	.5	.4	.4	.3	.3	.1	.1	.2	.3	.3	.3	.3	.3	.5	.5	.4	.4	.3
118.	*	.4	.6	.5	.4	.4	.3	.3	.1	.1	.2	.4	.3	.3	.3	.3	.5	.5	.4	.4	.3
120.	*	.4	.6	.6	.5	.4	.4	.3	.1	.2	.2	.4	.3	.3	.4	.3	.6	.6	.5	.4	.3
122.	*	.4	.6	.6	.5	.4	.4	.3	.1	.2	.2	.4	.3	.4	.4	.3	.6	.6	.5	.4	.3
124.	*	.7	.7	.7	.6	.4	.4	.3	.1	.2	.2	.5	.5	.5	.5	.3	.6	.6	.5	.3	.4
126.	*	.7	.8	.7	.7	.5	.4	.3	.1	.2	.3	.5	.5	.5	.5	.4	.5	.6	.5	.3	.4
128.	*	.7	.8	.7	.7	.5	.5	.4	.1	.2	.3	.5	.5	.5	.5	.4	.5	.5	.5	.4	.3
130.	*	.7	.8	.7	.7	.5	.5	.4	.2	.3	.4	.5	.5	.5	.5	.5	.6	.6	.6	.4	.4
132.	*	.8	.7	.7	.7	.6	.5	.4	.2	.3	.4	.5	.5	.5	.5	.4	.6	.5	.6	.4	.3
134.	*	.9	.9	.9	.8	.6	.5	.5	.3	.3	.4	.5	.5	.5	.6	.3	.6	.5	.5	.4	.3
136.	*	.9	.9	.9	.8	.7	.5	.5	.3	.3	.4	.6	.6	.6	.7	.3	.5	.5	.5	.3	.3
138.	*	.9	.9	.9	.8	.7	.5	.5	.3	.3	.5	.6	.6	.6	.6	.3	.5	.5	.5	.3	.3
140.	*	.9	.9	1.0	.7	.7	.6	.6	.3	.4	.5	.6	.6	.6	.6	.3	.5	.4	.5	.3	.3
142.	*	.8	.9	1.0	.7	.8	.6	.6	.4	.4	.5	.6	.6	.6	.6	.3	.5	.4	.4	.3	.3
144.	*	.8	.9	1.0	.7	.7	.6	.7	.4	.4	.5	.6	.6	.6	.6	.3	.4	.4	.3	.3	.3
146.	*	.7	.9	1.0	.7	.7	.6	.7	.5	.4	.5	.6	.6	.6	.6	.3	.4	.4	.2	.2	.3
148.	*	.8	.8	.9	.7	.7	.6	.7	.5	.4	.5	.6	.7	.6	.6	.3	.4	.3	.2	.2	.3
150.	*	.8	.8	.8	.7	.7	.6	.7	.5	.4	.5	.6	.6	.6	.6	.3	.4	.3	.2	.2	.3
152.	*	.8	.7	.7	.6	.7	.6	.7	.5	.4	.5	.6	.6	.6	.6	.3	.3	.3	.2	.2	.3
154.	*	.8	.7	.7	.6	.7	.6	.7	.5	.4	.5	.5	.6	.6	.6	.2	.3	.2	.2	.2	.3
156.	*	.9	.7	.7	.6	.7	.6	.7	.5	.4	.4	.5	.6	.6	.6	.2	.3	.2	.2	.2	.3
158.	*	.8	.7	.7	.5	.7	.6	.6	.5	.4	.4	.5	.6	.6	.6	.2	.3	.2	.2	.2	.3
160.	*	.8	.7	.7	.5	.6	.6	.6	.5	.4	.4	.4	.6	.6	.6	.2	.3	.2	.2	.2	.3
162.	*	.8	.9	.8	.5	.6	.6	.6	.5	.4	.4	.5	.6	.6	.6	.2	.2	.2	.2	.2	.3
164.	*	.8	.9	.8	.6	.6	.7	.6	.5	.4	.4	.5	.5	.5	.6	.2	.2	.2	.2	.3	.3
166.	*	.7	.9	.9	.6	.6	.6	.6	.5	.4	.3	.5	.5	.5	.5	.2	.2	.2	.2	.3	.3
168.	*	.6	.9	.8	.6	.5	.6	.6	.5	.4	.3	.5	.5	.5	.5	.2	.2	.2	.2	.3	.3
170.	*	.6	.8	.9	.6	.5	.6	.6	.5	.4	.4	.5	.5	.4	.5	.2	.2	.2	.2	.3	.3
172.	*	.6	.8	.9	.7	.5	.6	.6	.4	.4	.4	.5	.5	.4	.5	.2	.2	.2	.3	.3	.4
174.	*	.6	.8	.8	.7	.5	.6	.6	.4	.3	.4	.5	.5	.4	.5	.3	.2	.2	.3	.3	.4
176.	*	.5	.8	.8	.6	.5	.5	.6	.4	.3	.4	.5	.4	.4	.5	.3	.2	.2	.3	.3	.3
178.	*	.5	.8	.8	.7	.5	.5	.5	.4	.3	.4	.5	.4	.4	.5	.3	.2	.2	.3	.2	.3
180.	*	.5	.8	.8	.8	.5	.4	.5	.4	.3	.4	.4	.4	.4	.5	.3	.2	.3	.3	.2	.3
182.	*	.5	.8	.8	.8	.5	.4	.4	.4	.3	.4	.4	.4	.4	.5	.3	.2	.3	.2	.2	.3
184.	*	.4	.7	.8	.8	.6	.5	.3	.4	.3	.4	.4	.4	.4	.4	.3	.2	.3	.2	.2	.3
186.	*	.3	.7	.9	.8	.6	.5	.3	.4	.2	.3	.4	.4	.4	.4	.3	.2	.3	.2	.3	.3

(DEGR)	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
188.	*	.3	.6	.8	.8	.6	.5	.3	.2	.2	.4	.4	.4	.4	.4	.2	.3	.2	.2	.3	.3								
190.	*	.3	.6	.7	.8	.6	.5	.3	.2	.2	.3	.4	.4	.4	.4	.2	.3	.2	.2	.3	.3								
192.	*	.3	.6	.7	1.0	.6	.6	.3	.2	.4	.3	.4	.4	.4	.4	.2	.3	.2	.2	.3	.3								
194.	*	.3	.6	.7	.9	.6	.6	.4	.2	.4	.3	.4	.4	.4	.4	.2	.2	.2	.2	.3	.3								
196.	*	.3	.6	.7	.7	.6	.6	.4	.2	.3	.3	.4	.4	.4	.4	.2	.2	.2	.2	.3	.3								
198.	*	.3	.4	.7	.7	.5	.5	.5	.1	.3	.3	.4	.4	.4	.4	.2	.2	.2	.2	.3	.3								
200.	*	.3	.4	.7	.7	.6	.5	.5	.2	.3	.3	.4	.4	.4	.4	.2	.2	.2	.2	.3	.3								
202.	*	.3	.4	.7	.7	.7	.5	.6	.2	.3	.3	.4	.4	.4	.4	.2	.2	.2	.2	.3	.2								
204.	*	.3	.4	.7	.7	.7	.5	.6	.2	.3	.3	.4	.4	.4	.4	.3	.2	.2	.2	.3	.3								
206.	*	.3	.3	.6	.7	.8	.5	.6	.2	.3	.3	.3	.4	.4	.3	.3	.2	.2	.1	.3	.3								
208.	*	.3	.3	.6	.7	.8	.5	.5	.1	.2	.2	.4	.4	.4	.3	.3	.2	.2	.2	.2	.3								
210.	*	.3	.3	.5	.7	.8	.5	.5	.1	.3	.3	.4	.4	.4	.4	.3	.2	.2	.2	.2	.3								
212.	*	.3	.3	.5	.7	.8	.7	.3	.1	.3	.3	.4	.3	.4	.4	.3	.2	.1	.2	.2	.3								
214.	*	.3	.3	.5	.6	.8	.8	.3	.3	.3	.3	.4	.3	.4	.4	.3	.2	.1	.2	.3	.3								
216.	*	.3	.3	.5	.7	.6	.6	.3	.3	.3	.3	.4	.3	.4	.4	.3	.2	.1	.2	.3	.4								
218.	*	.3	.3	.5	.6	.6	.6	.3	.3	.3	.3	.4	.3	.4	.4	.3	.2	.1	.2	.3	.4								
220.	*	.3	.3	.5	.6	.5	.6	.3	.3	.3	.3	.4	.3	.3	.4	.2	.1	.1	.2	.3	.4								
222.	*	.3	.3	.4	.6	.5	.5	.3	.3	.3	.3	.4	.4	.3	.4	.2	.1	.1	.3	.3	.4								
224.	*	.3	.3	.4	.6	.5	.5	.4	.3	.2	.3	.5	.4	.3	.4	.2	.1	.1	.3	.3	.4								
226.	*	.3	.3	.4	.6	.5	.4	.4	.2	.2	.2	.5	.4	.3	.4	.2	.1	.2	.3	.4	.3								
228.	*	.3	.4	.4	.6	.5	.4	.4	.2	.2	.3	.4	.4	.3	.4	.2	.1	.2	.3	.4	.3								
230.	*	.3	.4	.4	.5	.5	.4	.4	.2	.3	.3	.4	.4	.3	.4	.2	.1	.2	.3	.4	.3								
232.	*	.3	.3	.4	.5	.4	.4	.3	.2	.3	.3	.4	.4	.3	.3	.2	.1	.2	.3	.4	.3								
234.	*	.3	.3	.4	.5	.4	.4	.3	.2	.3	.3	.4	.4	.4	.3	.2	.1	.2	.3	.4	.4								
236.	*	.3	.3	.4	.5	.4	.4	.2	.2	.3	.4	.4	.4	.4	.3	.2	.1	.2	.3	.4	.4								
238.	*	.3	.3	.4	.5	.4	.4	.2	.2	.3	.4	.4	.3	.4	.3	.1	.1	.2	.3	.4	.4								
240.	*	.3	.3	.4	.5	.4	.4	.2	.2	.3	.4	.4	.3	.4	.3	.1	.2	.2	.3	.3	.4								
242.	*	.3	.3	.3	.5	.3	.4	.2	.2	.3	.4	.4	.3	.4	.3	.1	.2	.2	.3	.3	.4								
244.	*	.3	.3	.3	.4	.3	.3	.2	.3	.5	.5	.4	.4	.3	.3	.1	.2	.2	.3	.3	.4								
246.	*	.3	.3	.3	.4	.3	.2	.2	.3	.4	.5	.5	.4	.3	.3	.1	.2	.1	.3	.3	.4								
248.	*	.3	.3	.3	.4	.3	.2	.2	.2	.4	.5	.5	.4	.3	.3	.1	.2	.2	.3	.3	.3								
250.	*	.3	.3	.3	.3	.3	.2	.1	.2	.4	.5	.5	.4	.3	.3	.2	.2	.2	.3	.3	.3								
252.	*	.3	.3	.3	.3	.3	.2	.1	.2	.4	.5	.6	.4	.3	.3	.2	.2	.2	.3	.3	.3								
254.	*	.3	.3	.3	.3	.3	.2	.1	.2	.4	.5	.7	.4	.3	.4	.2	.1	.2	.3	.3	.3								
256.	*	.3	.3	.3	.3	.3	.1	.1	.2	.4	.5	.7	.4	.3	.3	.2	.1	.2	.3	.3	.3								
258.	*	.3	.3	.3	.3	.3	.1	.1	.2	.4	.5	.7	.4	.3	.3	.2	.1	.2	.3	.3	.3								
260.	*	.3	.3	.3	.3	.3	.1	.1	.2	.3	.5	.7	.4	.3	.3	.2	.1	.2	.3	.3	.3								
262.	*	.3	.3	.3	.3	.3	.1	.1	.2	.3	.5	.6	.3	.3	.3	.2	.1	.2	.3	.3	.3								
264.	*	.3	.3	.4	.3	.3	.1	.1	.2	.3	.4	.5	.4	.3	.3	.2	.1	.2	.3	.3	.3								
266.	*	.3	.3	.4	.3	.3	.1	.1	.2	.3	.4	.5	.4	.4	.3	.2	.1	.2	.3	.3	.3								
268.	*	.3	.3	.4	.4	.3	.1	.1	.2	.2	.4	.5	.4	.4	.3	.2	.1	.2	.3	.3	.3								
270.	*	.3	.3	.5	.4	.3	.1	.1	.2	.2	.3	.5	.5	.4	.3	.1	.1	.2	.3	.3	.3								
272.	*	.4	.4	.5	.4	.2	.1	.1	.2	.2	.3	.5	.5	.4	.3	.1	.1	.2	.3	.3	.3								
274.	*	.4	.4	.5	.4	.2	.1	.1	.2	.2	.3	.5	.5	.4	.3	.1	.1	.2	.3	.3	.3								
276.	*	.4	.4	.5	.5	.2	.1	.1	.2	.2	.3	.5	.5	.5	.4	.1	.1	.2	.3	.3	.3								
278.	*	.4	.4	.5	.5	.2	.1	.1	.2	.2	.3	.5	.5	.6	.4	.1	.1	.3	.3	.3	.3								
280.	*	.4	.4	.5	.5	.3	.1	.1	.2	.2	.3	.6	.5	.6	.4	.2	.1	.3	.3	.3	.3								
282.	*	.4	.4	.5	.5	.3	.1	.0	.2	.2	.3	.6	.5	.6	.4	.2	.2	.3	.4	.3	.3								
284.	*	.4	.4	.4	.5	.3	.1	.0	.2	.2	.2	.6	.6	.6	.4	.2	.2	.3	.4	.3	.3								
286.	*	.4	.4	.4	.5	.3	.1	.0	.1	.2	.3	.5	.6	.6	.5	.2	.2	.3	.4	.3	.3								
288.	*	.4	.4	.4	.4	.3	.1	.0	.1	.2	.2	.5	.6	.5	.5	.2	.2	.4	.4	.3	.3								
290.	*	.4	.4	.4	.4	.3	.1	.0	.1	.2	.3	.6	.6	.5	.5	.2	.2	.5	.5	.3	.3								

WIND ANGLE (DEGR)	*	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
292.	*	.4	.4	.4	.4	.3	.1	.0	.1	.2	.3	.6	.5	.5	.5	.2	.3	.5	.5	.3	.3								
294.	*	.4	.4	.4	.4	.2	.1	.0	.1	.2	.3	.6	.4	.3	.5	.2	.3	.5	.5	.3	.3								
296.	*	.4	.4	.4	.4	.2	.1	.0	.1	.2	.3	.6	.5	.3	.4	.2	.4	.5	.6	.3	.3								
298.	*	.4	.4	.4	.4	.2	.1	.0	.1	.2	.2	.6	.5	.2	.4	.2	.4	.5	.7	.3	.3								
300.	*	.4	.4	.4	.4	.2	.0	.0	.1	.2	.2	.6	.5	.3	.4	.2	.4	.5	.7	.3	.3								
302.	*	.4	.4	.4	.4	.1	.0	.0	.1	.1	.2	.5	.4	.3	.4	.2	.4	.6	.7	.4	.3								
304.	*	.4	.4	.4	.4	.1	.0	.0	.1	.1	.2	.5	.3	.3	.3	.2	.4	.6	.7	.5	.3								
306.	*	.4	.4	.4	.3	.1	.0	.0	.1	.1	.2	.5	.3	.3	.3	.2	.4	.5	.8	.5	.3								
308.	*	.4	.4	.4	.3	.1	.0	.0	.1	.1	.2	.4	.3	.3	.3	.3	.4	.6	.7	.6	.3								
310.	*	.4	.4	.4	.2	.1	.0	.0	.1	.1	.2	.3	.3	.3	.2	.3	.5	.6	.7	.6	.3								
312.	*	.3	.4	.4	.2	.0	.0	.0	.1	.1	.1	.3	.3	.3	.2	.3	.5	.7	.7	.6	.3								
314.	*	.3	.3	.4	.2	.0	.0	.0	.1	.1	.1	.3	.3	.3	.2	.3	.5	.7	.8	.6	.5								
316.	*	.2	.2	.2	.2	.0	.0	.0	.1	.1	.1	.2	.3	.3	.1	.3	.5	.6	.8	.6	.5								
318.	*	.2	.2	.2	.1	.0	.0	.0	.1	.1	.1	.2	.3	.3	.1	.3	.5	.6	.8	.6	.5								
320.	*	.2	.2	.2	.1	.0	.0	.0	.1	.1	.1	.2	.3	.2	.1	.4	.5	.5	.6	.6	.5								
322.	*	.2	.2	.2	.1	.0	.0	.0	.1	.1	.1	.2	.3	.1	.1	.4	.5	.5	.6	.6	.5								
324.	*	.2	.2	.2	.1	.0	.0	.0	.1	.1	.1	.2	.2	.1	.1	.4	.3	.5	.6	.6	.5								
326.	*	.1	.2	.2	.1	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.3	.4	.5	.6	.5	.4								
328.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.3	.4	.5	.6	.5	.4								
330.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.3	.4	.6	.6	.5	.4								
332.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.3	.5	.5	.6	.5	.5								
334.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.3	.5	.4	.5	.5	.5								
336.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.3	.5	.4	.4	.5	.5								
338.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.3	.4	.4	.4	.5	.5								
340.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.4	.4	.4	.5	.5	.5								
342.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.0	.4	.4	.4	.5	.5	.5								
344.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.4	.4	.4	.5	.5	.5								
346.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.3	.4	.3	.5	.5	.5								
348.	*	.1	.1	.1	.0	.0	.0	.0	.2	.1	.1	.1	.1	.1	.2	.3	.4	.3	.5	.5	.5								
350.	*	.1	.1	.1	.0	.0	.0	.0	.2	.1	.1	.1	.1	.1	.2	.3	.4	.3	.5	.5	.5								
352.	*	.1	.1	.1	.0	.0	.0	.0	.2	.1	.1	.1	.1	.1	.2	.3	.4	.3	.5	.5	.5								
354.	*	.1	.1	.1	.0	.0	.0	.0	.2	.1	.1	.1	.1	.2	.3	.2	.3	.3	.4	.5	.5								
356.	*	.0	.1	.1	.0	.0	.0	.0	.2	.2	.1	.1	.1	.2	.3	.2	.3	.3	.5	.4	.5								
358.	*	.0	.0	.1	.0	.0	.0	.1	.2	.2	.1	.1	.2	.2	.3	.2	.4	.3	.5	.4	.5								
360.	*	.0	.0	.1	.0	.0	.0	.1	.2	.2	.2	.1	.2	.2	.3	.2	.4	.3	.4	.4	.5								
MAX	*	.9	.9	1.0	1.0	.8	.8	.7	.5	.5	.5	.7	.7	.6	.7	.5	.6	.7	.8	.7	.7								
DEGR.	*	134	134	140	192	142	214	144	16	18	16	254	148	136	136	30	120	312	306	10	12								

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	.4	.2	.3	.2	.4	.4	.3	.3
2.	.5	.2	.3	.2	.4	.4	.3	.3
4.	.5	.2	.3	.2	.4	.4	.3	.3
6.	.4	.2	.3	.2	.4	.4	.3	.3
8.	.4	.2	.3	.2	.4	.4	.3	.3
10.	.4	.3	.3	.2	.4	.3	.3	.3
12.	.4	.3	.3	.2	.4	.3	.3	.3
14.	.3	.3	.3	.3	.4	.3	.3	.3
16.	.3	.3	.4	.4	.5	.3	.3	.3
18.	.4	.4	.5	.4	.5	.3	.3	.3
20.	.4	.6	.5	.4	.5	.4	.3	.3
22.	.4	.6	.5	.4	.5	.4	.3	.3
24.	.4	.6	.5	.4	.5	.4	.4	.3
26.	.3	.7	.6	.4	.5	.5	.4	.3
28.	.3	.8	.7	.5	.5	.5	.4	.3
30.	.4	.8	.7	.6	.6	.5	.4	.4
32.	.4	.8	.7	.6	.6	.5	.4	.4
34.	.4	.6	.7	.6	.6	.5	.4	.4
36.	.4	.7	.7	.6	.6	.5	.4	.4
38.	.4	.7	.7	.6	.6	.6	.4	.4
40.	.3	.7	.8	.6	.6	.6	.4	.4
42.	.3	.7	.8	.6	.7	.6	.4	.4
44.	.2	.7	.8	.6	.7	.6	.5	.4
46.	.2	.7	.8	.7	.7	.6	.5	.4
48.	.1	.7	.7	.7	.6	.6	.5	.4
50.	.1	.7	.8	.7	.6	.6	.5	.4
52.	.1	.7	.8	.7	.6	.5	.5	.4
54.	.1	.7	.8	.7	.6	.5	.6	.4
56.	.1	.7	.7	.8	.6	.5	.6	.5
58.	.2	.6	.7	.8	.6	.5	.6	.5
60.	.2	.6	.7	.8	.6	.5	.6	.5
62.	.2	.5	.7	.7	.6	.5	.6	.5
64.	.2	.5	.7	.7	.6	.5	.6	.5
66.	.2	.5	.6	.7	.6	.5	.5	.5
68.	.2	.5	.6	.7	.8	.5	.5	.5
70.	.2	.5	.6	.7	.8	.5	.5	.5
72.	.2	.5	.6	.7	.8	.5	.5	.5
74.	.2	.6	.6	.6	.8	.5	.5	.5
76.	.2	.6	.6	.5	.8	.5	.5	.5
78.	.2	.5	.6	.5	.8	.5	.5	.5
80.	.2	.5	.6	.5	.8	.6	.5	.5
82.	.2	.6	.7	.5	.8	.6	.5	.5

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
84.	.2	.6	.7	.5	.8	.6	.6	.5
86.	.2	.6	.6	.5	.8	.6	.6	.4
88.	.2	.6	.6	.6	.8	.7	.6	.4
90.	.2	.6	.5	.6	.7	.7	.6	.4
92.	.2	.6	.5	.6	.7	.7	.5	.4
94.	.2	.6	.5	.6	.8	.6	.4	.5
96.	.2	.6	.5	.6	.9	.6	.5	.5
98.	.2	.6	.5	.6	.8	.6	.5	.5
100.	.2	.6	.5	.6	.7	.7	.6	.5
102.	.2	.7	.5	.6	.7	.7	.7	.5
104.	.2	.7	.5	.5	.7	.7	.7	.5
106.	.3	.7	.5	.5	.7	.8	.7	.5
108.	.3	.7	.5	.5	.7	.8	.7	.5
110.	.3	.7	.5	.5	.7	.8	.7	.6
112.	.2	.6	.6	.5	.7	.8	.6	.6
114.	.3	.7	.6	.5	.7	.8	.6	.6
116.	.3	.8	.6	.6	.7	.7	.6	.6
118.	.5	.9	.7	.6	.8	.7	.6	.7
120.	.5	.9	.7	.6	.8	.7	.6	.6
122.	.5	.8	.7	.6	.8	.7	.5	.6
124.	.4	.7	.7	.6	.8	.6	.5	.6
126.	.4	.7	.6	.7	.7	.6	.5	.6
128.	.4	.7	.7	.7	.8	.7	.7	.6
130.	.4	.8	.6	.6	.8	.7	.7	.4
132.	.5	.9	.6	.6	.8	.7	.6	.4
134.	.5	.9	.6	.6	.8	.6	.6	.4
136.	.5	.9	.6	.6	.6	.6	.6	.3
138.	.6	.9	.7	.6	.6	.6	.4	.3
140.	.6	.9	.7	.6	.5	.4	.4	.3
142.	.6	.8	.7	.6	.5	.4	.4	.4
144.	.6	.8	.7	.6	.5	.4	.4	.4
146.	.7	.8	.7	.6	.5	.4	.5	.4
148.	.7	.8	.7	.6	.5	.4	.5	.4
150.	.6	.7	.7	.6	.5	.5	.5	.4
152.	.6	.6	.7	.6	.5	.5	.5	.4
154.	.7	.6	.7	.6	.6	.5	.4	.4
156.	.7	.6	.8	.6	.6	.5	.4	.4
158.	.7	.6	.8	.7	.6	.5	.4	.4
160.	.6	.6	.8	.7	.6	.5	.4	.3
162.	.6	.5	.8	.7	.6	.5	.4	.3
164.	.6	.5	.8	.8	.6	.5	.3	.3
166.	.6	.4	.8	.8	.6	.5	.3	.2
168.	.6	.4	.7	.8	.6	.4	.3	.1
170.	.6	.4	.7	.7	.6	.4	.3	.1
172.	.5	.4	.7	.7	.5	.4	.3	.1
174.	.5	.3	.7	.7	.5	.4	.3	.1

180. *	.5	.2	.7	.7	.5	.4	.2	.0
182. *	.5	.2	.7	.7	.5	.2	.2	.0
184. *	.5	.2	.6	.7	.5	.2	.2	.0

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR) *	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
186. *	.5	.2	.5	.6	.4	.2	.1	.0
188. *	.5	.1	.5	.5	.4	.2	.0	.0
190. *	.5	.1	.5	.5	.4	.2	.0	.0
192. *	.5	.1	.5	.4	.4	.2	.0	.0
194. *	.5	.1	.4	.4	.4	.2	.0	.0
196. *	.5	.1	.4	.4	.4	.2	.0	.0
198. *	.4	.1	.4	.4	.4	.1	.0	.0
200. *	.4	.1	.4	.4	.3	.0	.0	.0
202. *	.4	.1	.4	.4	.3	.0	.0	.0
204. *	.4	.1	.4	.4	.3	.0	.0	.0
206. *	.4	.0	.4	.4	.3	.0	.0	.0
208. *	.4	.0	.3	.3	.2	.0	.0	.0
210. *	.4	.0	.3	.2	.1	.0	.0	.0
212. *	.3	.0	.3	.2	.1	.0	.0	.0
214. *	.3	.0	.2	.2	.1	.0	.0	.0
216. *	.3	.0	.2	.2	.1	.0	.0	.0
218. *	.3	.0	.2	.1	.1	.0	.0	.0
220. *	.3	.0	.2	.1	.1	.0	.0	.0
222. *	.3	.0	.1	.1	.1	.0	.0	.0
224. *	.3	.0	.1	.1	.0	.0	.0	.0
226. *	.3	.0	.1	.1	.0	.0	.0	.0
228. *	.3	.0	.1	.1	.0	.0	.0	.0
230. *	.3	.0	.1	.1	.0	.0	.0	.0
232. *	.3	.0	.1	.1	.0	.0	.0	.0
234. *	.3	.0	.1	.0	.0	.0	.0	.0
236. *	.3	.0	.1	.0	.0	.0	.0	.0
238. *	.3	.0	.1	.0	.0	.0	.0	.0
240. *	.3	.0	.1	.0	.0	.0	.0	.0
242. *	.3	.0	.1	.0	.0	.0	.0	.0
244. *	.3	.0	.0	.0	.0	.0	.0	.0
246. *	.3	.0	.0	.0	.0	.0	.0	.0
248. *	.3	.0	.0	.0	.0	.0	.0	.0
250. *	.3	.0	.0	.0	.0	.0	.0	.0
252. *	.3	.0	.0	.0	.0	.0	.0	.0
254. *	.3	.0	.0	.0	.0	.0	.0	.0
256. *	.3	.0	.0	.0	.0	.0	.0	.0
258. *	.3	.0	.0	.0	.0	.0	.0	.0
260. *	.3	.0	.0	.0	.0	.0	.0	.0
262. *	.3	.0	.0	.0	.0	.0	.0	.0
264. *	.3	.0	.0	.0	.0	.0	.0	.0
266. *	.3	.0	.0	.0	.0	.0	.0	.0
268. *	.3	.0	.0	.0	.0	.0	.0	.0
270. *	.3	.0	.0	.0	.0	.0	.0	.0
272. *	.4	.0	.0	.0	.0	.0	.0	.0
274. *	.4	.0	.0	.0	.0	.0	.0	.0
276. *	.4	.0	.0	.0	.0	.0	.0	.0
278. *	.4	.0	.0	.0	.0	.0	.0	.0
280. *	.4	.0	.0	.0	.0	.0	.0	.0
282. *	.4	.0	.0	.0	.0	.0	.0	.0
284. *	.3	.0	.0	.0	.0	.0	.0	.0
286. *	.3	.0	.0	.0	.0	.0	.0	.0

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR) *	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
288. *	.3	.0	.0	.0	.0	.0	.0	.0
290. *	.3	.0	.0	.0	.0	.0	.0	.0
292. *	.3	.0	.0	.0	.0	.0	.0	.0
294. *	.4	.0	.0	.0	.0	.1	.1	.1
296. *	.4	.0	.0	.0	.2	.1	.1	.1
298. *	.4	.0	.0	.0	.3	.2	.1	.1
300. *	.4	.0	.0	.0	.3	.2	.2	.1
302. *	.4	.0	.0	.0	.3	.2	.2	.1
304. *	.4	.0	.0	.0	.3	.2	.2	.2
306. *	.4	.0	.0	.1	.3	.2	.2	.2
308. *	.4	.0	.0	.1	.3	.2	.2	.2
310. *	.4	.0	.0	.2	.3	.2	.2	.2
312. *	.4	.0	.0	.2	.3	.2	.2	.2
314. *	.4	.0	.0	.2	.4	.2	.2	.2
316. *	.4	.0	.1	.2	.4	.3	.2	.2
318. *	.4	.0	.1	.2	.4	.3	.3	.2
320. *	.5	.0	.2	.2	.4	.3	.3	.2
322. *	.5	.0	.2	.2	.4	.3	.3	.2
324. *	.5	.0	.2	.2	.4	.3	.3	.3
326. *	.5	.0	.2	.2	.4	.3	.3	.3
328. *	.5	.0	.2	.2	.4	.3	.3	.3
330. *	.5	.0	.2	.2	.4	.3	.3	.3
332. *	.5	.0	.2	.2	.4	.3	.3	.3
334. *	.5	.0	.2	.2	.5	.3	.3	.3
336. *	.5	.1	.2	.2	.5	.3	.3	.3
338. *	.5	.1	.1	.3	.5	.3	.3	.3
340. *	.5	.1	.1	.3	.4	.3	.3	.3
342. *	.5	.1	.1	.2	.4	.3	.3	.3
344. *	.5	.1	.1	.2	.4	.4	.3	.3
346. *	.5	.2	.1	.2	.4	.4	.3	.3
348. *	.5	.2	.1	.2	.4	.4	.3	.3
350. *	.5	.2	.1	.2	.4	.4	.3	.3
352. *	.5	.2	.1	.2	.4	.4	.3	.3
354. *	.4	.2	.1	.2	.4	.4	.3	.3
356. *	.4	.2	.2	.2	.4	.4	.3	.3
358. *	.4	.2	.3	.2	.4	.4	.3	.3
360. *	.4	.2	.3	.2	.4	.4	.3	.3

MAX *	.7	.9	.8	.8	.9	.8	.7	.7	
DEGR. *	146	118	40	56	96	106	102	118	

THE HIGHEST CONCENTRATION OF 1.00 PPM OCCURRED AT RECEPTOR REC3 .

JOB: CASE:1 BUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs6bd.dat>

DATE : 8/18/99
TIME : 15: 5:50

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC1 134	REC2 134	REC3 140	REC4 192	REC5 142	REC6 214	REC7 144	REC8 16	REC9 18	REC10 16	REC11 254	REC12 148	REC13 136	REC14 136	REC15 30	REC16 120	REC17 312	REC18 306	REC19 10	REC20 12
1	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5	.1	.1	.1	.0	.1	.0	.1	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	.0	.0	.0	.1	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	.1	.1	.1	.3	.0	.2	.0	.0	.0	.0	.2	.0	.0	.0	.0	.0	.1	.3	.2	.3
10	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	.0	.0	.1	.1	.2	.2	.2	.2	.2	.2	.1	.0	.0	.0	.1	.0	.0	.0	.1	.1
12	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	.1	.1	.1	.1	.0	.1	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.1	.1	.1	.1
14	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0
16	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	.3	.2	.2	.2	.0	.1	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.2	.2	.1	.1
20	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	.0	.1	.1	.1	.1	.1	.0	.0	.0	.0	.2	.1	.0	.0	.1	.0	.2	.1	.1	.0
22	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	.1	.1	.1	.0	.2	.0	.1	.0	.0	.0	.0	.3	.3	.4	.1	.4	.0	.0	.0	.0
24	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	.1	.1	.1	.0	.1	.0	.2	.2	.2	.2	.0	.1	.1	.1	.2	.1	.0	.0	.1	.1
28	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
29	.1	.1	.1	.1	.1	.0	.1	.0	.0	.0	.0	.1	.1	.1	.0	.1	.0	.0	.0	.0
30	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 BUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs6bd.dat>

DATE : 8/18/99
TIME : 15: 5:50

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

CO/LINK (PPM)
ANGLE (DEGREES)

LINK #	REC21 146	REC22 118	REC23 40	REC24 56	REC25 96	REC26 106	REC27 102	REC28 118
1	.0	.0	.0	.0	.0	.0	.0	.0
2	.0	.0	.0	.0	.0	.0	.0	.0
3	.0	.0	.0	.0	.0	.0	.0	.0
4	.0	.0	.0	.0	.0	.0	.0	.0
5	.2	.1	.0	.0	.0	.0	.0	.0
6	.0	.0	.0	.0	.0	.0	.0	.0
7	.3	.3	.0	.0	.0	.0	.0	.0
8	.0	.0	.0	.0	.0	.0	.0	.0
9	.0	.2	.4	.3	.3	.2	.1	.1
10	.0	.0	.0	.0	.0	.0	.0	.0
11	.0	.0	.1	.1	.0	.0	.0	.0
12	.0	.0	.0	.0	.0	.0	.0	.0
13	.0	.0	.1	.1	.2	.2	.2	.1
14	.0	.0	.0	.0	.0	.0	.0	.0
15	.0	.0	.0	.0	.0	.0	.0	.1
16	.0	.0	.0	.0	.0	.0	.0	.0
17	.0	.0	.0	.0	.0	.0	.0	.0
18	.0	.0	.0	.0	.0	.0	.0	.0
19	.0	.0	.1	.1	.1	.1	.1	.1
20	.0	.0	.0	.0	.0	.0	.0	.0
21	.0	.0	.0	.1	.1	.1	.1	.0
22	.0	.0	.0	.0	.0	.0	.0	.0
23	.0	.1	.0	.0	.1	.1	.1	.1
24	.0	.0	.0	.0	.0	.0	.0	.0
25	.0	.0	.0	.0	.0	.0	.0	.0
26	.0	.0	.0	.0	.0	.0	.0	.0
27	.0	.0	.1	.1	.1	.1	.1	.1
28	.0	.0	.0	.0	.0	.0	.0	.0
29	.2	.2	.0	.0	.0	.0	.0	.1
30	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs6nb.dat>

DATE : 8/18/99
TIME : 15: 5:22

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = .0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	LENGTH (M)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (M)	W (M)	V/C	QUEUE (VEH)
1. Link 1A	206.7	230.1	4.0	-2.1	308.	221.	AG	92.	9.9	.0	7.9		
2. Link 1B	206.7	230.1	4.0	-2.1	308.	221.	AG	92.	.0	.0	4.3		
3. Link 2A	.9	-.6	-19.5	-31.7	37.	213.	AG	0.	.0	.0	10.7		
4. Link 2B	.9	-.6	-19.5	-31.7	37.	213.	AG	0.	.0	.0	7.0		
5. Link 3A	252.4	-253.0	1.2	-79.6	305.	305.	AG	929.	9.7	.0	15.8		
6. Link 3B	252.4	-253.0	1.2	-79.6	305.	305.	AG	929.	.0	.0	12.2		
7. Link 4A	1.2	-79.6	-22.9	-31.7	54.	333.	AG	929.	9.7	.0	15.8		
8. Link 4B	1.2	-79.6	-22.9	-31.7	54.	333.	AG	929.	.0	.0	12.2		
9. Link 5A	-22.9	-31.7	-3.0	1.2	38.	31.	AG	929.	9.7	.0	11.6		
10. Link 5B	-22.9	-31.7	-3.0	1.2	38.	31.	AG	929.	.0	.0	7.9		
11. Link 6A	-.3	.0	204.5	232.6	310.	41.	AG	489.	9.8	.0	7.9		
12. Link 6B	-.3	.0	204.5	232.6	310.	41.	AG	489.	.0	.0	4.3		
13. Link 7A	-2.7	-2.1	-19.2	10.1	20.	307.	AG	134.	24.5	.0	12.5		
14. Link 7B	-2.7	-2.1	-19.2	10.1	20.	307.	AG	134.	.0	.0	8.8		
15. Link 8A	-19.2	10.1	-255.4	181.4	292.	306.	AG	134.	9.8	.0	12.5		
16. Link 8B	-19.2	10.1	-255.4	181.4	292.	306.	AG	134.	.0	.0	8.8		
17. Link 9A	-248.7	191.4	-67.1	49.1	231.	128.	AG	132.	9.7	.0	8.2		
18. Link 9B	-248.7	191.4	-67.1	49.1	231.	128.	AG	132.	.0	.0	4.6		
19. Link 10A	-67.1	49.1	.3	2.1	82.	125.	AG	132.	24.4	.0	15.8		
20. Link 10B	-67.1	49.1	.3	2.1	82.	125.	AG	132.	.0	.0	12.2		
21. Link 11A	.0	.9	16.8	-11.0	21.	125.	AG	530.	9.7	.0	15.8		
22. Link 11B	.0	.9	16.8	-11.0	21.	125.	AG	530.	.0	.0	12.2		
23. Link 12A	16.8	-11.0	256.3	-179.8	293.	125.	AG	530.	9.7	.0	15.8		
24. Link 12B	16.8	-11.0	256.3	-179.8	293.	125.	AG	530.	.0	.0	12.2		
25. Link 13A	-264.0	-199.6	-270.7	152.1	352.	359.	BR	2317.	4.5	9.1	17.4		
26. Link 13B	-264.0	-199.6	-270.7	152.1	352.	359.	BR	2317.	.0	9.1	13.7		
27. Link 14A	47.5	162.8	47.5	-59.7	223.	180.	BR	2918.	4.5	9.1	17.4		
28. Link 14B	47.5	162.8	47.5	-59.7	223.	180.	BR	2918.	.0	9.1	13.7		
29. Link 15A	-19.2	-59.7	248.1	-190.5	298.	116.	BR	2918.	4.5	9.1	17.4		
30. Link 15B	-19.2	-59.7	248.1	-190.5	298.	116.	BR	2918.	.0	9.1	13.7		

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs6nb.dat>

DATE : 8/18/99
TIME : 15: 5:22

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. 1:	-26.5	25.9	1.8
2. 2:	-14.0	17.1	1.8
3. 3:	-7.6	12.8	1.8
4. 4:	-.3	10.7	1.8
5. 5:	6.7	13.7	1.8
6. 6:	11.6	19.2	1.8
7. 7:	21.9	30.8	1.8
8. 8:	32.3	24.4	1.8
9. 9:	22.3	12.8	1.8
10. 10:	17.1	7.0	1.8
11. 11:	12.2	1.5	1.8
12. 12:	18.3	-3.0	1.8
13. 13:	24.7	-7.3	1.8
14. 14:	36.9	-16.5	1.8
15. 15:	5.8	-27.1	1.8
16. 16:	15.5	-17.7	1.8
17. 17:	9.4	-13.4	1.8
18. 18:	2.4	-9.8	1.8
19. 19:	-3.0	-14.6	1.8
20. 20:	-7.6	-21.0	1.8
21. 21:	-13.1	-35.4	1.8
22. 22:	-27.1	-29.3	1.8
23. 23:	-19.8	-15.8	1.8
24. 24:	-16.8	-8.8	1.8
25. 25:	-14.6	-1.5	1.8
26. 26:	-21.0	2.7	1.8
27. 27:	-27.4	7.0	1.8
28. 28:	-39.9	15.5	1.8

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs6nb.dat>

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND * CONCENTRATION

(DEGR)	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
0.	*	.0	.0	.0	.0	.0	.0	.1	.2	.2	.2	.1	.2	.2	.3	.2	.4	.3	.2	.3	.3
2.	*	.0	.0	.0	.0	.0	.0	.1	.3	.2	.2	.2	.2	.2	.3	.2	.4	.4	.2	.3	.3
4.	*	.0	.0	.0	.0	.0	.1	.1	.4	.3	.3	.3	.2	.2	.3	.3	.4	.4	.2	.3	.3
6.	*	.0	.0	.0	.0	.1	.1	.1	.4	.3	.3	.3	.2	.2	.4	.3	.4	.4	.3	.4	.3
8.	*	.0	.0	.0	.0	.1	.1	.1	.4	.3	.3	.3	.2	.3	.4	.3	.4	.4	.3	.4	.3
10.	*	.0	.0	.0	.1	.1	.1	.1	.4	.3	.3	.3	.2	.3	.4	.3	.4	.4	.3	.5	.4
12.	*	.0	.0	.0	.1	.1	.1	.2	.4	.4	.3	.3	.2	.3	.4	.3	.4	.4	.3	.5	.4
14.	*	.0	.0	.1	.1	.2	.2	.3	.4	.4	.3	.3	.3	.3	.4	.3	.4	.4	.3	.4	.4
16.	*	.0	.0	.1	.1	.2	.2	.3	.5	.4	.4	.4	.3	.3	.4	.3	.5	.4	.5	.4	.4
18.	*	.0	.0	.1	.1	.2	.2	.3	.5	.5	.5	.4	.3	.3	.4	.3	.5	.4	.5	.4	.4
20.	*	.0	.1	.1	.1	.2	.2	.3	.5	.5	.5	.4	.3	.3	.3	.3	.5	.4	.5	.4	.4
22.	*	.0	.1	.1	.1	.2	.2	.3	.5	.5	.5	.5	.3	.3	.3	.3	.5	.4	.5	.4	.5
24.	*	.0	.1	.1	.1	.2	.2	.3	.5	.5	.5	.5	.3	.3	.3	.3	.5	.5	.5	.4	.5
26.	*	.1	.1	.1	.1	.2	.2	.3	.5	.5	.5	.5	.3	.3	.3	.3	.4	.5	.5	.4	.5
28.	*	.1	.1	.1	.2	.3	.3	.4	.5	.5	.5	.5	.3	.3	.3	.3	.4	.5	.5	.5	.4
30.	*	.1	.1	.1	.2	.3	.4	.4	.5	.5	.5	.5	.3	.3	.2	.3	.4	.5	.5	.5	.4
32.	*	.1	.1	.1	.2	.3	.4	.4	.5	.5	.5	.5	.3	.3	.2	.3	.4	.5	.5	.4	.4
34.	*	.1	.1	.1	.2	.3	.4	.4	.5	.5	.5	.5	.3	.3	.2	.4	.4	.5	.5	.4	.4
36.	*	.1	.1	.2	.2	.3	.3	.4	.5	.5	.5	.5	.3	.3	.1	.3	.4	.4	.5	.4	.4
38.	*	.1	.1	.2	.2	.4	.4	.5	.4	.4	.4	.4	.3	.3	.1	.3	.4	.3	.5	.3	.4
40.	*	.1	.1	.2	.2	.4	.4	.5	.3	.4	.4	.3	.3	.3	.1	.3	.4	.3	.4	.3	.4
42.	*	.1	.2	.2	.3	.4	.4	.5	.3	.4	.3	.3	.3	.2	.1	.2	.2	.3	.4	.3	.4
44.	*	.1	.2	.2	.3	.4	.4	.4	.2	.2	.2	.3	.2	.1	.1	.2	.2	.3	.4	.3	.3
46.	*	.1	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.2	.1	.1	.2	.3	.3	.4	.3	.3
48.	*	.1	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.1	.1	.1	.2	.3	.2	.4	.3	.3
50.	*	.1	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.1	.1	.1	.2	.3	.2	.4	.3	.3
52.	*	.1	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.1	.1	.1	.2	.3	.2	.4	.3	.3
54.	*	.2	.2	.2	.3	.4	.4	.4	.2	.2	.2	.2	.1	.1	.1	.2	.3	.2	.4	.3	.2
56.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.3	.3	.3	.2	.2
58.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.3	.3	.3	.2	.2
60.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.3	.3	.3	.2	.2
62.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.3	.3	.3	.2	.2
64.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.3	.3	.3	.2	.2
66.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.1	.2	.3	.3	.3	.2	.2
68.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.2	.2
70.	*	.2	.2	.2	.3	.4	.4	.4	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.2	.1
72.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.2	.2
74.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.2	.2
76.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.3	.2
78.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.3	.2
80.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.4	.3	.2
82.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.3	.2

WIND * CONCENTRATION
ANGLE * (PPM)

(DEGR)	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
84.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.3	.2
86.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.3	.2
88.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.3	.3	.2
90.	*	.2	.2	.2	.3	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.4	.3	.3	.2
92.	*	.2	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.4	.3	.3	.2
94.	*	.2	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.3	.4	.3	.2	.2
96.	*	.3	.2	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.4	.4	.3	.2	.2
98.	*	.3	.3	.2	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.0	.2	.4	.4	.3	.2	.2
100.	*	.3	.3	.3	.2	.3	.3	.3	.1	.1	.1	.1	.1	.1	.1	.2	.4	.4	.3	.2	.2
102.	*	.3	.3	.3	.2	.3	.3	.3	.1	.1	.1	.1	.1	.2	.1	.2	.4	.4	.3	.2	.2
104.	*	.2	.3	.3	.2	.3	.3	.3	.1	.1	.1	.1	.2	.2	.1	.2	.4	.4	.3	.2	.2
106.	*	.2	.3	.3	.2	.3	.3	.3	.1	.1	.1	.1	.2	.2	.1	.2	.4	.4	.4	.2	.2
108.	*	.2	.3	.3	.2	.3	.3	.3	.1	.1	.1	.2	.2	.2	.1	.2	.4	.4	.4	.2	.2
110.	*	.2	.3	.4	.2	.3	.3	.3	.1	.1	.1	.2	.2	.2	.1	.2	.4	.4	.4	.3	.2
112.	*	.2	.4	.4	.3	.3	.3	.3	.1	.1	.1	.2	.2	.2	.1	.2	.4	.5	.4	.3	.2
114.	*	.3	.4	.4	.3	.3	.3	.3	.1	.1	.1	.2	.2	.2	.3	.3	.4	.5	.4	.2	.3
116.	*	.3	.4	.5	.4	.4	.3	.3	.1	.1	.2	.2	.3	.3	.3	.3	.4	.5	.4	.3	.3
118.	*	.3	.4	.5	.4	.4	.3	.3	.1	.1	.2	.3	.3	.3	.3	.3	.4	.5	.4	.3	.3
120.	*	.3	.4	.5	.4	.4	.3	.3	.1	.1	.2	.3	.3	.3	.3	.3	.5	.6	.5	.3	.3
122.	*	.3	.4	.5	.4	.4	.4	.3	.1	.2	.2	.4	.3	.3	.3	.3	.5	.6	.5	.3	.3
124.	*	.4	.6	.6	.5	.4	.4	.3	.1	.2	.2	.5	.4	.4	.5	.3	.5	.4	.5	.3	.3
126.	*	.4	.6	.6	.5	.5	.4	.3	.1	.2	.2	.5	.4	.5	.5	.3	.5	.4	.5	.3	.4
128.	*	.4	.6	.6	.5	.5	.4	.3	.1	.2	.3	.5	.4	.5	.5	.4	.5	.4	.5	.4	.3
130.	*	.4	.6	.6	.5	.5	.5	.3	.1	.3	.3	.5	.5	.5	.5	.4	.5	.4	.4	.4	.3
132.	*	.4	.5	.6	.5	.5	.5	.4	.2	.3	.3	.5	.5	.5	.5	.3	.5	.5	.5	.4	.3
134.	*	.5	.5	.6	.5	.5	.5	.5	.3	.3	.3	.5	.5	.5	.5	.3	.5	.5	.5	.4	.3
136.	*	.6	.8	.7	.6	.5	.5	.5	.3	.3	.4	.5	.5	.5	.5	.3	.5	.5	.5	.2	.3
138.	*	.6	.8	.7	.6	.6	.5	.5	.3	.3	.4	.6	.6	.6	.6	.3	.5	.4	.4	.2	.3
140.	*	.6	.8	.7	.6	.6	.6	.5	.3	.3	.5	.6	.6	.6	.6	.3	.4	.4	.4	.2	.3
142.	*	.4	.8	.8	.6	.6	.6	.6	.3	.4	.5	.6	.5	.6	.6	.3	.4	.4	.4	.2	.3
144.	*	.4	.8	.8	.6	.6	.6	.6	.4	.4	.5	.6	.5	.6	.6	.3	.4	.4	.3	.2	.3
146.	*	.4	.6	.8	.6	.7	.6	.6	.4	.4	.4	.6	.5	.6	.6	.3	.4	.4	.2	.2	.3
148.	*	.4	.5	.7	.6	.7	.6	.7	.5	.4	.4	.6	.5	.6	.6	.3	.4	.3	.2	.2	.3
150.	*	.4	.5	.6	.6	.7	.6	.7	.5	.4	.4	.5	.5	.5	.5	.3	.4	.3	.2	.2	.3
152.	*	.4	.5	.6	.5	.7	.6	.7	.5	.4	.4	.5	.5	.5	.5	.3	.3	.2	.2	.2	.3
154.	*	.4	.5	.6	.5	.7	.6	.7	.5	.4	.4	.5	.5	.5	.5	.2	.3	.2	.2	.2	.2
156.	*	.4	.5	.6	.4	.7	.6	.6	.5	.4	.4	.5	.5	.5	.5	.2	.3	.2	.2	.2	.3
158.	*	.5	.5	.6	.5	.7	.6	.6	.5	.4	.4	.5	.6	.5	.5	.2	.2	.2	.2	.2	.3
160.	*	.5	.5	.6	.5	.6	.6	.6	.5	.4	.4	.4	.6	.5	.5	.2	.2	.2	.2	.2	.3
162.	*	.4	.5	.6	.5	.6	.6	.6	.5	.4	.4	.4	.6	.5	.5	.2	.2	.2	.2	.2	.3
164.	*	.4	.6	.6	.6	.6	.6	.6	.5	.4	.4	.4	.5	.5	.5	.2	.2	.2	.2	.2	.3
166.	*	.4	.6	.6	.6	.5	.5	.6	.5	.4	.3	.4	.5	.5	.5	.2	.2	.2	.2	.3	.3
168.	*	.4	.6	.7	.6	.5	.6	.6	.5	.4	.3	.4	.4	.5	.5	.2	.2	.2	.2	.3	.3
170.	*	.4	.6	.6	.6	.5	.6	.6	.5	.4	.3	.4	.4	.4	.5	.2	.2	.2	.2	.3	.3
172.	*	.4	.6	.6	.6	.5	.5	.6	.4	.4	.3	.4	.4	.4	.5	.2	.2	.2	.2	.3	.3
174.	*	.3	.6	.6	.6	.5	.5	.6	.4	.3	.4	.4	.4	.4	.5	.2	.2	.2	.3	.3	.2
176.	*	.3	.6	.6	.6	.4	.5	.6	.4	.3	.4	.3	.4	.4	.5	.3	.2	.2	.3	.2	.3
178.	*	.3	.6	.6	.6	.4	.4	.3	.4	.3	.4	.3	.4	.4	.5	.3	.2	.2	.2	.2	.3
180.	*	.3	.6	.6	.6	.4	.4	.3	.4	.3	.4	.3	.4	.4	.5	.3	.2	.2	.2	.2	.3
182.	*	.2	.5	.6	.6	.5	.4	.3	.3	.3	.3	.2	.4	.4	.5	.3	.2	.3	.2	.2	.3
184.	*	.1	.4	.6	.7	.5	.4	.3	.3	.2	.3	.3	.4	.4	.4	.3	.2	.2	.2	.2	.3
186.	*	.1	.4	.6	.7	.6	.5	.3	.3	.2	.2	.4	.3	.4	.4	.2	.2	.2	.2	.2	.3

(DEGR)	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28														
188.	*	.1	.4	.5	.7	.6	.5	.3	.2	.2	.2	.4	.3	.4	.4	.2	.2	.2	.2	.2	.3
190.	*	.1	.4	.5	.7	.6	.5	.3	.2	.2	.3	.4	.3	.4	.4	.2	.2	.2	.2	.2	.3
192.	*	.1	.4	.5	.6	.6	.6	.3	.1	.1	.3	.4	.4	.3	.4	.2	.2	.2	.2	.2	.3
194.	*	.1	.4	.5	.5	.6	.6	.3	.1	.1	.3	.4	.4	.3	.4	.2	.2	.2	.2	.2	.3
196.	*	.1	.3	.5	.5	.6	.6	.3	.1	.3	.3	.4	.4	.3	.4	.2	.2	.2	.2	.2	.3
198.	*	.1	.3	.5	.5	.5	.5	.4	.1	.3	.3	.4	.4	.4	.4	.2	.2	.2	.2	.2	.3
200.	*	.1	.3	.5	.6	.5	.5	.3	.1	.3	.3	.4	.4	.4	.4	.2	.2	.2	.2	.2	.2
202.	*	.1	.3	.5	.6	.5	.5	.5	.1	.3	.3	.4	.4	.4	.3	.2	.2	.2	.2	.2	.2
204.	*	.1	.3	.4	.6	.6	.5	.5	.1	.3	.3	.4	.3	.4	.3	.2	.2	.2	.1	.2	.3
206.	*	.1	.2	.3	.6	.6	.5	.4	.1	.3	.2	.3	.3	.4	.3	.2	.2	.2	.1	.2	.3
208.	*	.1	.2	.3	.6	.6	.5	.4	.1	.2	.2	.3	.3	.4	.3	.2	.2	.2	.2	.2	.3
210.	*	.1	.2	.3	.6	.6	.5	.4	.1	.2	.3	.4	.3	.4	.3	.2	.2	.2	.2	.2	.3
212.	*	.1	.2	.3	.4	.5	.3	.3	.1	.3	.3	.4	.2	.4	.3	.2	.2	.1	.2	.2	.3
214.	*	.1	.2	.3	.4	.4	.3	.3	.0	.3	.3	.4	.2	.4	.4	.2	.2	.1	.2	.2	.3
216.	*	.1	.1	.3	.4	.5	.3	.3	.1	.3	.3	.4	.2	.4	.4	.2	.2	.1	.2	.2	.3
218.	*	.1	.1	.3	.4	.5	.3	.3	.1	.3	.3	.4	.3	.4	.4	.1	.2	.1	.2	.3	.3
220.	*	.1	.1	.3	.4	.4	.3	.3	.2	.3	.3	.4	.3	.2	.4	.1	.1	.1	.2	.3	.3
222.	*	.1	.1	.2	.4	.4	.3	.3	.2	.2	.3	.4	.3	.2	.4	.1	.1	.1	.2	.3	.3
224.	*	.1	.1	.2	.4	.4	.3	.3	.2	.2	.2	.4	.4	.2	.4	.1	.1	.1	.3	.3	.3
226.	*	.1	.1	.2	.4	.4	.2	.3	.2	.2	.2	.4	.4	.2	.4	.1	.1	.1	.3	.3	.3
228.	*	.1	.1	.2	.3	.4	.2	.3	.2	.2	.2	.4	.4	.2	.4	.1	.1	.2	.3	.3	.3
230.	*	.1	.1	.2	.3	.4	.3	.3	.2	.3	.2	.4	.4	.2	.4	.1	.1	.2	.3	.3	.3
232.	*	.1	.1	.2	.3	.4	.3	.2	.2	.3	.2	.4	.4	.2	.3	.1	.1	.2	.3	.3	.3
234.	*	.1	.1	.2	.3	.4	.3	.1	.2	.3	.2	.4	.3	.3	.3	.1	.1	.2	.2	.4	.3
236.	*	.1	.1	.2	.3	.4	.3	.1	.2	.3	.3	.4	.3	.4	.3	.1	.1	.2	.2	.4	.3
238.	*	.1	.1	.2	.3	.4	.3	.1	.2	.3	.3	.4	.3	.4	.3	.1	.1	.2	.2	.3	.3
240.	*	.1	.1	.2	.3	.4	.3	.1	.2	.3	.3	.4	.3	.4	.3	.1	.1	.2	.2	.3	.4
242.	*	.1	.1	.2	.3	.3	.2	.1	.2	.2	.3	.4	.3	.3	.3	.1	.2	.2	.2	.3	.4
244.	*	.1	.1	.2	.2	.3	.2	.1	.2	.2	.3	.3	.3	.3	.3	.1	.2	.1	.2	.3	.4
246.	*	.1	.1	.2	.2	.2	.1	.1	.1	.2	.3	.3	.3	.3	.3	.1	.2	.1	.3	.3	.3
248.	*	.1	.1	.2	.2	.2	.1	.1	.1	.2	.3	.3	.3	.3	.3	.1	.2	.1	.3	.3	.3
250.	*	.1	.1	.2	.2	.2	.1	.0	.1	.2	.3	.3	.3	.3	.3	.1	.2	.1	.3	.3	.3
252.	*	.1	.1	.2	.2	.1	.1	.0	.1	.2	.3	.4	.3	.3	.2	.2	.1	.1	.3	.3	.3
254.	*	.1	.1	.2	.2	.1	.1	.0	.1	.2	.3	.4	.3	.3	.2	.2	.1	.2	.3	.3	.3
256.	*	.1	.1	.2	.2	.1	.1	.0	.1	.2	.3	.4	.3	.3	.3	.2	.1	.2	.3	.3	.3
258.	*	.1	.1	.2	.2	.1	.1	.0	.1	.1	.3	.3	.3	.3	.3	.2	.1	.2	.3	.3	.3
260.	*	.1	.1	.2	.2	.1	.1	.0	.1	.1	.3	.3	.3	.3	.3	.2	.1	.2	.3	.3	.3
262.	*	.1	.1	.1	.2	.1	.1	.0	.1	.2	.3	.3	.3	.3	.3	.2	.1	.2	.3	.3	.3
264.	*	.1	.1	.1	.2	.1	.1	.0	.1	.2	.3	.3	.3	.3	.3	.2	.1	.2	.2	.3	.3
266.	*	.1	.1	.1	.2	.1	.1	.0	.1	.2	.3	.4	.3	.3	.3	.2	.1	.2	.2	.3	.3
268.	*	.1	.1	.1	.2	.1	.1	.0	.1	.2	.2	.4	.3	.3	.3	.1	.1	.2	.2	.3	.3
270.	*	.1	.1	.1	.2	.1	.1	.0	.1	.2	.2	.5	.3	.3	.3	.1	.1	.2	.2	.3	.3
272.	*	.2	.1	.1	.1	.1	.1	.0	.1	.2	.2	.5	.3	.3	.3	.1	.1	.2	.2	.3	.3
274.	*	.2	.2	.1	.1	.1	.1	.0	.1	.2	.2	.5	.3	.3	.3	.1	.1	.2	.2	.3	.3
276.	*	.2	.2	.2	.1	.1	.1	.0	.1	.2	.2	.5	.3	.3	.3	.1	.1	.2	.2	.3	.3
278.	*	.2	.3	.2	.1	.1	.1	.0	.1	.2	.2	.5	.3	.3	.3	.1	.1	.2	.2	.3	.3
280.	*	.3	.3	.2	.2	.1	.1	.0	.1	.2	.2	.5	.4	.3	.4	.1	.1	.2	.2	.3	.3
282.	*	.3	.3	.2	.2	.1	.1	.0	.1	.2	.2	.4	.3	.3	.4	.1	.1	.2	.2	.3	.3
284.	*	.3	.3	.2	.2	.1	.1	.0	.1	.2	.2	.3	.4	.2	.4	.1	.2	.3	.2	.3	.3
286.	*	.3	.3	.2	.2	.1	.1	.0	.1	.2	.2	.3	.4	.3	.4	.1	.2	.3	.2	.3	.3
288.	*	.3	.3	.2	.2	.1	.1	.0	.1	.2	.2	.3	.4	.3	.4	.1	.2	.3	.2	.3	.3
290.	*	.3	.3	.2	.2	.1	.0	.0	.1	.1	.2	.3	.3	.3	.3	.1	.2	.3	.2	.3	.3

WIND * CONCENTRATION
ANGLE * (PPM)

(DEGR)	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28														
292.	*	.3	.3	.3	.2	.1	.0	.0	.1	.1	.2	.3	.3	.2	.3	.1	.2	.3	.2	.3	.3
294.	*	.3	.3	.3	.2	.1	.0	.0	.1	.1	.2	.3	.3	.2	.2	.1	.2	.3	.3	.3	.3
296.	*	.3	.3	.3	.2	.1	.0	.0	.1	.1	.2	.3	.3	.2	.2	.1	.2	.3	.4	.3	.3
298.	*	.3	.3	.2	.2	.1	.0	.0	.1	.1	.2	.3	.3	.2	.2	.1	.2	.3	.4	.3	.3
300.	*	.3	.3	.2	.2	.1	.0	.0	.1	.1	.2	.3	.3	.3	.2	.1	.2	.3	.5	.3	.3
302.	*	.3	.3	.2	.1	.1	.0	.0	.1	.1	.2	.3	.3	.3	.2	.1	.3	.3	.5	.3	.3
304.	*	.2	.2	.2	.1	.0	.0	.0	.1	.1	.1	.3	.3	.3	.2	.1	.3	.3	.5	.3	.3
306.	*	.1	.2	.2	.1	.0	.0	.0	.1	.1	.1	.3	.3	.3	.1	.1	.3	.3	.5	.3	.3
308.	*	.1	.2	.2	.1	.0	.0	.0	.1	.1	.1	.3	.3	.3	.1	.1	.3	.3	.5	.3	.3
310.	*	.1	.1	.2	.1	.0	.0	.0	.1	.1	.1	.3	.3	.2	.1	.1	.3	.3	.5	.3	.3
312.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.3	.3	.2	.1	.1	.3	.3	.5	.4	.3
314.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.2	.3	.2	.1	.1	.3	.3	.5	.4	.3
316.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.2	.2	.2	.1	.1	.3	.3	.5	.4	.3
318.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.2	.2	.1	.1	.1	.3	.3	.5	.4	.3
320.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.2	.1	.1	.2	.3	.3	.5	.4	.3
322.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.2	.2	.3	.5	.3	.3
324.	*	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.0	.2	.2	.3	.5	.4	.3
326.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.0	.2	.2	.4	.5	.4	.4
328.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.0	.2	.1	.4	.4	.5	.4
330.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.0	.2	.1	.4	.4	.5	.4
332.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.0	.2	.2	.4	.4	.5	.4
334.	*	.1	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.4	.5	.4
336.	*	.0	.1	.1	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.0	.2	.3	.3	.4	.5	.4
338.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.0	.1	.3	.3	.4	.5	.4
340.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.0	.1	.3	.3	.4	.5	.4
342.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.0	.1	.3	.3	.4	.5	.4
344.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.0	.1	.3	.3	.4	.4	.4
346.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.2	.3	.3	.4	.4	.4	.4
348.	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.2	.3	.3	.4	.4	.4	.4
350.	*	.0	.0	.0	.0	.0	.0	.0	.2	.1	.1	.1	.1	.1	.1	.2	.2	.3	.3	.4	.4	.4
352.	*	.0	.0	.0	.0	.0	.0	.0	.2	.1	.1	.1	.1	.1	.1	.2	.2	.3	.3	.4	.4	.4
354.	*	.0	.0	.0	.0	.0	.0	.0	.2	.1	.1	.1	.1	.1	.2	.3	.1	.3	.3	.3	.4	.4
356.	*	.0	.0	.0	.0	.0	.0	.0	.2	.2	.1	.1	.1	.2	.3	.2	.3	.3	.3	.4	.3	
358.	*	.0	.0	.0	.0	.0	.0	.1	.2	.2	.1	.1	.2	.2	.3	.2	.4	.3	.2	.3	.3	
360.	*	.0	.0	.0	.0	.0	.0	.1	.2	.2	.2	.1	.2	.2	.3	.2	.4	.3	.2	.3	.3	
MAX	*	.6	.8	.8	.7	.7	.6	.7	.5	.5	.5	.6	.6	.6	.6	.4	.5	.6	.5	.5	.5
DEGR.	*	136	136	142	184	146	142	148	16	18	18	138	138	138	138	34	16	120	16	10	22

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
0.	.3	.1	.2	.2	.2	.1	.1	.1
2.	.3	.1	.2	.2	.2	.1	.1	.1
4.	.3	.1	.2	.2	.2	.1	.1	.1
6.	.2	.1	.2	.2	.2	.1	.1	.1
8.	.2	.1	.2	.2	.2	.1	.1	.1
10.	.2	.1	.2	.2	.2	.1	.1	.1
12.	.3	.1	.2	.2	.2	.2	.1	.1
14.	.3	.2	.2	.2	.2	.2	.1	.1
16.	.3	.2	.2	.4	.3	.2	.1	.1
18.	.4	.3	.3	.4	.3	.2	.1	.1
20.	.4	.3	.4	.4	.3	.3	.1	.1
22.	.3	.4	.3	.4	.3	.3	.1	.1
24.	.3	.4	.3	.4	.3	.3	.2	.1
26.	.3	.4	.4	.4	.3	.3	.2	.1
28.	.3	.5	.4	.5	.3	.3	.2	.1
30.	.3	.6	.4	.5	.4	.3	.2	.2
32.	.3	.6	.5	.6	.4	.3	.2	.2
34.	.3	.6	.5	.6	.4	.3	.2	.2
36.	.3	.6	.5	.6	.4	.3	.2	.2
38.	.2	.6	.5	.6	.4	.4	.2	.2
40.	.2	.6	.5	.6	.4	.4	.2	.2
42.	.2	.6	.5	.6	.4	.4	.2	.2
44.	.2	.6	.5	.6	.5	.4	.3	.2
46.	.2	.6	.5	.5	.5	.4	.3	.2
48.	.1	.6	.5	.5	.5	.4	.3	.2
50.	.1	.6	.5	.5	.5	.4	.3	.2
52.	.1	.6	.6	.5	.5	.4	.3	.2
54.	.1	.6	.6	.6	.5	.4	.3	.2
56.	.1	.6	.7	.6	.5	.4	.3	.3
58.	.1	.5	.7	.5	.5	.4	.3	.3
60.	.1	.5	.7	.6	.5	.4	.3	.3
62.	.1	.5	.7	.6	.5	.4	.3	.3
64.	.2	.5	.7	.6	.5	.4	.3	.3
66.	.2	.5	.6	.6	.5	.4	.3	.3
68.	.2	.5	.6	.6	.5	.4	.4	.3
70.	.2	.5	.6	.6	.5	.4	.4	.3
72.	.2	.4	.6	.6	.6	.4	.4	.3
74.	.2	.4	.6	.5	.7	.4	.4	.3
76.	.2	.4	.5	.5	.7	.4	.4	.3
78.	.2	.4	.5	.5	.7	.4	.4	.3
80.	.2	.5	.4	.5	.6	.4	.4	.3
82.	.2	.5	.4	.5	.6	.5	.4	.3

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs6nb.dat>

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
84.	.2	.6	.5	.5	.6	.5	.4	.3
86.	.2	.6	.5	.5	.6	.5	.4	.2
88.	.2	.6	.5	.5	.6	.5	.4	.2
90.	.2	.6	.5	.6	.5	.5	.4	.2
92.	.2	.6	.5	.6	.5	.5	.4	.2
94.	.2	.6	.5	.6	.5	.5	.3	.2
96.	.2	.5	.5	.6	.5	.5	.3	.2
98.	.2	.5	.5	.6	.6	.5	.4	.2
100.	.2	.5	.5	.5	.6	.5	.4	.2
102.	.2	.5	.5	.5	.6	.5	.4	.2
104.	.2	.6	.5	.5	.6	.5	.5	.2
106.	.3	.7	.5	.5	.6	.5	.5	.2
108.	.3	.7	.5	.5	.6	.5	.5	.3
110.	.3	.6	.5	.5	.7	.5	.5	.3
112.	.2	.6	.5	.5	.7	.6	.4	.4
114.	.2	.6	.6	.5	.7	.6	.4	.4
116.	.2	.6	.6	.6	.7	.6	.4	.4
118.	.4	.8	.6	.6	.8	.7	.5	.4
120.	.4	.7	.6	.6	.8	.6	.5	.4
122.	.4	.7	.6	.6	.7	.6	.5	.4
124.	.4	.7	.6	.6	.6	.6	.5	.4
126.	.4	.7	.6	.6	.6	.6	.4	.4
128.	.4	.7	.6	.7	.6	.6	.4	.4
130.	.4	.7	.6	.6	.7	.6	.5	.4
132.	.4	.7	.6	.6	.7	.6	.4	.4
134.	.4	.7	.6	.5	.7	.5	.4	.3
136.	.4	.8	.6	.6	.6	.5	.3	.3
138.	.5	.8	.6	.6	.5	.4	.3	.3
140.	.6	.8	.7	.6	.5	.4	.3	.3
142.	.6	.8	.7	.6	.5	.4	.3	.3
144.	.6	.8	.7	.5	.5	.4	.3	.4
146.	.5	.7	.7	.5	.5	.4	.3	.4
148.	.6	.7	.7	.5	.5	.4	.4	.4
150.	.6	.7	.7	.6	.5	.4	.4	.4
152.	.6	.6	.6	.6	.5	.5	.4	.4
154.	.6	.6	.7	.6	.5	.5	.4	.4
156.	.6	.6	.7	.6	.6	.5	.4	.4
158.	.6	.6	.7	.6	.6	.5	.4	.3
160.	.6	.4	.7	.6	.6	.5	.4	.3
162.	.6	.4	.7	.6	.6	.5	.3	.3
164.	.6	.4	.7	.6	.6	.5	.3	.2
166.	.6	.4	.6	.6	.6	.4	.3	.2
168.	.6	.4	.6	.5	.5	.4	.3	.1
170.	.5	.4	.6	.6	.5	.4	.3	.1
172.	.5	.4	.6	.6	.5	.4	.3	.1
174.	.5	.2	.6	.6	.5	.4	.3	.0

180. *	.5	.2	.6	.6	.5	.3	.2	.0
182. *	.5	.2	.6	.6	.5	.2	.2	.0
184. *	.5	.2	.5	.5	.5	.2	.1	.0

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs6nb.dat>

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR) *	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
186. *	.5	.1	.5	.4	.4	.2	.0	.0
188. *	.5	.1	.5	.4	.4	.2	.0	.0
190. *	.5	.1	.4	.4	.4	.2	.0	.0
192. *	.5	.1	.4	.4	.4	.2	.0	.0
194. *	.4	.1	.4	.4	.3	.2	.0	.0
196. *	.4	.1	.4	.4	.3	.1	.0	.0
198. *	.3	.1	.4	.4	.3	.0	.0	.0
200. *	.3	.1	.4	.4	.3	.0	.0	.0
202. *	.3	.0	.3	.4	.3	.0	.0	.0
204. *	.3	.0	.3	.3	.3	.0	.0	.0
206. *	.3	.0	.3	.3	.2	.0	.0	.0
208. *	.3	.0	.3	.2	.1	.0	.0	.0
210. *	.3	.0	.3	.2	.1	.0	.0	.0
212. *	.3	.0	.2	.2	.1	.0	.0	.0
214. *	.3	.0	.2	.2	.1	.0	.0	.0
216. *	.3	.0	.2	.1	.1	.0	.0	.0
218. *	.3	.0	.1	.1	.1	.0	.0	.0
220. *	.3	.0	.1	.1	.1	.0	.0	.0
222. *	.3	.0	.1	.1	.0	.0	.0	.0
224. *	.3	.0	.1	.1	.0	.0	.0	.0
226. *	.3	.0	.1	.1	.0	.0	.0	.0
228. *	.3	.0	.1	.1	.0	.0	.0	.0
230. *	.3	.0	.1	.1	.0	.0	.0	.0
232. *	.3	.0	.1	.0	.0	.0	.0	.0
234. *	.3	.0	.1	.0	.0	.0	.0	.0
236. *	.3	.0	.1	.0	.0	.0	.0	.0
238. *	.3	.0	.1	.0	.0	.0	.0	.0
240. *	.3	.0	.0	.0	.0	.0	.0	.0
242. *	.3	.0	.0	.0	.0	.0	.0	.0
244. *	.3	.0	.0	.0	.0	.0	.0	.0
246. *	.3	.0	.0	.0	.0	.0	.0	.0
248. *	.3	.0	.0	.0	.0	.0	.0	.0
250. *	.3	.0	.0	.0	.0	.0	.0	.0
252. *	.3	.0	.0	.0	.0	.0	.0	.0
254. *	.3	.0	.0	.0	.0	.0	.0	.0
256. *	.3	.0	.0	.0	.0	.0	.0	.0
258. *	.3	.0	.0	.0	.0	.0	.0	.0
260. *	.3	.0	.0	.0	.0	.0	.0	.0
262. *	.3	.0	.0	.0	.0	.0	.0	.0
264. *	.3	.0	.0	.0	.0	.0	.0	.0
266. *	.2	.0	.0	.0	.0	.0	.0	.0
268. *	.2	.0	.0	.0	.0	.0	.0	.0
270. *	.2	.0	.0	.0	.0	.0	.0	.0
272. *	.2	.0	.0	.0	.0	.0	.0	.0
274. *	.3	.0	.0	.0	.0	.0	.0	.0
276. *	.3	.0	.0	.0	.0	.0	.0	.0
278. *	.3	.0	.0	.0	.0	.0	.0	.0
280. *	.3	.0	.0	.0	.0	.0	.0	.0
282. *	.3	.0	.0	.0	.0	.0	.0	.0
284. *	.3	.0	.0	.0	.0	.0	.0	.0
286. *	.3	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs6nb.dat>

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR) *	CONCENTRATION (PPM) REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
288. *	.3	.0	.0	.0	.0	.0	.0	.0
290. *	.3	.0	.0	.0	.0	.0	.0	.0
292. *	.3	.0	.0	.0	.0	.0	.0	.0
294. *	.3	.0	.0	.0	.0	.0	.0	.0
296. *	.3	.0	.0	.0	.0	.0	.0	.0
298. *	.4	.0	.0	.0	.0	.0	.0	.0
300. *	.4	.0	.0	.0	.0	.0	.0	.0
302. *	.4	.0	.0	.0	.0	.0	.0	.0
304. *	.4	.0	.0	.0	.1	.1	.1	.0
306. *	.4	.0	.0	.0	.1	.2	.1	.1
308. *	.4	.0	.0	.0	.1	.2	.2	.1
310. *	.4	.0	.0	.0	.2	.2	.2	.1
312. *	.3	.0	.0	.0	.3	.2	.2	.2
314. *	.3	.0	.0	.0	.3	.2	.2	.2
316. *	.3	.0	.0	.0	.3	.2	.2	.2
318. *	.3	.0	.0	.0	.3	.2	.2	.2
320. *	.3	.0	.0	.1	.2	.2	.2	.2
322. *	.3	.0	.0	.1	.2	.2	.2	.2
324. *	.3	.0	.0	.1	.2	.2	.2	.2
326. *	.3	.0	.0	.1	.2	.2	.2	.2
328. *	.3	.0	.0	.1	.2	.2	.2	.2
330. *	.3	.0	.0	.1	.2	.2	.2	.2
332. *	.3	.0	.0	.1	.2	.2	.2	.2
334. *	.3	.0	.0	.1	.2	.2	.2	.2
336. *	.3	.0	.1	.1	.2	.1	.2	.2
338. *	.3	.0	.1	.1	.2	.1	.2	.2
340. *	.4	.0	.1	.1	.2	.1	.2	.2
342. *	.4	.0	.1	.1	.2	.1	.2	.2
344. *	.4	.0	.1	.1	.2	.1	.2	.2
346. *	.4	.0	.1	.1	.2	.1	.2	.1
348. *	.4	.0	.1	.1	.2	.1	.1	.1
350. *	.4	.0	.1	.1	.2	.1	.1	.1
352. *	.3	.1	.1	.1	.2	.1	.1	.1
354. *	.3	.1	.1	.1	.2	.1	.1	.1
356. *	.3	.1	.1	.2	.2	.1	.1	.1
358. *	.3	.1	.1	.2	.2	.1	.1	.1
360. *	.3	.1	.2	.2	.2	.1	.1	.1

MAX	*	.6	.8	.7	.7	.8	.7	.5	.4
DEGR.	*	140	118	56	128	118	118	104	112

THE HIGHEST CONCENTRATION OF .80 PPM OCCURRED AT RECEPTOR REC25.

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs6nb.dat>

DATE : 8/18/99
TIME : 15: 5:22

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	*	CO/LINK (PPM)																			
	*	ANGLE (DEGREES)																			
	*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8	REC9	REC10	REC11	REC12	REC13	REC14	REC15	REC16	REC17	REC18	REC19	REC20
LINK #	*	136	136	142	184	146	142	148	16	18	18	138	138	138	138	34	16	120	16	10	22
1	*	.0	.0	.0	.0	.0	.0	.0	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5	*	.1	.1	.1	.0	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0
6	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7	*	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.1	.1	.1	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.2
10	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.1	.1	.2	.2	.2	.2	.2	.2	.0	.0	.0	.0	.1	.1	.0	.2	.1	.1
12	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13	*	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19	*	.1	.1	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.1	.1	.1	.1	.0	.0	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1	.2	.1	.1
22	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.1	.1	.1	.0	.1	.1	.1	.0	.0	.0	.2	.3	.3	.3	.1	.1	.3	.0	.0	.0
24	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
25	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
26	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
27	*	.1	.1	.1	.0	.1	.1	.2	.2	.2	.2	.1	.1	.1	.1	.1	.2	.1	.1	.1	.1
28	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
29	*	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0	.1	.1	.1	.1	.0	.0	.1	.0	.0	.0
30	*	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

JOB: CASE:1 NOBUILD: Goethals/Western RUN: CAL3HQ v2.0 (o-s) <cqs6nb.dat>

DATE : 8/18/99
TIME : 15: 5:22

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	*	CO/LINK (PPM)							
	*	ANGLE (DEGREES)							
	*	REC21	REC22	REC23	REC24	REC25	REC26	REC27	REC28
LINK #	*	140	118	56	128	118	118	104	112
1	*	.0	.0	.0	.0	.0	.0	.0	.0
2	*	.0	.0	.0	.0	.0	.0	.0	.0
3	*	.0	.0	.0	.0	.0	.0	.0	.0
4	*	.0	.0	.0	.0	.0	.0	.0	.0
5	*	.2	.1	.0	.1	.0	.0	.0	.0
6	*	.0	.0	.0	.0	.0	.0	.0	.0
7	*	.2	.2	.0	.0	.0	.0	.0	.0
8	*	.0	.0	.0	.0	.0	.0	.0	.0
9	*	.0	.2	.4	.3	.3	.2	.1	.1
10	*	.0	.0	.0	.0	.0	.0	.0	.0
11	*	.0	.0	.1	.0	.0	.0	.0	.0
12	*	.0	.0	.0	.0	.0	.0	.0	.0
13	*	.0	.0	.0	.0	.1	.1	.1	.0
14	*	.0	.0	.0	.0	.0	.0	.0	.0
15	*	.0	.0	.0	.0	.0	.0	.0	.0
16	*	.0	.0	.0	.0	.0	.0	.0	.0
17	*	.0	.0	.0	.0	.0	.0	.0	.0
18	*	.0	.0	.0	.0	.0	.0	.0	.0
19	*	.0	.0	.0	.0	.0	.0	.1	.1
20	*	.0	.0	.0	.0	.0	.0	.0	.0
21	*	.0	.0	.1	.0	.1	.1	.0	.0
22	*	.0	.0	.0	.0	.0	.0	.0	.0
23	*	.0	.1	.0	.1	.1	.1	.1	.1
24	*	.0	.0	.0	.0	.0	.0	.0	.0
25	*	.0	.0	.0	.0	.0	.0	.0	.0
26	*	.0	.0	.0	.0	.0	.0	.0	.0
27	*	.0	.0	.1	.1	.1	.1	.1	.1
28	*	.0	.0	.0	.0	.0	.0	.0	.0
29	*	.2	.2	.0	.1	.1	.1	.0	.0
30	*	.0	.0	.0	.0	.0	.0	.0	.0

```
BAYONNE-PM PK HR 2030NB(file:WPULNB30)  60. 321.   0.   0. 8     .3048    1    1
REC 1-NE CORNER            -37.       25.        5.
REC 2-SE CORNER             37.       25.        5.
REC 3-NW CORNER            -37.      -25.        5.
REC 4-SW CORNER             37.      -25.        5.
REC 5-P.JERSEY-N MID       -37.      750.        5.
REC 6-P.JERSEY-S MID        37.      750.        5.
REC 7-W.PULASK-E MID       750.       25.        5.
REC 8-W.PULASK-W MID       750.      -25.        5.
PORT JERSEY BLVD/W.PULASKI LANE            8  1   0
  1
PO JERSEY-EB   APP  AG      6. -1000.      6.      0.    587.19.5  0. 32.
  1
PO JERSEY-EB   DEP  AG      6.      0.     6.   1000.    176.19.5  0. 32.
  1
PO JERSEY-WB   APP  AG     -6.      0.    -6.   1000.    671.19.5  0. 32.
  1
PO JERSEY-WB   DEP  AG     -6.      0.    -6.  -1000.    865.19.5  0. 32.
  1
W.PULASKI-NB   APP  AG      0.      6.  1000.      6.     41.48.6  0. 32.
  1
W.PULASKI-NB   DEP  AG      0.      6. -1000.      6.    324.19.5  0. 32.
  1
W.PULASKI-SB   APP  AG      0.     -6. -1000.     -6.    466.48.6  0. 32.
  1
W.PULASKI-SB   DEP  AG      0.     -6.  1000.     -6.    400.48.6  0. 32.
1.0  0.5 1000.  0.Y  5  0 72
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JOB: BAYONNE-PM PK HR 2030NB(file:WPULNB30) RUN: PORT JERSEY BLVD/W.PULASKI LANE
DATE: 08/10/99 TIME: 22:22

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)		(G/MI)	(FT)	(FT)			(VEH)
1. PO JERSEY-EB APP	*	6.0	-1000.0	6.0	0.0	*	1000.	360.	AG	587.	19.5	0.0	32.0		
2. PO JERSEY-EB DEP	*	6.0	0.0	6.0	1000.0	*	1000.	360.	AG	176.	19.5	0.0	32.0		
3. PO JERSEY-WB APP	*	-6.0	0.0	-6.0	1000.0	*	1000.	360.	AG	671.	19.5	0.0	32.0		
4. PO JERSEY-WB DEP	*	-6.0	0.0	-6.0	-1000.0	*	1000.	180.	AG	865.	19.5	0.0	32.0		
5. W.PULASKI-NB APP	*	0.0	6.0	1000.0	6.0	*	1000.	90.	AG	41.	48.6	0.0	32.0		
6. W.PULASKI-NB DEP	*	0.0	6.0	-1000.0	6.0	*	1000.	270.	AG	324.	19.5	0.0	32.0		
7. W.PULASKI-SB APP	*	0.0	-6.0	-1000.0	-6.0	*	1000.	270.	AG	466.	48.6	0.0	32.0		
8. W.PULASKI-SB DEP	*	0.0	-6.0	1000.0	-6.0	*	1000.	90.	AG	400.	48.6	0.0	32.0		

1

JOB: BAYONNE-PM PK HR 2030NB(file:WPULNB30) RUN: PORT JERSEY BLVD/W.PULASKI LANE
DATE: 08/10/99 TIME: 22:22

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH	RED TIME	CLEARANCE LOST TIME	APPROACH VOL	SATURATION FLOW RATE	IDLE EM FAC	SIGNAL TYPE	ARRIVAL RATE
	*	(SEC)	(SEC)	(SEC)	(VPH)	(VPH)	(gm/hr)		

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1-NE CORNER	-37.0	25.0	5.0
2. REC 2-SE CORNER	37.0	25.0	5.0
3. REC 3-NW CORNER	-37.0	-25.0	5.0
4. REC 4-SW CORNER	37.0	-25.0	5.0
5. REC 5-P.JERSEY-N MID	-37.0	750.0	5.0
6. REC 6-P.JERSEY-S MID	37.0	750.0	5.0
7. REC 7-W.PULASK-E MID	750.0	25.0	5.0
8. REC 8-W.PULASK-W MID	750.0	-25.0	5.0

1

JOB: BAYONNE-PM PK HR 2030NB(file:WPULNB30) BLVD/W.PULASKI LANE

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
0.	0.5	0.4	1.6	1.2	0.2	0.2	0.0	0.8
5.	0.7	0.3	1.7	1.1	0.4	0.1	0.0	0.8
10.	0.7	0.1	1.7	0.9	0.5	0.0	0.0	0.8
15.	0.7	0.0	1.6	0.7	0.6	0.0	0.0	0.7
20.	0.7	0.0	1.5	0.7	0.6	0.0	0.0	0.7
25.	0.6	0.0	1.7	0.8	0.6	0.0	0.0	0.8
30.	0.6	0.0	1.6	0.8	0.6	0.0	0.0	0.8
35.	0.6	0.0	1.6	0.8	0.6	0.0	0.0	0.8
40.	0.6	0.0	1.7	0.9	0.5	0.0	0.0	0.9
45.	0.5	0.0	1.7	0.9	0.5	0.0	0.0	0.9
50.	0.5	0.0	1.8	1.0	0.5	0.0	0.0	1.0
55.	0.5	0.0	1.8	1.0	0.5	0.0	0.0	1.0
60.	0.5	0.0	1.9	1.1	0.5	0.0	0.0	1.1
65.	0.5	0.0	2.0	1.2	0.5	0.0	0.0	1.1
70.	0.5	0.0	2.1	1.3	0.5	0.0	0.0	1.2
75.	0.6	0.1	2.1	1.4	0.5	0.0	0.0	1.3
80.	0.7	0.3	2.3	1.5	0.5	0.0	0.1	1.2
85.	1.0	0.5	2.3	1.4	0.5	0.0	0.3	1.1
90.	1.4	0.8	2.1	1.2	0.5	0.0	0.5	0.8
95.	1.5	0.9	1.7	0.8	0.5	0.0	0.6	0.6
100.	1.6	1.0	1.3	0.5	0.5	0.0	0.7	0.4
105.	1.5	1.0	1.1	0.3	0.5	0.0	0.8	0.2

110. *	1.7	1.0	1.0	0.2	0.5	0.0	0.9	0.1
115. *	1.7	0.9	0.8	0.1	0.5	0.0	0.9	0.1
120. *	1.6	0.8	0.8	0.1	0.5	0.0	0.8	0.1
125. *	1.6	0.8	0.8	0.0	0.5	0.0	0.8	0.0
130. *	1.6	0.8	0.8	0.0	0.6	0.1	0.8	0.0
135. *	1.6	0.7	0.9	0.0	0.6	0.1	0.7	0.0
140. *	1.7	0.7	0.9	0.0	0.7	0.1	0.7	0.0
145. *	1.8	0.7	0.9	0.0	0.7	0.1	0.7	0.0
150. *	1.8	0.7	1.1	0.0	0.7	0.1	0.7	0.0
155. *	1.9	0.7	1.1	0.0	0.7	0.1	0.7	0.0
160. *	1.9	0.6	1.1	0.0	0.8	0.1	0.6	0.0
165. *	2.0	0.8	1.2	0.2	0.8	0.1	0.6	0.0
170. *	2.0	0.8	1.2	0.2	1.0	0.2	0.6	0.0
175. *	1.9	1.2	1.1	0.6	0.8	0.6	0.6	0.0
180. *	1.7	1.4	0.9	0.8	0.8	0.7	0.6	0.0
185. *	1.4	1.7	0.6	1.0	0.6	0.8	0.6	0.0
190. *	1.1	1.7	0.3	1.1	0.3	1.0	0.6	0.0
195. *	0.9	1.7	0.1	1.1	0.2	0.8	0.6	0.0
200. *	0.8	1.7	0.0	1.1	0.1	0.7	0.6	0.0
205. *	0.9	1.6	0.0	1.1	0.1	0.6	0.7	0.0

1

WIND * CONCENTRATION
ANGLE * (PPM)

(DEGR)*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
210. *	0.9	1.6	0.0	0.9	0.1	0.6	0.7	0.0
215. *	0.9	1.5	0.0	0.9	0.1	0.6	0.7	0.0
220. *	1.0	1.5	0.0	0.9	0.1	0.6	0.8	0.1
225. *	1.0	1.5	0.0	0.9	0.1	0.6	0.8	0.1
230. *	1.1	1.7	0.0	0.8	0.1	0.5	0.9	0.1
235. *	1.1	1.5	0.0	0.8	0.0	0.5	1.0	0.1
240. *	1.2	1.6	0.1	0.7	0.0	0.4	1.0	0.3
245. *	1.3	1.8	0.1	0.7	0.0	0.4	1.1	0.3
250. *	1.4	1.6	0.2	0.8	0.0	0.4	1.0	0.3
255. *	1.5	1.9	0.3	1.1	0.0	0.4	1.2	0.4
260. *	1.6	1.7	0.7	1.4	0.0	0.4	1.2	0.7
265. *	1.4	1.7	1.1	1.8	0.0	0.4	1.1	1.0
270. *	1.2	1.5	1.5	2.2	0.0	0.4	0.9	1.4
275. *	0.8	1.1	1.9	2.5	0.0	0.4	0.6	1.5
280. *	0.5	0.8	1.9	2.6	0.0	0.4	0.4	1.6
285. *	0.2	0.6	1.9	2.5	0.0	0.4	0.2	1.4
290. *	0.1	0.4	1.7	2.2	0.0	0.4	0.1	1.4
295. *	0.0	0.4	1.6	2.1	0.0	0.4	0.1	1.3
300. *	0.0	0.4	1.4	1.9	0.0	0.4	0.1	1.2
305. *	0.0	0.4	1.3	1.6	0.0	0.4	0.1	1.1
310. *	0.0	0.4	1.2	1.6	0.0	0.4	0.1	1.1
315. *	0.0	0.5	1.1	1.7	0.0	0.5	0.1	1.0
320. *	0.0	0.5	1.1	1.5	0.0	0.5	0.0	0.9
325. *	0.0	0.5	1.1	1.5	0.0	0.5	0.0	0.8
330. *	0.0	0.5	1.0	1.4	0.0	0.5	0.0	0.8

335.	*	0.0	0.5	1.0	1.2	0.0	0.5	0.0	0.8
340.	*	0.0	0.7	1.0	1.3	0.0	0.5	0.0	0.7
345.	*	0.1	0.7	1.0	1.4	0.0	0.4	0.0	0.7
350.	*	0.2	0.7	1.2	1.5	0.1	0.4	0.0	0.8
355.	*	0.4	0.5	1.4	1.3	0.1	0.3	0.0	0.8
360.	*	0.5	0.4	1.6	1.2	0.2	0.2	0.0	0.8
------	*	----------							
MAX	*	2.0	1.9	2.3	2.6	1.0	1.0	1.2	1.6
DEGR.	*	165	255	85	280	170	190	255	280

THE HIGHEST CONCENTRATION IS 2.60 PPM AT 280 DEGREES FROM REC4 .
THE 2ND HIGHEST CONCENTRATION IS 2.30 PPM AT 85 DEGREES FROM REC3 .
THE 3RD HIGHEST CONCENTRATION IS 2.00 PPM AT 165 DEGREES FROM REC1 .

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BAYONNE-PM PK HR 2030BD(file:WPULBD30)  60. 321.   0.   0. 8      .3048    1    1
REC 1-NE CORNER            -37.       25.         5.
REC 2-SE CORNER             37.       25.         5.
REC 3-NW CORNER            -37.      -25.         5.
REC 4-SW CORNER             37.      -25.         5.
REC 5-P.JERSEY-N MID       -37.      750.         5.
REC 6-P.JERSEY-S MID        37.      750.         5.
REC 7-W.PULASK-E MID       750.       25.         5.
REC 8-W.PULASK-W MID       750.      -25.         5.
PORT JERSEY BLVD/W.PULASKI LANE            8  1   0
  1
PO JERSEY-EB   APP  AG     6. -1000.     6.     0.    778.18.4  0. 32.
  1
PO JERSEY-EB   DEP  AG     6.     0.     6.  1000.    353.17.4  0. 32.
  1
PO JERSEY-WB   APP  AG    -6.     0.    -6.  1000.   1273.17.9  0. 32.
  1
PO JERSEY-WB   DEP  AG    -6.     0.    -6. -1000.   1406.17.4  0. 32.
  1
W.PULASKI-NB   APP  AG     0.     6.  1000.     6.    131.35.4  0. 32.
  1
W.PULASKI-NB   DEP  AG     0.     6. -1000.     6.    389.19.5  0. 32.
  1
W.PULASKI-SB   APP  AG     0.    -6. -1000.    -6.    466.48.6  0. 32.
  1
W.PULASKI-SB   DEP  AG     0.    -6.  1000.    -6.    500.48.6  0. 32.
1.0  0.5 1000.  0.Y  5  0 72
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JOB: BAYONNE-PM PK HR 2030BD(file:WPULBD30) RUN: PORT JERSEY BLVD/W.PULASKI LANE
DATE: 08/10/99 TIME: 22:22

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)		(G/MI)		(FT)	(FT)		(VEH)
1. PO JERSEY-EB APP	*	6.0	-1000.0	6.0	0.0	*	1000.	360.	AG	778.	18.4	0.0	32.0		
2. PO JERSEY-EB DEP	*	6.0	0.0	6.0	1000.0	*	1000.	360.	AG	353.	17.4	0.0	32.0		
3. PO JERSEY-WB APP	*	-6.0	0.0	-6.0	1000.0	*	1000.	360.	AG	1273.	17.9	0.0	32.0		
4. PO JERSEY-WB DEP	*	-6.0	0.0	-6.0	-1000.0	*	1000.	180.	AG	1406.	17.4	0.0	32.0		
5. W.PULASKI-NB APP	*	0.0	6.0	1000.0	6.0	*	1000.	90.	AG	131.	35.4	0.0	32.0		
6. W.PULASKI-NB DEP	*	0.0	6.0	-1000.0	6.0	*	1000.	270.	AG	389.	19.5	0.0	32.0		
7. W.PULASKI-SB APP	*	0.0	-6.0	-1000.0	-6.0	*	1000.	270.	AG	466.	48.6	0.0	32.0		
8. W.PULASKI-SB DEP	*	0.0	-6.0	1000.0	-6.0	*	1000.	90.	AG	500.	48.6	0.0	32.0		

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH	RED TIME	CLEARANCE LOST TIME	APPROACH VOL	SATURATION FLOW RATE	EM FAC	IDLE TYPE	SIGNAL RATE	ARRIVAL
	*	(SEC)	(SEC)	(SEC)	(VPH)	(VPH)	(gm/hr)			

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1-NE CORNER	-37.0	25.0	5.0
2. REC 2-SE CORNER	37.0	25.0	5.0
3. REC 3-NW CORNER	-37.0	-25.0	5.0
4. REC 4-SW CORNER	37.0	-25.0	5.0
5. REC 5-P.JERSEY-N MID	-37.0	750.0	5.0
6. REC 6-P.JERSEY-S MID	37.0	750.0	5.0
7. REC 7-W.PULASK-E MID	750.0	25.0	5.0
8. REC 8-W.PULASK-W MID	750.0	-25.0	5.0

JOB: BAYONNE-PM PK HR 2030BD(file:WPULBD30)
BLVD/W.PULASKI LANE

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
0.	1.0	0.8	2.0	1.8	0.5	0.3	0.0	1.0
5.	1.2	0.5	2.2	1.4	0.7	0.2	0.0	0.9
10.	1.3	0.3	2.3	1.2	0.8	0.1	0.0	0.9
15.	1.3	0.1	2.1	1.0	1.1	0.0	0.0	0.9
20.	1.2	0.0	2.1	0.9	1.1	0.0	0.0	0.9
25.	1.1	0.0	2.1	0.9	1.1	0.0	0.0	0.9
30.	1.1	0.0	2.0	1.0	1.1	0.0	0.0	1.0
35.	1.0	0.0	2.1	1.0	1.0	0.0	0.0	1.0
40.	1.0	0.0	2.1	1.1	1.0	0.0	0.0	1.1
45.	0.9	0.0	2.2	1.2	1.0	0.0	0.0	1.2
50.	0.9	0.0	2.2	1.3	0.9	0.0	0.0	1.3
55.	0.9	0.0	2.4	1.3	0.9	0.0	0.0	1.3
60.	0.9	0.0	2.4	1.4	0.9	0.0	0.0	1.4
65.	0.9	0.0	2.5	1.6	0.8	0.0	0.0	1.5
70.	0.8	0.1	2.7	1.7	0.7	0.0	0.0	1.6
75.	0.9	0.2	2.8	1.9	0.7	0.0	0.2	1.7
80.	1.1	0.4	3.0	1.9	0.7	0.0	0.2	1.6
85.	1.6	0.8	2.9	1.9	0.7	0.0	0.4	1.4
90.	1.8	1.1	2.6	1.6	0.7	0.0	0.6	1.1
95.	2.0	1.3	2.2	1.1	0.7	0.0	0.8	0.8
100.	2.2	1.4	1.7	0.8	0.7	0.0	1.1	0.5
105.	2.4	1.4	1.4	0.4	0.7	0.0	1.2	0.3

110. *	2.3	1.4	1.2	0.2	0.7	0.0	1.2	0.2
115. *	2.2	1.3	1.1	0.1	0.8	0.0	1.2	0.1
120. *	2.2	1.1	1.1	0.1	0.9	0.0	1.1	0.1
125. *	2.3	1.1	1.2	0.1	1.0	0.0	1.1	0.1
130. *	2.1	1.0	1.2	0.0	1.0	0.1	1.0	0.0
135. *	2.2	1.0	1.2	0.0	1.1	0.1	1.0	0.0
140. *	2.1	1.0	1.2	0.0	1.1	0.1	1.0	0.0
145. *	2.3	0.9	1.3	0.0	1.1	0.1	0.9	0.0
150. *	2.3	0.9	1.3	0.0	1.2	0.1	0.9	0.0
155. *	2.4	0.9	1.5	0.0	1.2	0.1	0.9	0.0
160. *	2.4	0.9	1.6	0.0	1.3	0.1	0.9	0.0
165. *	2.4	1.1	1.7	0.2	1.5	0.2	0.9	0.0
170. *	2.5	1.3	1.6	0.4	1.5	0.5	0.9	0.0
175. *	2.5	1.6	1.5	0.7	1.5	0.7	0.9	0.0
180. *	2.1	2.0	1.2	1.1	1.2	1.1	0.9	0.0
185. *	1.7	2.3	0.8	1.4	0.9	1.3	0.9	0.0
190. *	1.3	2.5	0.4	1.6	0.5	1.4	0.9	0.0
195. *	1.0	2.5	0.1	1.6	0.2	1.3	0.9	0.0
200. *	1.0	2.3	0.1	1.5	0.1	1.2	0.9	0.0
205. *	1.0	2.2	0.0	1.4	0.1	1.2	0.9	0.0

1

JOB: BAYONNE-PM PK HR 2030BD(file:WPULBD30) RUN: PORT JERSEY
BLVD/W.PULASKI LANE

WIND * CONCENTRATION
ANGLE * (PPM)

(DEGR)*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
210. *	1.0	2.1	0.0	1.4	0.1	1.0	0.9	0.0
215. *	1.0	2.1	0.0	1.2	0.1	1.0	1.0	0.0
220. *	1.0	2.1	0.0	1.2	0.1	0.9	1.1	0.1
225. *	1.0	2.1	0.0	1.2	0.1	0.9	1.2	0.2
230. *	1.1	2.1	0.0	1.0	0.1	0.9	1.2	0.2
235. *	1.2	2.1	0.0	1.0	0.0	0.9	1.3	0.3
240. *	1.3	2.0	0.1	1.0	0.0	0.8	1.3	0.3
245. *	1.3	2.0	0.1	1.1	0.0	0.8	1.5	0.3
250. *	1.5	2.3	0.2	1.2	0.0	0.8	1.6	0.4
255. *	1.6	2.3	0.3	1.4	0.0	0.7	1.7	0.6
260. *	1.6	2.3	0.7	1.7	0.0	0.7	1.6	1.0
265. *	1.5	2.2	1.2	2.2	0.0	0.7	1.6	1.3
270. *	1.2	2.0	1.6	2.7	0.0	0.7	1.5	1.9
275. *	0.8	1.5	1.9	2.9	0.0	0.7	0.9	2.1
280. *	0.5	1.2	2.0	3.0	0.0	0.7	0.6	2.1
285. *	0.2	0.9	2.0	2.9	0.0	0.7	0.3	1.9
290. *	0.1	0.8	1.7	2.7	0.0	0.8	0.1	1.8
295. *	0.0	0.8	1.6	2.4	0.0	0.8	0.1	1.7
300. *	0.0	0.8	1.5	2.6	0.0	0.8	0.1	1.5
305. *	0.0	0.8	1.4	2.3	0.0	0.8	0.1	1.4
310. *	0.0	0.8	1.3	2.1	0.0	0.8	0.1	1.4
315. *	0.0	0.8	1.1	2.2	0.0	0.8	0.1	1.3
320. *	0.0	0.8	1.1	2.1	0.0	0.8	0.1	1.2
325. *	0.0	0.9	1.1	2.1	0.0	0.9	0.0	1.1
330. *	0.0	0.9	1.0	1.9	0.0	0.9	0.0	1.0

335. *	0.0	1.1	1.0	1.9	0.0	0.9	0.0	0.9
340. *	0.0	1.1	1.1	2.0	0.0	0.9	0.0	0.9
345. *	0.1	1.2	1.0	2.1	0.1	0.8	0.0	0.9
350. *	0.3	1.1	1.3	2.0	0.1	0.7	0.0	0.9
355. *	0.6	1.0	1.6	1.9	0.3	0.6	0.0	0.9
360. *	1.0	0.8	2.0	1.8	0.5	0.3	0.0	1.0
------*								
MAX *	2.5	2.5	3.0	3.0	1.5	1.4	1.7	2.1
DEGR. *	170	190	80	280	175	190	255	275

THE HIGHEST CONCENTRATION IS 3.00 PPM AT 80 DEGREES FROM REC3 .
THE 2ND HIGHEST CONCENTRATION IS 3.00 PPM AT 280 DEGREES FROM REC4 .
THE 3RD HIGHEST CONCENTRATION IS 2.50 PPM AT 170 DEGREES FROM REC1 .

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BAYONNE-PM PK HR 2060BD(file:WPULBD60)  60. 321.   0.   0. 8      .3048    1    1
REC 1-NE CORNER            -37.       25.          5.
REC 2-SE CORNER             37.       25.          5.
REC 3-NW CORNER            -37.      -25.          5.
REC 4-SW CORNER             37.      -25.          5.
REC 5-P.JERSEY-N MID       -37.      750.          5.
REC 6-P.JERSEY-S MID        37.      750.          5.
REC 7-W.PULASK-E MID       750.       25.          5.
REC 8-W.PULASK-W MID       750.      -25.          5.
PORT JERSEY BLVD/W.PULASKI LANE                8  1   0
  1
PO JERSEY-EB   APP  AG      6. -1000.      6.      0.    854.18.4  0. 32.
  1
PO JERSEY-EB   DEP  AG      6.      0.     6.   1000.    377.17.4  0. 32.
  1
PO JERSEY-WB   APP  AG     -6.      0.    -6.   1000.   1353.17.9  0. 32.
  1
PO JERSEY-WB   DEP  AG     -6.      0.    -6.  -1000.   1509.17.4  0. 32.
  1
W.PULASKI-NB   APP  AG      0.      6.  1000.      6.    137.36.0  0. 32.
  1
W.PULASKI-NB   DEP  AG      0.      6. -1000.      6.    431.17.4  0. 32.
  1
W.PULASKI-SB   APP  AG      0.     -6. -1000.     -6.    524.48.6  0. 32.
  1
W.PULASKI-SB   DEP  AG      0.     -6.  1000.     -6.    551.48.6  0. 32.
1.0  0.5 1000.  0.Y  5  0 72
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JOB: BAYONNE-PM PK HR 2060BD(file:WPULBD60) RUN: PORT JERSEY BLVD/W.PULASKI LANE
DATE: 08/10/99 TIME: 22:22

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)		(G/MI)		(FT)	(FT)		(VEH)
1. PO JERSEY-EB APP	*	6.0	-1000.0	6.0	0.0	*	1000.	360.	AG	854.	18.4	0.0	32.0		
2. PO JERSEY-EB DEP	*	6.0	0.0	6.0	1000.0	*	1000.	360.	AG	377.	17.4	0.0	32.0		
3. PO JERSEY-WB APP	*	-6.0	0.0	-6.0	1000.0	*	1000.	360.	AG	1353.	17.9	0.0	32.0		
4. PO JERSEY-WB DEP	*	-6.0	0.0	-6.0	-1000.0	*	1000.	180.	AG	1509.	17.4	0.0	32.0		
5. W.PULASKI-NB APP	*	0.0	6.0	1000.0	6.0	*	1000.	90.	AG	137.	36.0	0.0	32.0		
6. W.PULASKI-NB DEP	*	0.0	6.0	-1000.0	6.0	*	1000.	270.	AG	431.	17.4	0.0	32.0		
7. W.PULASKI-SB APP	*	0.0	-6.0	-1000.0	-6.0	*	1000.	270.	AG	524.	48.6	0.0	32.0		
8. W.PULASKI-SB DEP	*	0.0	-6.0	1000.0	-6.0	*	1000.	90.	AG	551.	48.6	0.0	32.0		

JOB: BAYONNE-PM PK HR 2060BD(file:WPULBD60) RUN: PORT JERSEY BLVD/W.PULASKI LANE
DATE: 08/10/99 TIME: 22:22

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH	RED TIME	CLEARANCE LOST TIME	APPROACH VOL	SATURATION FLOW RATE	EM FAC	IDLE TYPE	SIGNAL ARRIVAL RATE
	*	(SEC)	(SEC)	(SEC)	(VPH)	(VPH)	(gm/hr)		

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1-NE CORNER	-37.0	25.0	5.0
2. REC 2-SE CORNER	37.0	25.0	5.0
3. REC 3-NW CORNER	-37.0	-25.0	5.0
4. REC 4-SW CORNER	37.0	-25.0	5.0
5. REC 5-P.JERSEY-N MID	-37.0	750.0	5.0
6. REC 6-P.JERSEY-S MID	37.0	750.0	5.0
7. REC 7-W.PULASK-E MID	750.0	25.0	5.0
8. REC 8-W.PULASK-W MID	750.0	-25.0	5.0

1

JOB: BAYONNE-PM PK HR 2060BD(file:WPULBD60) RUN: PORT JERSEY
BLVD/W.PULASKI LANE

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
0.	1.0	0.8	2.1	1.8	0.5	0.3	0.0	1.0
5.	1.2	0.5	2.3	1.6	0.7	0.2	0.0	1.0
10.	1.3	0.3	2.4	1.3	0.9	0.1	0.0	1.0
15.	1.3	0.1	2.3	1.1	1.1	0.0	0.0	1.0
20.	1.3	0.0	2.3	1.0	1.1	0.0	0.0	1.0
25.	1.2	0.0	2.2	1.0	1.1	0.0	0.0	1.0
30.	1.1	0.0	2.3	1.1	1.1	0.0	0.0	1.1
35.	1.1	0.0	2.3	1.2	1.1	0.0	0.0	1.2
40.	1.0	0.0	2.4	1.3	1.0	0.0	0.0	1.3
45.	1.0	0.0	2.5	1.3	1.0	0.0	0.0	1.3
50.	1.0	0.0	2.4	1.4	1.0	0.0	0.0	1.4
55.	0.9	0.0	2.5	1.5	0.9	0.0	0.0	1.5
60.	0.9	0.0	2.6	1.6	0.9	0.0	0.0	1.5
65.	0.9	0.0	2.8	1.7	0.9	0.0	0.0	1.6
70.	1.0	0.1	2.9	1.8	0.9	0.0	0.0	1.7
75.	1.1	0.2	3.1	2.0	0.9	0.0	0.2	1.8
80.	1.3	0.4	3.1	2.1	0.9	0.0	0.3	1.8
85.	1.8	0.8	3.1	2.0	0.9	0.0	0.4	1.5
90.	2.1	1.2	2.9	1.8	0.9	0.0	0.7	1.2
95.	2.3	1.4	2.3	1.2	0.9	0.0	1.0	0.9
100.	2.5	1.6	1.9	0.8	0.9	0.0	1.2	0.5
105.	2.6	1.6	1.5	0.4	0.9	0.0	1.3	0.3

110. *	2.5	1.5	1.3	0.2	0.9	0.0	1.3	0.2
115. *	2.3	1.4	1.4	0.1	0.9	0.0	1.3	0.1
120. *	2.3	1.3	1.2	0.1	0.9	0.0	1.2	0.1
125. *	2.3	1.2	1.2	0.1	1.0	0.0	1.2	0.1
130. *	2.5	1.1	1.2	0.1	1.1	0.1	1.1	0.1
135. *	2.3	1.1	1.3	0.1	1.1	0.1	1.1	0.1
140. *	2.4	1.0	1.3	0.0	1.1	0.1	1.0	0.0
145. *	2.4	1.0	1.5	0.0	1.2	0.1	1.0	0.0
150. *	2.5	1.0	1.5	0.0	1.2	0.1	1.0	0.0
155. *	2.6	1.0	1.6	0.0	1.3	0.1	1.0	0.0
160. *	2.7	1.0	1.8	0.0	1.4	0.1	1.0	0.0
165. *	2.7	1.1	1.8	0.2	1.5	0.2	0.9	0.0
170. *	2.8	1.3	1.8	0.4	1.6	0.5	0.9	0.0
175. *	2.6	1.7	1.6	0.8	1.6	0.7	0.9	0.0
180. *	2.3	2.1	1.3	1.1	1.3	1.1	0.9	0.0
185. *	1.8	2.5	0.8	1.5	0.9	1.4	0.9	0.0
190. *	1.4	2.6	0.4	1.7	0.5	1.4	0.9	0.0
195. *	1.0	2.6	0.1	1.7	0.2	1.4	0.9	0.0
200. *	1.1	2.4	0.1	1.6	0.1	1.2	1.0	0.0
205. *	1.0	2.4	0.0	1.5	0.1	1.2	1.0	0.0

1

JOB: BAYONNE-PM PK HR 2060BD(file:WPULBD60) RUN: PORT JERSEY
BLVD/W.PULASKI LANE

WIND * CONCENTRATION
ANGLE * (PPM)

(DEGR)*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
210. *	1.1	2.3	0.0	1.4	0.1	1.2	1.0	0.0
215. *	1.1	2.3	0.0	1.4	0.1	1.0	1.1	0.1
220. *	1.1	2.2	0.0	1.2	0.1	1.0	1.2	0.1
225. *	1.1	2.3	0.0	1.3	0.1	1.0	1.3	0.3
230. *	1.2	2.2	0.0	1.2	0.1	0.9	1.3	0.3
235. *	1.3	2.1	0.1	1.2	0.0	0.9	1.4	0.3
240. *	1.4	2.2	0.1	1.2	0.0	0.8	1.5	0.3
245. *	1.5	2.3	0.1	1.3	0.0	0.8	1.6	0.3
250. *	1.6	2.5	0.2	1.2	0.0	0.8	1.7	0.4
255. *	1.7	2.4	0.4	1.4	0.0	0.8	1.8	0.6
260. *	1.7	2.5	0.8	1.8	0.0	0.8	1.8	1.1
265. *	1.6	2.3	1.3	2.3	0.0	0.8	1.7	1.5
270. *	1.3	2.2	1.8	2.8	0.0	0.8	1.5	2.1
275. *	0.9	1.7	2.0	3.0	0.0	0.8	1.0	2.4
280. *	0.5	1.3	2.2	3.2	0.0	0.8	0.6	2.3
285. *	0.2	1.0	2.1	3.1	0.0	0.8	0.3	2.2
290. *	0.2	0.9	1.9	3.0	0.0	0.8	0.2	1.9
295. *	0.0	0.8	1.7	2.7	0.0	0.8	0.1	1.8
300. *	0.0	0.8	1.6	2.6	0.0	0.8	0.1	1.7
305. *	0.0	0.8	1.5	2.6	0.0	0.8	0.1	1.6
310. *	0.0	0.8	1.4	2.4	0.0	0.8	0.1	1.5
315. *	0.0	0.9	1.3	2.3	0.0	0.9	0.1	1.4
320. *	0.0	0.9	1.2	2.4	0.0	0.9	0.1	1.4
325. *	0.0	0.9	1.2	2.2	0.0	0.9	0.0	1.3
330. *	0.0	1.1	1.1	2.0	0.0	0.9	0.0	1.1

335.	*	0.0	1.1	1.1	2.1	0.0	1.0	0.0	1.0
340.	*	0.1	1.2	1.2	2.2	0.0	1.0	0.0	1.0
345.	*	0.1	1.2	1.1	2.2	0.1	0.8	0.0	1.0
350.	*	0.4	1.2	1.5	2.2	0.1	0.7	0.0	1.0
355.	*	0.7	1.1	1.8	2.1	0.3	0.6	0.0	1.0
360.	*	1.0	0.8	2.1	1.8	0.5	0.3	0.0	1.0
------	*	----------							
MAX	*	2.8	2.6	3.1	3.2	1.6	1.4	1.8	2.4
DEGR.	*	170	190	75	280	170	185	255	275

THE HIGHEST CONCENTRATION IS 3.20 PPM AT 280 DEGREES FROM REC4 .
THE 2ND HIGHEST CONCENTRATION IS 3.10 PPM AT 75 DEGREES FROM REC3 .
THE 3RD HIGHEST CONCENTRATION IS 2.80 PPM AT 170 DEGREES FROM REC1 .

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BAYONNE-PM PK HR 2060NB(file:WPULNB60)  60. 321.   0.   0. 8     .3048    1    1
REC 1-NE CORNER            -37.       25.         5.
REC 2-SE CORNER             37.       25.         5.
REC 3-NW CORNER            -37.      -25.         5.
REC 4-SW CORNER             37.      -25.         5.
REC 5-P.JERSEY-N MID       -37.      750.         5.
REC 6-P.JERSEY-S MID        37.      750.         5.
REC 7-W.PULASK-E MID       750.       25.         5.
REC 8-W.PULASK-W MID       750.      -25.         5.
PORT JERSEY BLVD/W.PULASKI LANE           8  1   0
  1
PO JERSEY-EB   APP  AG     6. -1000.      6.      0.    660.19.5  0. 32.
  1
PO JERSEY-EB   DEP  AG     6.      0.     6.   1000.    197.19.5  0. 32.
  1
PO JERSEY-WB   APP  AG    -6.      0.    -6.   1000.    736.19.5  0. 32.
  1
PO JERSEY-WB   DEP  AG    -6.      0.    -6.  -1000.    957.19.5  0. 32.
  1
W.PULASKI-NB   APP  AG     0.      6.  1000.      6.     47.48.6  0. 32.
  1
W.PULASKI-NB   DEP  AG     0.      6. -1000.      6.    364.19.5  0. 32.
  1
W.PULASKI-SB   APP  AG     0.     -6. -1000.     -6.    524.48.6  0. 32.
  1
W.PULASKI-SB   DEP  AG     0.     -6.  1000.     -6.    449.48.6  0. 32.
1.0  0.5 1000.  0.Y  5  0 72
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JOB: BAYONNE-PM PK HR 2060NB(file:WPULNB60) RUN: PORT JERSEY BLVD/W.PULASKI LANE
DATE: 08/10/99 TIME: 22:23

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)		(G/MI)		(FT)	(FT)		(VEH)
1. PO JERSEY-EB APP	*	6.0	-1000.0	6.0	0.0	*	1000.	360.	AG	660.	19.5	0.0	32.0		
2. PO JERSEY-EB DEP	*	6.0	0.0	6.0	1000.0	*	1000.	360.	AG	197.	19.5	0.0	32.0		
3. PO JERSEY-WB APP	*	-6.0	0.0	-6.0	1000.0	*	1000.	360.	AG	736.	19.5	0.0	32.0		
4. PO JERSEY-WB DEP	*	-6.0	0.0	-6.0	-1000.0	*	1000.	180.	AG	957.	19.5	0.0	32.0		
5. W.PULASKI-NB APP	*	0.0	6.0	1000.0	6.0	*	1000.	90.	AG	47.	48.6	0.0	32.0		
6. W.PULASKI-NB DEP	*	0.0	6.0	-1000.0	6.0	*	1000.	270.	AG	364.	19.5	0.0	32.0		
7. W.PULASKI-SB APP	*	0.0	-6.0	-1000.0	-6.0	*	1000.	270.	AG	524.	48.6	0.0	32.0		
8. W.PULASKI-SB DEP	*	0.0	-6.0	1000.0	-6.0	*	1000.	90.	AG	449.	48.6	0.0	32.0		

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH	RED TIME	CLEARANCE LOST TIME	APPROACH VOL	SATURATION FLOW RATE	EM FAC	IDLE TYPE	SIGNAL RATE	ARRIVAL
	*	(SEC)	(SEC)	(SEC)	(VPH)	(VPH)	(gm/hr)			

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. REC 1-NE CORNER	-37.0	25.0	5.0
2. REC 2-SE CORNER	37.0	25.0	5.0
3. REC 3-NW CORNER	-37.0	-25.0	5.0
4. REC 4-SW CORNER	37.0	-25.0	5.0
5. REC 5-P.JERSEY-N MID	-37.0	750.0	5.0
6. REC 6-P.JERSEY-S MID	37.0	750.0	5.0
7. REC 7-W.PULASK-E MID	750.0	25.0	5.0
8. REC 8-W.PULASK-W MID	750.0	-25.0	5.0

JOB: BAYONNE-PM PK HR 2060NB(file:WPULNB60)
BLVD/W.PULASKI LANE

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
0.	0.6	0.5	1.7	1.4	0.3	0.2	0.0	0.9
5.	0.7	0.3	1.8	1.2	0.5	0.1	0.0	0.9
10.	0.8	0.1	1.9	0.9	0.6	0.0	0.0	0.8
15.	0.8	0.0	1.8	0.8	0.6	0.0	0.0	0.8
20.	0.7	0.0	1.7	0.8	0.7	0.0	0.0	0.8
25.	0.7	0.0	1.7	0.8	0.7	0.0	0.0	0.8
30.	0.7	0.0	1.8	0.9	0.6	0.0	0.0	0.9
35.	0.6	0.0	1.9	0.9	0.6	0.0	0.0	0.9
40.	0.6	0.0	1.8	1.0	0.6	0.0	0.0	1.0
45.	0.6	0.0	1.9	1.0	0.6	0.0	0.0	1.0
50.	0.5	0.0	1.9	1.1	0.5	0.0	0.0	1.1
55.	0.5	0.0	1.9	1.1	0.5	0.0	0.0	1.1
60.	0.5	0.0	2.2	1.2	0.5	0.0	0.0	1.2
65.	0.5	0.0	2.2	1.3	0.5	0.0	0.0	1.3
70.	0.5	0.0	2.4	1.4	0.5	0.0	0.0	1.4
75.	0.6	0.1	2.5	1.6	0.5	0.0	0.1	1.4
80.	0.9	0.4	2.5	1.7	0.5	0.0	0.1	1.4
85.	1.2	0.6	2.5	1.6	0.5	0.0	0.3	1.2
90.	1.4	0.8	2.2	1.4	0.5	0.0	0.5	0.9
95.	1.6	1.1	1.9	1.0	0.5	0.0	0.7	0.6
100.	1.7	1.2	1.4	0.6	0.5	0.0	0.8	0.4
105.	1.9	1.2	1.2	0.3	0.5	0.0	0.9	0.2

110. *	2.0	1.1	1.0	0.2	0.5	0.0	1.0	0.1
115. *	1.8	1.0	0.9	0.1	0.5	0.0	1.0	0.1
120. *	1.8	0.9	0.9	0.1	0.5	0.0	0.9	0.1
125. *	1.8	0.9	0.9	0.0	0.6	0.0	0.9	0.0
130. *	1.7	0.9	0.9	0.0	0.6	0.1	0.9	0.0
135. *	2.1	0.8	0.9	0.0	0.7	0.1	0.8	0.0
140. *	2.0	0.8	1.0	0.0	0.7	0.1	0.8	0.0
145. *	2.0	0.8	1.1	0.0	0.7	0.1	0.8	0.0
150. *	2.1	0.7	1.1	0.0	0.8	0.1	0.7	0.0
155. *	2.1	0.7	1.2	0.0	0.8	0.1	0.7	0.0
160. *	2.2	0.7	1.3	0.0	0.8	0.1	0.7	0.0
165. *	2.3	0.9	1.4	0.2	0.9	0.1	0.7	0.0
170. *	2.3	1.0	1.4	0.3	1.0	0.3	0.7	0.0
175. *	2.1	1.3	1.2	0.6	1.0	0.6	0.7	0.0
180. *	1.9	1.6	0.9	0.9	0.9	0.7	0.7	0.0
185. *	1.5	1.9	0.6	1.1	0.7	0.9	0.7	0.0
190. *	1.2	2.0	0.3	1.3	0.4	1.0	0.7	0.0
195. *	1.0	2.0	0.1	1.3	0.2	0.8	0.7	0.0
200. *	0.9	1.9	0.0	1.3	0.1	0.8	0.7	0.0
205. *	0.9	1.8	0.0	1.1	0.1	0.8	0.7	0.0

1

WIND * CONCENTRATION ANGLE * (PPM) (DEGR)*	REC1	REC2	REC3	REC4	REC5	REC6	REC7	REC8
210. *	1.1	1.8	0.0	1.1	0.1	0.6	0.7	0.0
215. *	1.1	1.6	0.0	1.0	0.1	0.6	0.8	0.0
220. *	1.1	1.6	0.0	0.9	0.1	0.6	0.9	0.1
225. *	1.1	1.7	0.0	0.9	0.1	0.6	1.0	0.2
230. *	1.2	1.7	0.0	0.9	0.1	0.6	1.1	0.2
235. *	1.2	1.8	0.1	0.9	0.0	0.6	1.1	0.2
240. *	1.4	1.8	0.1	0.9	0.0	0.5	1.1	0.3
245. *	1.5	1.9	0.1	1.0	0.0	0.4	1.2	0.3
250. *	1.5	2.1	0.2	1.1	0.0	0.4	1.3	0.4
255. *	1.7	2.1	0.4	1.2	0.0	0.4	1.4	0.5
260. *	1.7	1.9	0.8	1.6	0.0	0.4	1.4	0.8
265. *	1.6	1.9	1.3	2.1	0.0	0.4	1.3	1.1
270. *	1.3	1.6	1.7	2.5	0.0	0.4	1.1	1.6
275. *	0.9	1.3	2.0	2.8	0.0	0.4	0.7	1.7
280. *	0.5	0.9	2.1	2.7	0.0	0.4	0.5	1.7
285. *	0.2	0.6	2.0	2.8	0.0	0.4	0.2	1.8
290. *	0.2	0.5	1.9	2.5	0.0	0.4	0.1	1.5
295. *	0.0	0.5	1.7	2.2	0.0	0.4	0.1	1.4
300. *	0.0	0.5	1.6	2.1	0.0	0.5	0.1	1.3
305. *	0.0	0.5	1.5	1.8	0.0	0.5	0.1	1.2
310. *	0.0	0.5	1.3	1.8	0.0	0.5	0.1	1.2
315. *	0.0	0.5	1.3	1.9	0.0	0.5	0.1	1.1
320. *	0.0	0.5	1.2	1.7	0.0	0.5	0.0	1.0
325. *	0.0	0.5	1.2	1.6	0.0	0.5	0.0	0.9
330. *	0.0	0.5	1.1	1.4	0.0	0.5	0.0	0.9

335.	*	0.0	0.7	1.1	1.5	0.0	0.5	0.0	0.8
340.	*	0.0	0.7	1.1	1.5	0.0	0.5	0.0	0.8
345.	*	0.1	0.7	1.1	1.5	0.0	0.5	0.0	0.8
350.	*	0.2	0.7	1.3	1.5	0.1	0.4	0.0	0.8
355.	*	0.4	0.7	1.5	1.6	0.2	0.3	0.0	0.9
360.	*	0.6	0.5	1.7	1.4	0.3	0.2	0.0	0.9
------	*	----------							
MAX	*	2.3	2.1	2.5	2.8	1.0	1.0	1.4	1.8
DEGR.	*	165	250	75	275	170	190	255	285

THE HIGHEST CONCENTRATION IS 2.80 PPM AT 275 DEGREES FROM REC4 .
THE 2ND HIGHEST CONCENTRATION IS 2.50 PPM AT 75 DEGREES FROM REC3 .
THE 3RD HIGHEST CONCENTRATION IS 2.30 PPM AT 165 DEGREES FROM REC1 .

```
NWK/ELIZ PM PKHR 2030NB (file:NOAVNB30) 60. 321.   0.   0. 4      .3048    1    1
REC 1-EAST COMM-MIDB          0.       50.         5.
REC 2-WEST COMM-MIDB          0.      -50.         5.
REC 3-EAST COMM-END         750.       50.         5.
REC 4-WEST COMM-END         750.      -50.         5.
NORTH AVE/NEAR I-95 & CENTER ST.            2  1   0
  1
NORTH AVE.-EB  APP  AG -1000.   -12.  1000.   -12.   1944.19.5  0. 44.
  1
NORTH AVE.-WB  DEP  AG  1000.    12. -1000.    12.   3248.19.5  0. 44.
1.0  0.5 1000.  0.Y  5  0 72
```

JOB: NWK/ELIZ PM PKHR 2030NB (file:NOAVNB30) RUN: NORTH AVE/NEAR I-95 & CENTER ST.
DATE: 08/19/99 TIME: 00:50

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)		(G/MI)	(FT)	(FT)			(VEH)
1. NORTH AVE.-EB APP	*	-1000.0	-12.0	1000.0	-12.0	*	2000.	90.	AG	1944.	19.5	0.0	44.0		
2. NORTH AVE.-WB DEP	*	1000.0	12.0	-1000.0	12.0	*	2000.	270.	AG	3248.	19.5	0.0	44.0		

1

JOB: NWK/ELIZ PM PKHR 2030NB (file:NOAVNB30) RUN: NORTH AVE/NEAR I-95 & CENTER ST.
DATE: 08/19/99 TIME: 00:50

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH	RED TIME	CLEARANCE LOST TIME	APPROACH VOL	SATURATION FLOW RATE	IDLE EM FAC	SIGNAL TYPE	ARRIVAL RATE
	*	(SEC)	(SEC)	(SEC)	(VPH)	(VPH)	(gm/hr)		

RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (FT) X	Y	Z	*
1. REC 1-EAST COMM-MIDB	*	0.0	50.0	5.0	*
2. REC 2-WEST COMM-MIDB	*	0.0	-50.0	5.0	*
3. REC 3-EAST COMM-END	*	750.0	50.0	5.0	*
4. REC 4-WEST COMM-END	*	750.0	-50.0	5.0	*

1

JOB: NWK/ELIZ PM PKHR 2030NB (file:NOAVNB30) RUN: NORTH AVE/NEAR I-95 & CENTER ST.

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	0.0	2.3	0.0	2.3
5.	0.0	2.3	0.0	2.3
10.	0.0	2.3	0.0	2.3
15.	0.0	2.3	0.0	2.3
20.	0.0	2.4	0.0	2.4
25.	0.0	2.5	0.0	2.5
30.	0.0	2.5	0.0	2.5
35.	0.0	2.5	0.0	2.5
40.	0.0	2.6	0.0	2.6
45.	0.0	2.7	0.0	2.7
50.	0.0	2.9	0.0	2.8
55.	0.0	2.9	0.0	2.9
60.	0.0	3.1	0.0	3.0
65.	0.0	3.3	0.0	2.9
70.	0.1	3.5	0.1	2.8
75.	0.4	3.7	0.1	2.4
80.	0.9	3.6	0.3	1.9
85.	1.7	3.1	0.7	1.3
90.	2.7	2.3	1.2	0.9
95.	3.5	1.5	1.7	0.4
100.	4.0	0.7	2.4	0.2
105.	4.1	0.3	2.9	0.1
110.	3.9	0.1	3.2	0.0
115.	3.7	0.0	3.3	0.0
120.	3.4	0.0	3.2	0.0
125.	3.2	0.0	3.1	0.0
130.	3.0	0.0	3.0	0.0
135.	2.9	0.0	2.9	0.0
140.	2.7	0.0	2.7	0.0
145.	2.7	0.0	2.7	0.0
150.	2.6	0.0	2.6	0.0
155.	2.6	0.0	2.6	0.0
160.	2.5	0.0	2.5	0.0
165.	2.5	0.0	2.5	0.0
170.	2.5	0.0	2.5	0.0
175.	2.5	0.0	2.5	0.0
180.	2.5	0.0	2.5	0.0
185.	2.5	0.0	2.5	0.0
190.	2.5	0.0	2.5	0.0
195.	2.5	0.0	2.5	0.0

200. * 2.5 0.0 2.5 0.0
205. * 2.6 0.0 2.6 0.0
1

JOB: NWK/ELIZ PM PKHR 2030NB (file:NOAVNB30) RUN: NORTH AVE/NEAR I-95 & CENTER ST.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) * REC1	REC2	REC3	REC4
210. *	2.6	0.0	2.6	0.0
215. *	2.7	0.0	2.7	0.0
220. *	2.7	0.0	2.7	0.0
225. *	2.9	0.0	2.9	0.0
230. *	3.0	0.0	3.0	0.0
235. *	3.2	0.0	3.2	0.0
240. *	3.4	0.0	3.4	0.0
245. *	3.7	0.0	3.7	0.0
250. *	3.9	0.1	4.0	0.1
255. *	4.1	0.3	4.3	0.3
260. *	4.0	0.7	4.3	0.9
265. *	3.5	1.5	3.9	1.8
270. *	2.7	2.3	3.2	2.8
275. *	1.7	3.1	2.0	3.6
280. *	0.9	3.6	1.0	3.9
285. *	0.4	3.7	0.4	3.9
290. *	0.1	3.5	0.1	3.7
295. *	0.0	3.3	0.0	3.3
300. *	0.0	3.1	0.0	3.1
305. *	0.0	2.9	0.0	2.9
310. *	0.0	2.9	0.0	2.9
315. *	0.0	2.7	0.0	2.7
320. *	0.0	2.6	0.0	2.6
325. *	0.0	2.5	0.0	2.5
330. *	0.0	2.5	0.0	2.5
335. *	0.0	2.5	0.0	2.5
340. *	0.0	2.4	0.0	2.4
345. *	0.0	2.3	0.0	2.3
350. *	0.0	2.3	0.0	2.3
355. *	0.0	2.3	0.0	2.3
360. *	0.0	2.3	0.0	2.3
MAX *	4.1	3.7	4.3	3.9
DEGR. *	105	75	255	280

THE HIGHEST CONCENTRATION IS 4.30 PPM AT 255 DEGREES FROM REC3 .
THE 2ND HIGHEST CONCENTRATION IS 4.10 PPM AT 105 DEGREES FROM REC1 .
THE 3RD HIGHEST CONCENTRATION IS 3.90 PPM AT 280 DEGREES FROM REC4 .

```
NWK/ELIZ PM PKHR 2030BLD(file:NOAVBD30) 60. 321.   0.   0. 4      .3048    1    1
REC 1-EAST COMM-MIDB          0.       50.         5.
REC 2-WEST COMM-MIDB          0.      -50.         5.
REC 3-EAST COMM-END         750.       50.         5.
REC 4-WEST COMM-END         750.      -50.         5.
NORTH AVE/NEAR I-95 & CENTER ST.           2  1   0
  1
NORTH AVE.-EB  APP  AG -1000.    -12.  1000.    -12.   2300.19.0  0. 44.
  1
NORTH AVE.-WB  DEP  AG  1000.     12. -1000.     12.   3780.19.0  0. 44.
1.0  0.5 1000.  0.Y  5  0 72
```

JOB: NWK/ELIZ PM PKHR 2030BLD(file:NOAVBD30) RUN: NORTH AVE/NEAR I-95 & CENTER ST.
DATE: 08/19/99 TIME: 00:51

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)		(G/MI)		(FT)	(FT)		(VEH)
1. NORTH AVE.-EB APP	*	-1000.0	-12.0	1000.0	-12.0	*	2000.	90.	AG	2300.	19.0	0.0	44.0		
2. NORTH AVE.-WB DEP	*	1000.0	12.0	-1000.0	12.0	*	2000.	270.	AG	3780.	19.0	0.0	44.0		

JOB: NWK/ELIZ PM PKHR 2030BLD(file:NOAVBD30) RUN: NORTH AVE/NEAR I-95 & CENTER ST.
DATE: 08/19/99 TIME: 00:51

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH	RED TIME	CLEARANCE LOST TIME	APPROACH VOL	SATURATION FLOW RATE	EM FAC	IDLE TYPE	SIGNAL RATE	ARRIVAL
	*	(SEC)	(SEC)	(SEC)	(VPH)	(VPH)	(gm/hr)			

RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (FT) X	Y	Z
1. REC 1-EAST COMM-MIDB	*	0.0	50.0	5.0
2. REC 2-WEST COMM-MIDB	*	0.0	-50.0	5.0
3. REC 3-EAST COMM-END	*	750.0	50.0	5.0
4. REC 4-WEST COMM-END	*	750.0	-50.0	5.0

JOB: NWK/ELIZ PM PKHR 2030BLD(file:NOAVBD30) RUN: NORTH AVE/NEAR I-95 & CENTER ST.

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	0.0	2.7	0.0	2.7
5.	0.0	2.7	0.0	2.7
10.	0.0	2.7	0.0	2.7
15.	0.0	2.7	0.0	2.7
20.	0.0	2.7	0.0	2.7
25.	0.0	2.8	0.0	2.8
30.	0.0	2.9	0.0	2.9
35.	0.0	2.9	0.0	2.9
40.	0.0	2.9	0.0	2.9
45.	0.0	3.1	0.0	3.1
50.	0.0	3.3	0.0	3.2
55.	0.0	3.4	0.0	3.3
60.	0.0	3.7	0.0	3.4
65.	0.0	3.9	0.0	3.3
70.	0.1	4.1	0.1	3.2
75.	0.4	4.3	0.1	2.8
80.	1.0	4.2	0.3	2.3
85.	2.0	3.6	0.7	1.6
90.	3.0	2.7	1.3	1.0
95.	4.0	1.7	2.0	0.6
100.	4.5	0.8	2.7	0.3
105.	4.7	0.3	3.3	0.1
110.	4.4	0.1	3.7	0.0
115.	4.2	0.0	3.8	0.0
120.	3.9	0.0	3.7	0.0
125.	3.7	0.0	3.6	0.0
130.	3.5	0.0	3.5	0.0
135.	3.3	0.0	3.3	0.0
140.	3.2	0.0	3.2	0.0
145.	3.2	0.0	3.2	0.0
150.	3.1	0.0	3.1	0.0
155.	2.9	0.0	2.9	0.0
160.	2.9	0.0	2.9	0.0
165.	2.8	0.0	2.8	0.0
170.	2.8	0.0	2.8	0.0
175.	2.8	0.0	2.8	0.0
180.	2.9	0.0	2.9	0.0
185.	2.8	0.0	2.8	0.0
190.	2.8	0.0	2.8	0.0
195.	2.8	0.0	2.8	0.0

200. * 2.9 0.0 2.9 0.0
205. * 2.9 0.0 2.9 0.0
1

JOB: NWK/ELIZ PM PKHR 2030BLD(file:NOAVBD30) RUN: NORTH AVE/NEAR I-95 & CENTER ST.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *			
	* REC1	REC2	REC3	REC4
210. *	3.1	0.0	3.1	0.0
215. *	3.2	0.0	3.2	0.0
220. *	3.2	0.0	3.2	0.0
225. *	3.3	0.0	3.3	0.0
230. *	3.5	0.0	3.5	0.0
235. *	3.7	0.0	3.7	0.0
240. *	3.9	0.0	3.9	0.0
245. *	4.2	0.0	4.2	0.0
250. *	4.4	0.1	4.5	0.1
255. *	4.7	0.3	4.9	0.4
260. *	4.5	0.8	5.0	1.1
265. *	4.0	1.7	4.5	2.1
270. *	3.0	2.7	3.6	3.2
275. *	2.0	3.6	2.3	4.0
280. *	1.0	4.2	1.2	4.5
285. *	0.4	4.3	0.5	4.5
290. *	0.1	4.1	0.1	4.1
295. *	0.0	3.9	0.0	3.9
300. *	0.0	3.7	0.0	3.7
305. *	0.0	3.4	0.0	3.4
310. *	0.0	3.3	0.0	3.3
315. *	0.0	3.1	0.0	3.1
320. *	0.0	2.9	0.0	2.9
325. *	0.0	2.9	0.0	2.9
330. *	0.0	2.9	0.0	2.9
335. *	0.0	2.8	0.0	2.8
340. *	0.0	2.7	0.0	2.7
345. *	0.0	2.7	0.0	2.7
350. *	0.0	2.7	0.0	2.7
355. *	0.0	2.7	0.0	2.7
360. *	0.0	2.7	0.0	2.7
MAX *	4.7	4.3	5.0	4.5
DEGR. *	105	75	260	280

THE HIGHEST CONCENTRATION IS 5.00 PPM AT 260 DEGREES FROM REC3 .
THE 2ND HIGHEST CONCENTRATION IS 4.70 PPM AT 105 DEGREES FROM REC1 .
THE 3RD HIGHEST CONCENTRATION IS 4.50 PPM AT 280 DEGREES FROM REC4 .

```
NWK/ELIZ PM PKHR 2060NB (file:NORTHANB) 60. 321.   0.   0. 4      .3048    1    1
REC 1-EAST COMM-MIDB          0.       50.        5.
REC 2-WEST COMM-MIDB          0.      -50.        5.
REC 3-EAST COMM-END         750.       50.        5.
REC 4-WEST COMM-END         750.      -50.        5.
NORTH AVE/NEAR I-95 & CENTER ST.           2  1   0
  1
NORTH AVE.-EB  APP  AG -1000.   -12.  1000.   -12.   2006.19.5  0. 44.
  1
NORTH AVE.-WB  DEP  AG  1000.    12. -1000.    12.   3371.19.5  0. 44.
1.0  0.5 1000.  0.Y  5  0 72
```

JOB: NWK/ELIZ PM PKHR 2060NB (file:NORTHANB) RUN: NORTH AVE/NEAR I-95 & CENTER ST.
DATE: 08/19/99 TIME: 00:48

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)		(G/MI)	(FT)	(FT)			(VEH)
1. NORTH AVE.-EB APP	*	-1000.0	-12.0	1000.0	-12.0	*	2000.	90.	AG	2006.	19.5	0.0	44.0		
2. NORTH AVE.-WB DEP	*	1000.0	12.0	-1000.0	12.0	*	2000.	270.	AG	3371.	19.5	0.0	44.0		

1

JOB: NWK/ELIZ PM PKHR 2060NB (file:NORTHANB) RUN: NORTH AVE/NEAR I-95 & CENTER ST.
DATE: 08/19/99 TIME: 00:48

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	APPROACH ARRIVAL RATE

RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (FT) X	Y	Z	*
1. REC 1-EAST COMM-MIDB	*	0.0	50.0	5.0	*
2. REC 2-WEST COMM-MIDB	*	0.0	-50.0	5.0	*
3. REC 3-EAST COMM-END	*	750.0	50.0	5.0	*
4. REC 4-WEST COMM-END	*	750.0	-50.0	5.0	*

1

JOB: NWK/ELIZ PM PKHR 2060NB (file:NORTHANB) RUN: NORTH AVE/NEAR I-95 & CENTER ST.

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	0.0	2.5	0.0	2.5
5.	0.0	2.5	0.0	2.5
10.	0.0	2.4	0.0	2.4
15.	0.0	2.4	0.0	2.4
20.	0.0	2.5	0.0	2.5
25.	0.0	2.5	0.0	2.5
30.	0.0	2.5	0.0	2.5
35.	0.0	2.6	0.0	2.6
40.	0.0	2.7	0.0	2.7
45.	0.0	2.9	0.0	2.9
50.	0.0	2.9	0.0	2.9
55.	0.0	3.1	0.0	3.0
60.	0.0	3.3	0.0	3.0
65.	0.0	3.5	0.0	3.1
70.	0.1	3.7	0.1	2.9
75.	0.4	3.9	0.1	2.6
80.	0.9	3.8	0.3	2.0
85.	1.8	3.3	0.7	1.5
90.	2.8	2.4	1.2	0.9
95.	3.6	1.5	1.8	0.5
100.	4.2	0.7	2.4	0.3
105.	4.2	0.3	3.0	0.1
110.	4.0	0.1	3.3	0.0
115.	3.8	0.0	3.4	0.0
120.	3.6	0.0	3.4	0.0
125.	3.3	0.0	3.3	0.0
130.	3.2	0.0	3.1	0.0
135.	3.0	0.0	3.0	0.0
140.	2.9	0.0	2.9	0.0
145.	2.9	0.0	2.9	0.0
150.	2.8	0.0	2.8	0.0
155.	2.6	0.0	2.6	0.0
160.	2.6	0.0	2.6	0.0
165.	2.5	0.0	2.5	0.0
170.	2.6	0.0	2.6	0.0
175.	2.6	0.0	2.6	0.0
180.	2.6	0.0	2.6	0.0
185.	2.6	0.0	2.6	0.0
190.	2.6	0.0	2.6	0.0
195.	2.5	0.0	2.5	0.0

200. * 2.6 0.0 2.6 0.0
205. * 2.6 0.0 2.6 0.0
1

JOB: NWK/ELIZ PM PKHR 2060NB (file:NORTHANB) RUN: NORTH AVE/NEAR I-95 & CENTER ST.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) *	REC1	REC2	REC3	REC4
210.	*	2.8	0.0	2.8	0.0
215.	*	2.9	0.0	2.9	0.0
220.	*	2.9	0.0	2.9	0.0
225.	*	3.0	0.0	3.0	0.0
230.	*	3.2	0.0	3.2	0.0
235.	*	3.3	0.0	3.3	0.0
240.	*	3.6	0.0	3.6	0.0
245.	*	3.8	0.0	3.8	0.0
250.	*	4.0	0.1	4.1	0.1
255.	*	4.2	0.3	4.4	0.3
260.	*	4.2	0.7	4.5	0.9
265.	*	3.6	1.5	4.1	1.8
270.	*	2.8	2.4	3.3	2.9
275.	*	1.8	3.3	2.1	3.7
280.	*	0.9	3.8	1.0	4.1
285.	*	0.4	3.9	0.4	4.1
290.	*	0.1	3.7	0.1	3.7
295.	*	0.0	3.5	0.0	3.5
300.	*	0.0	3.3	0.0	3.3
305.	*	0.0	3.1	0.0	3.1
310.	*	0.0	2.9	0.0	2.9
315.	*	0.0	2.9	0.0	2.9
320.	*	0.0	2.7	0.0	2.7
325.	*	0.0	2.6	0.0	2.6
330.	*	0.0	2.5	0.0	2.5
335.	*	0.0	2.5	0.0	2.5
340.	*	0.0	2.5	0.0	2.5
345.	*	0.0	2.4	0.0	2.4
350.	*	0.0	2.4	0.0	2.4
355.	*	0.0	2.5	0.0	2.5
360.	*	0.0	2.5	0.0	2.5
MAX	*	4.2	3.9	4.5	4.1
DEGR.	*	100	75	260	280

THE HIGHEST CONCENTRATION IS 4.50 PPM AT 260 DEGREES FROM REC3 .
THE 2ND HIGHEST CONCENTRATION IS 4.20 PPM AT 100 DEGREES FROM REC1 .
THE 3RD HIGHEST CONCENTRATION IS 4.10 PPM AT 280 DEGREES FROM REC4 .

```
NWK/ELIZ PM PKHR 2060BLD(file:NORTHBLD) 60. 321.   0.   0. 4     .3048    1    1
REC 1-EAST COMM-MIDB          0.       50.         5.
REC 2-WEST COMM-MIDB          0.      -50.         5.
REC 3-EAST COMM-END         750.       50.         5.
REC 4-WEST COMM-END         750.      -50.         5.
NORTH AVE/NEAR I-95 & CENTER ST.            2  1   0
  1
NORTH AVE.-EB  APP  AG -1000.    -12.  1000.    -12.   2382.18.9  0. 44.
  1
NORTH AVE.-WB  DEP  AG  1000.     12. -1000.     12.   3950.19.0  0. 44.
1.0  0.5 1000.  0.Y  5  0 72
```

JOB: NWK/ELIZ PM PKHR 2060BLD(file:NORTHBLD) RUN: NORTH AVE/NEAR I-95 & CENTER ST.
DATE: 08/19/99 TIME: 00:50

SITE & METEOROLOGICAL VARIABLES

VS = 0.0 CM/S VD = 0.0 CM/S Z0 = 321. CM
U = 1.0 M/S CLAS = 5 (E) ATIM = 60. MINUTES MIXH = 1000. M AMB = 0.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT)				*	LENGTH	BRG	TYPE	VPH	EF	H	W	V/C	QUEUE
	*	X1	Y1	X2	Y2	*	(FT)	(DEG)		(G/MI)	(FT)	(FT)			(VEH)
1. NORTH AVE.-EB APP	*	-1000.0	-12.0	1000.0	-12.0	*	2000.	90.	AG	2382.	18.9	0.0	44.0		
2. NORTH AVE.-WB DEP	*	1000.0	12.0	-1000.0	12.0	*	2000.	270.	AG	3950.	19.0	0.0	44.0		

1

JOB: NWK/ELIZ PM PKHR 2060BLD(file:NORTHBLD) RUN: NORTH AVE/NEAR I-95 & CENTER ST.
DATE: 08/19/99 TIME: 00:50

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH	RED TIME	CLEARANCE LOST TIME	APPROACH VOL	SATURATION FLOW RATE	EM FAC	IDLE TYPE	SIGNAL RATE	ARRIVAL
	*	(SEC)	(SEC)	(SEC)	(VPH)	(VPH)	(gm/hr)			

RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (FT) X	Y	Z	*
1. REC 1-EAST COMM-MIDB	*	0.0	50.0	5.0	*
2. REC 2-WEST COMM-MIDB	*	0.0	-50.0	5.0	*
3. REC 3-EAST COMM-END	*	750.0	50.0	5.0	*
4. REC 4-WEST COMM-END	*	750.0	-50.0	5.0	*

1

JOB: NWK/ELIZ PM PKHR 2060BLD(file:NORTHBLD) RUN: NORTH AVE/NEAR I-95 & CENTER ST.

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	0.0	2.8	0.0	2.8
5.	0.0	2.8	0.0	2.8
10.	0.0	2.8	0.0	2.8
15.	0.0	2.8	0.0	2.8
20.	0.0	2.8	0.0	2.8
25.	0.0	2.9	0.0	2.9
30.	0.0	2.9	0.0	2.9
35.	0.0	2.9	0.0	2.9
40.	0.0	3.1	0.0	3.1
45.	0.0	3.2	0.0	3.2
50.	0.0	3.4	0.0	3.3
55.	0.0	3.5	0.0	3.5
60.	0.0	3.7	0.0	3.5
65.	0.0	4.0	0.0	3.5
70.	0.1	4.2	0.1	3.4
75.	0.4	4.5	0.1	3.0
80.	1.0	4.3	0.3	2.3
85.	2.0	3.7	0.8	1.6
90.	3.1	2.8	1.3	1.1
95.	4.1	1.7	2.1	0.6
100.	4.8	0.9	2.8	0.3
105.	4.9	0.3	3.4	0.1
110.	4.6	0.1	3.8	0.0
115.	4.3	0.0	3.9	0.0
120.	4.0	0.0	3.8	0.0
125.	3.9	0.0	3.7	0.0
130.	3.6	0.0	3.6	0.0
135.	3.5	0.0	3.5	0.0
140.	3.3	0.0	3.3	0.0
145.	3.2	0.0	3.2	0.0
150.	3.2	0.0	3.2	0.0
155.	3.1	0.0	3.1	0.0
160.	3.0	0.0	3.0	0.0
165.	3.0	0.0	3.0	0.0
170.	2.9	0.0	2.9	0.0
175.	2.9	0.0	2.9	0.0
180.	3.0	0.0	3.0	0.0
185.	2.9	0.0	2.9	0.0
190.	2.9	0.0	2.9	0.0
195.	3.0	0.0	3.0	0.0

200. * 3.0 0.0 3.0 0.0
205. * 3.1 0.0 3.1 0.0
1

JOB: NWK/ELIZ PM PKHR 2060BLD(file:NORTHBLD) RUN: NORTH AVE/NEAR I-95 & CENTER ST.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) * REC1	REC2	REC3	REC4
210. *	3.2	0.0	3.2	0.0
215. *	3.2	0.0	3.2	0.0
220. *	3.3	0.0	3.3	0.0
225. *	3.5	0.0	3.5	0.0
230. *	3.6	0.0	3.6	0.0
235. *	3.9	0.0	3.9	0.0
240. *	4.0	0.0	4.0	0.0
245. *	4.3	0.0	4.4	0.0
250. *	4.6	0.1	4.7	0.2
255. *	4.9	0.3	5.1	0.4
260. *	4.8	0.9	5.1	1.1
265. *	4.1	1.7	4.6	2.1
270. *	3.1	2.8	3.7	3.3
275. *	2.0	3.7	2.4	4.2
280. *	1.0	4.3	1.3	4.7
285. *	0.4	4.5	0.5	4.6
290. *	0.1	4.2	0.2	4.3
295. *	0.0	4.0	0.0	4.0
300. *	0.0	3.7	0.0	3.7
305. *	0.0	3.5	0.0	3.5
310. *	0.0	3.4	0.0	3.4
315. *	0.0	3.2	0.0	3.2
320. *	0.0	3.1	0.0	3.1
325. *	0.0	2.9	0.0	2.9
330. *	0.0	2.9	0.0	2.9
335. *	0.0	2.9	0.0	2.9
340. *	0.0	2.8	0.0	2.8
345. *	0.0	2.8	0.0	2.8
350. *	0.0	2.8	0.0	2.8
355. *	0.0	2.8	0.0	2.8
360. *	0.0	2.8	0.0	2.8
MAX *	4.9	4.5	5.1	4.7
DEGR. *	105	75	255	280

THE HIGHEST CONCENTRATION IS 5.10 PPM AT 255 DEGREES FROM REC3 .
THE 2ND HIGHEST CONCENTRATION IS 4.90 PPM AT 105 DEGREES FROM REC1 .
THE 3RD HIGHEST CONCENTRATION IS 4.70 PPM AT 280 DEGREES FROM REC4 .

Regional Analysis Pollutant Loading Spreadsheets

2030 No Build Scenario A

Destination	Speed	VOC	NOx	PM_{10}	VMT	VOC SUM	ADJ VOC SUM (g/day)	VOC (ton/day)	NOx SUM	ADJ NOx SUM (g/day)	NOx (ton/day)	PM10 SUM	ADJ PM10 SUM (g/day)	PM_{10} (ton/day)
Bergen, NJ	40	1.17	6.72	45.36	6.25E+07	73109263.5	200299.3521	0.221	419909616	1150437.304	1.268	2.83E+09	7765451.803	8.560
Essex, NJ	40	1.17	6.72	45.36	3.84E+07	44917259.4	123060.9847	0.136	257986310.4	706811.8093	0.779	1.74E+09	4770979.713	5.259
Hudson, NJ	40	1.17	6.72	45.36	1.39E+08	162421178.4	444989.5299	0.491	932880614.4	2555837.3	2.817	6.30E+09	17251901.77	19.017
Middlesex, NJ	40	1.17	6.72	45.36	1.13E+08	131944269.6	361491.1496	0.398	757833753.6	2076256.859	2.289	5.12E+09	14014733.8	15.448
Morris, NJ	40	1.17	6.72	45.36	1.67E+07	19580324.4	53644.72438	0.059	112461350.4	308113.2888	0.340	7.59E+08	2079764.699	2.293
Passaic, NJ	40	1.17	6.72	45.36	3.77E+07	44078580	120763.2329	0.133	253169280	693614.4658	0.765	1.71E+09	4681897.644	5.161
Somerset, NJ	40	1.17	6.72	45.36	1.54E+07	17967339	49225.5863	0.054	103197024	282731.5726	0.312	6.97E+08	1908438.115	2.104
Union, NJ	40	1.17	6.72	45.36	3.41E+07	39926987.1	109389.0058	0.121	229324233.6	628285.5715	0.693	1.55E+09	4240927.608	4.675
Rockland, NY	40	1.17	6.72	45.36	5.29E+06	6186164.4	16948.39562	0.019	35530790.4	97344.63123	0.107	2.40E+08	657076.2608	0.724
Richmond, NY	40	1.17	6.72	45.36	2.96E+06	3462264	9485.654795	0.010	19885824	54481.70959	0.060	1.34E+08	367751.5397	0.405
Bronx, NY	40	1.17	6.72	45.36	1.99E+07	23300362.8	63836.61041	0.070	133827724.8	366651.3008	0.404	9.03E+08	2474896.281	2.728
Kings, NY	40	1.17	6.72	45.36	5.68E+07	66505584.6	182207.0811	0.201	381980793.6	1046522.722	1.154	2.58E+09	7064028.375	7.787
New York, NY	40	1.17	6.72	45.36	8.56E+07	100163466	274420.4548	0.302	575297856	1576158.51	1.737	3.88E+09	10639069.94	11.727
Queens, NY	40	1.17	6.72	45.36	4.03E+07	47154463.2	129190.3101	0.142	270835891.2	742016.1403	0.818	1.83E+09	5008608.947	5.521
Nassau, NY	40	1.17	6.72	45.36	3.39E+07	39709086.3	108792.0173	0.120	228072700.8	624856.7145	0.689	1.54E+09	4217782.823	4.649
Suffolk, NY	40	1.17	6.72	45.36	4.83E+07	56479129.2	154737.3403	0.171	324392947.2	888747.8005	0.980	2.19E+09	5999047.654	6.613
Westchester, NY	40	1.17	6.72	45.36	2.90E+07	33902177.4	92882.67781	0.102	194720198.4	533479.9956	0.588	1.31E+09	3600989.97	3.969
Massachusetts	40	1.17	6.72	45.36	4.14E+08	483807870	1325501.014	1.461	2778793920	7613134.027	8.392	1.88E+10	51388654.68	56.646
Rhode Island	40	1.17	6.72	45.36	2.90E+07	33961777.2	93045.96493	0.103	195062515.2	534417.8499	0.589	1.32E+09	3607320.487	3.976
New Hampshire	40	1.17	6.72	45.36	6.30E+07	73681569	201867.3123	0.223	423196704	1159443.025	1.278	2.86E+09	7826240.416	8.627
Maine	40	1.17	6.72	45.36	1.41E+06	1655456.4	4535.496986	0.005	9508262.4	26050.03397	0.029	6.42E+07	175837.7293	0.194
Vermont	40	1.17	6.72	45.36	2.32E+07	27140022	74356.22466	0.082	155881152	427071.6493	0.471	1.05E+09	2882733.633	3.178
Connecticut	40	1.17	6.72	45.36	1.02E+08	119702232	327951.3205	0.362	687520512	1883617.841	2.076	4.64E+09	12714420.43	14.015
New Jersey	40	1.17	6.72	45.36	7.90E+07	92462455.8	253321.7967	0.279	531066412.8	1454976.473	1.604	3.58E+09	9821091.196	10.826
New York	40	1.17	6.72	45.36	1.79E+08	209156968.8	573032.7912	0.632	1201311821	3291265.262	3.628	8.11E+09	22216040.52	24.489
Pennsylvania	40	1.17	6.72	45.36	4.59E+08	536803956	1470695.77	1.621	3083181696	8447073.14	9.311	2.08E+10	57017743.69	62.851
Deleware	40	1.17	6.72	45.36	2.09E+07	24456556.8	67004.26521	0.074	140468428.8	384845.0104	0.424	9.48E+08	2597703.82	2.863
District of Columbia	40	1.17	6.72	45.36	3.33E+06	3901575.6	10689.24822	0.012	22409049.6	61394.65644	0.068	1.51E+08	414413.931	0.457
Maryland	40	1.17	6.72	45.36	7.11E+07	83226557.7	228017.9663	0.251	478019203.2	1309641.653	1.444	3.23E+09	8840081.155	9.744
Virginia	40	1.17	6.72	45.36	4.29E+07	50246948.7	137662.8732	0.152	288597859.2	790679.0663	0.872	1.95E+09	5337083.698	5.883
W Virginia	40	1.17	6.72	45.36	1.75E+06	2052226.8	5622.539178	0.006	11787148.8	32293.55836	0.036	7.96E+07	217981.5189	0.240
							Total	8.012		Total	46.019		Total	310.629

2030 No Build Scenario B

Destination	Speed	VOC	NOx	PM_{10}	VMT	VOC SUM	ADJ VOC SUM (g/day)	VOC (ton/day)	NOx SUM	ADJ NOx SUM (g/day)	NOx (ton/day)	PM10 SUM	ADJ PM10 SUM (g/day)	PM_{10} (ton/day)
Bergen, NJ	40	1.17	6.72	45.36	1.23E+08	143465458.5	393056.0507	0.433	824006736	2257552.701	2.489	5.56E+09	15238480.73	16.797
Essex, NJ	40	1.17	6.72	45.36	8.73E+07	102181084.2	279948.1759	0.309	586886227.2	1607907.472	1.772	3.96E+09	10853375.43	11.964
Hudson, NJ	40	1.17	6.72	45.36	3.25E+08	380025734.4	1041166.396	1.148	2182711910	5980032.631	6.592	1.47E+10	40365220.26	44.495
Middlesex, NJ	40	1.17	6.72	45.36	2.75E+08	321798906	881640.8384	0.972	1848280896	5063783.277	5.582	1.25E+10	34180537.12	37.677
Morris, NJ	40	1.17	6.72	45.36	3.51E+07	41041728	112443.0904	0.124	235726848	645826.9808	0.712	1.59E+09	4359332.121	4.805
Passaic, NJ	40	1.17	6.72	45.36	7.59E+07	88755369.3	243165.3953	0.268	509774428.8	1396642.271	1.540	3.44E+09	9427335.327	10.392
Somerset, NJ	40	1.17	6.72	45.36	3.79E+07	44345936.7	121495.717	0.134	254704867.2	697821.554	0.769	1.72E+09	4710295.489	5.192
Union, NJ	40	1.17	6.72	45.36	8.24E+07	96351834.15	263977.6278	0.291	553405406.4	1516179.196	1.671	3.74E+09	10234209.57	11.281
Rockland, NY	40	1.17	6.72	45.36	9.76E+06	11419995.6	31287.65918	0.034	65591769.6	179703.4784	0.198	4.43E+08	1212998.479	1.337
Richmond, NY	40	1.17	6.72	45.36	7.24E+06	8466120	23194.84932	0.026	48625920	133221.6986	0.147	3.28E+08	899246.4658	0.991
Bronx, NY	40	1.17	6.72	45.36	4.19E+07	49050530.1	134385.014	0.148	281726121.6	771852.3879	0.851	1.90E+09	5210003.619	5.743
Kings, NY	40	1.17	6.72	45.36	1.30E+08	152253901.8	417133.9775	0.460	874483948.8	2395846.435	2.641	5.90E+09	16171963.44	17.826
New York, NY	40	1.17	6.72	45.36	1.92E+08	224486964	615032.7781	0.678	1289361024	3532495.956	3.894	8.70E+09	23844347.7	26.284
Queens, NY	40	1.17	6.72	45.36	8.87E+07	103831977.6	284471.1715	0.314	596368281.6	1633885.703	1.801	4.03E+09	11028728.5	12.157
Nassau, NY	40	1.17	6.72	45.36	6.96E+07	81394776.45	222999.3875	0.246	467498203.2	1280816.995	1.412	3.16E+09	8645514.717	9.530
Suffolk, NY	40	1.17	6.72	45.36	8.58E+07	100440720.9	275180.0573	0.303	576890294.4	1580521.355	1.742	3.89E+09	10668519.14	11.760
Westchester, NY	40	1.17	6.72	45.36	5.35E+07	62566153.65	171414.1196	0.189	359354318.4	984532.3792	1.085	2.43E+09	6645593.559	7.325
Massachusetts	40	1.17	6.72	45.36	5.86E+08	685822339.8	1878965.315	2.071	3939082157	10792005.91	11.896	2.66E+10	72846039.89	80.298
Rhode Island	40	1.17	6.72	45.36	4.38E+07	51280520.85	140494.5777	0.155	294534273.6	806943.2153	0.889	1.99E+09	5446866.704	6.004
New Hampshire	40	1.17	6.72	45.36	7.97E+07	93204978.75	255356.1062	0.281	535331160	1466660.712	1.617	3.61E+09	9899959.808	10.913
Maine	40	1.17	6.72	45.36	1.55E+06	1818355.5	4981.79589	0.005	10443888	28613.39178	0.032	7.05E+07	193140.3945	0.213
Vermont	40	1.17	6.72	45.36	3.03E+07	35395542	96974.08767	0.107	203297472	556979.3753	0.614	1.37E+09	3759610.784	4.144
Connecticut	40	1.17	6.72	45.36	1.67E+08	218486268	598592.5151	0.660	1254895488	3438069.83	3.790	8.47E+09	23206971.35	25.581
New Jersey	40	1.17	6.72	45.36	2.76E+08	322844850.9	884506.4408	0.975	1854288374	5080242.122	5.600	1.25E+10	34291634.32	37.800
New York	40	1.17	6.72	45.36	3.51E+08	411218928.9	1126627.202	1.242	2361872822	6470884.445	7.133	1.59E+10	43678470	48.147
Pennsylvania	40	1.17	6.72	45.36	1.09E+09	1278177030	3501854.877	3.860	7341324480	20113217.75	22.171	4.96E+10	135764219.8	149.653
Deleware	40	1.17	6.72	45.36	8.26E+07	96699938.4	264931.3381	0.292	555404774.4	1521656.916	1.677	3.75E+09	10271184.18	11.322
District of Columbia	40	1.17	6.72	45.36	1.93E+07	22632866.1	62007.85233	0.068	129993897.6	356147.6647	0.393	8.77E+08	2403996.736	2.650
Maryland	40	1.17	6.72	45.36	4.13E+08	483183651.6	1323790.826	1.459	2775208666	7603311.413	8.381	1.87E+10	51322352.04	56.573
Virginia	40	1.17	6.72	45.36	1.25E+08	146487779.1	401336.3811	0.442	841365705.6	2305111.522	2.541	5.68E+09	15559502.77	17.151
W Virginia	40	1.17	6.72	45.36	6.86E+06	8020841.4	21974.90795	0.024	46068422.4	126214.8559	0.139	3.11E+08	851950.2773	0.939
							Total	17.719		Total	101.769		Total	686.944

2030 Build Scenario A

Destination	Speed	VOC	NOx	PM_{10}	VMT	VOC SUM	ADJ VOC SUM (g/day)	VOC (ton/day)	NOx SUM	ADJ NOx SUM (g/day)	NOx (ton/day)	PM10 SUM	ADJ PM10 SUM (g/day)	PM_{10} (ton/day)
Bergen, NJ	40	1.17	6.72	45.36	2.95E+07	34556107.95	94674.26836	0.104	198476107.2	543770.1567	0.599	1.34E+09	3670448.558	4.046
Essex, NJ	40	1.17	6.72	45.36	1.74E+07	20307448.98	55636.84652	0.061	116637655.7	319555.221	0.352	7.87E+08	2156997.742	2.378
Hudson, NJ	40	1.17	6.72	45.36	5.71E+07	66760508.88	182905.5038	0.202	383444974.1	1050534.176	1.158	2.59E+09	7091105.685	7.817
Middlesex, NJ	40	1.17	6.72	45.36	5.47E+07	64037310.48	175444.6862	0.193	367804039.7	1007682.3	1.111	2.48E+09	6801855.528	7.498
Morris, NJ	40	1.17	6.72	45.36	8.73E+06	10211979.96	27978.02729	0.031	58653423.36	160694.3106	0.177	3.96E+08	1084686.596	1.196
Passaic, NJ	40	1.17	6.72	45.36	1.97E+07	23021612.64	63072.91134	0.070	132226698.2	362264.9267	0.399	8.93E+08	2445288.255	2.695
Somerset, NJ	40	1.17	6.72	45.36	7.56E+06	8843746.86	24229.44345	0.027	50794853.76	139163.9829	0.153	3.43E+08	939356.8846	1.035
Union, NJ	40	1.17	6.72	45.36	1.41E+07	16468979.67	45120.49225	0.050	94591062.72	259153.5965	0.286	6.38E+08	1749286.776	1.928
Rockland, NY	40	1.17	6.72	45.36	3.07E+06	3586054.68	9824.807342	0.011	20596826.88	56429.66268	0.062	1.39E+08	380900.2231	0.420
Richmond, NY	40	1.17	6.72	45.36	1.15E+06	1349524.8	3697.328219	0.004	7751116.8	21235.93644	0.023	5.23E+07	143342.571	0.158
Bronx, NY	40	1.17	6.72	45.36	9.66E+06	11301764.76	30963.73907	0.034	64912700.16	177843.0141	0.196	4.38E+08	1200440.345	1.323
Kings, NY	40	1.17	6.72	45.36	2.45E+07	28661543.82	78524.77759	0.087	164620149.1	451014.1072	0.497	1.11E+09	3044345.223	3.356
New York, NY	40	1.17	6.72	45.36	3.79E+07	44377281	121581.5918	0.134	254884896	698314.7836	0.770	1.72E+09	4713624.789	5.196
Queens, NY	40	1.17	6.72	45.36	1.81E+07	21181109.04	58030.43573	0.064	121655600.6	333303.0155	0.367	8.21E+08	2249795.354	2.480
Nassau, NY	40	1.17	6.72	45.36	1.76E+07	20538979.11	56271.17564	0.062	117967469.8	323198.5473	0.356	7.96E+08	2181590.194	2.405
Suffolk, NY	40	1.17	6.72	45.36	2.59E+07	30349186.92	83148.45732	0.092	174313278.7	477570.6266	0.526	1.18E+09	3223601.73	3.553
Westchester, NY	40	1.17	6.72	45.36	1.63E+07	19037376.54	52157.196	0.057	109342880.6	299569.536	0.330	7.38E+08	2022094.368	2.229
Massachusetts	40	1.17	6.72	45.36	3.19E+08	373499675.6	1023286.783	1.128	2145228906	5877339.469	6.479	1.45E+10	39672041.42	43.730
Rhode Island	40	1.17	6.72	45.36	2.16E+07	25253930.52	69188.85074	0.076	145048216.3	397392.3735	0.438	9.79E+08	2682398.521	2.957
New Hampshire	40	1.17	6.72	45.36	5.37E+07	62783756.1	172010.2907	0.190	360604137.6	987956.5414	1.089	2.43E+09	6668706.654	7.351
Maine	40	1.17	6.72	45.36	1.20E+06	1402301.16	3841.920986	0.004	8054242.56	22066.41797	0.024	5.44E+07	148948.3213	0.164
Vermont	40	1.17	6.72	45.36	1.86E+07	21715457.4	59494.40384	0.066	124724678.4	341711.4477	0.377	8.42E+08	2306552.272	2.543
Connecticut	40	1.17	6.72	45.36	6.61E+07	77324738.4	211848.5984	0.234	444121574.4	1216771.437	1.341	3.00E+09	8213207.198	9.053
New Jersey	40	1.17	6.72	45.36	5.20E+07	60854997.06	166726.0193	0.184	349526137	957605.8547	1.056	2.36E+09	6463839.519	7.125
New York	40	1.17	6.72	45.36	1.56E+08	182565265	500178.8081	0.551	1048579983	2872821.872	3.167	7.08E+09	19391547.64	21.375
Pennsylvania	40	1.17	6.72	45.36	4.34E+08	507927186	1391581.332	1.534	2917325376	7992672.263	8.810	1.97E+10	53950537.78	59.470
Deleware	40	1.17	6.72	45.36	2.51E+07	29347868.16	80405.11825	0.089	168562114.6	461814.0125	0.509	1.14E+09	3117244.584	3.436
District of Columbia	40	1.17	6.72	45.36	6.85E+06	8009412.84	21943.59682	0.024	46002781.44	126035.0176	0.139	3.11E+08	850736.3691	0.938
Maryland	40	1.17	6.72	45.36	1.42E+08	166009588.3	454820.7898	0.501	953490968.6	2612304.024	2.880	6.44E+09	17633052.16	19.437
Virginia	40	1.17	6.72	45.36	6.57E+07	76913678.79	210722.4076	0.232	441760616.6	1210303.059	1.334	2.98E+09	8169545.65	9.005
W Virginia	40	1.17	6.72	45.36	3.07E+06	3594366.36	9847.579068	0.011	20644565.76	56560.45414	0.062	1.39E+08	381783.0654	0.421
							Total	6.106		Total	35.069		Total	236.718

2030 Build Scenario B

Destination	Speed	VOC	NOx	PM_{10}	VMT	VOC SUM	ADJ VOC SUM (g/day)	VOC (ton/day)	NOx SUM	ADJ NOx SUM (g/day)	NOx (ton/day)	PM10 SUM	ADJ PM10 SUM (g/day)	PM_{10} (ton/day)
Bergen, NJ	40	1.17	6.72	45.36	5.16E+07	60353379.45	165351.7245	0.182	346645051.2	949712.469	1.047	2.34E+09	6410559.166	7.066
Essex, NJ	40	1.17	6.72	45.36	3.53E+07	41304184.74	113162.15	0.125	237234291.8	649956.9639	0.716	1.60E+09	4387209.507	4.836
Hudson, NJ	40	1.17	6.72	45.36	1.25E+08	146548846.1	401503.6879	0.443	841716449.3	2306072.464	2.542	5.68E+09	15565989.13	17.158
Middlesex, NJ	40	1.17	6.72	45.36	1.14E+08	133650677.2	366166.2388	0.404	767634658.6	2103108.654	2.318	5.18E+09	14195983.41	15.648
Morris, NJ	40	1.17	6.72	45.36	1.55E+07	18081161.28	49537.42816	0.055	103850772.5	284522.6643	0.314	7.01E+08	1920527.984	2.117
Passaic, NJ	40	1.17	6.72	45.36	3.37E+07	39403102.05	107953.7042	0.119	226315252.8	620041.7885	0.683	1.53E+09	4185282.072	4.613
Somerset, NJ	40	1.17	6.72	45.36	1.58E+07	18515899.35	50728.49137	0.056	106347729.6	291363.6427	0.321	7.18E+08	1966704.588	2.168
Union, NJ	40	1.17	6.72	45.36	3.18E+07	37158090.26	101802.987	0.112	213420826.1	584714.592	0.645	1.44E+09	3946823.496	4.351
Rockland, NY	40	1.17	6.72	45.36	4.71E+06	5505126.12	15082.53732	0.017	31619185.92	86627.90663	0.095	2.13E+08	584738.3698	0.645
Richmond, NY	40	1.17	6.72	45.36	2.72E+06	3184272	8724.032877	0.010	18289152	50107.26575	0.055	1.23E+08	338224.0438	0.373
Bronx, NY	40	1.17	6.72	45.36	1.77E+07	20743492.77	56831.48704	0.063	119142112.3	326416.7461	0.360	8.04E+08	2203313.036	2.429
Kings, NY	40	1.17	6.72	45.36	5.14E+07	60102593.46	164664.6396	0.182	345204639.4	945766.1352	1.043	2.33E+09	6383921.413	7.037
New York, NY	40	1.17	6.72	45.36	7.69E+07	89962563.6	246472.777	0.272	516708057.6	1415638.514	1.560	3.49E+09	9555559.969	10.533
Queens, NY	40	1.17	6.72	45.36	3.59E+07	41962864.32	114966.7516	0.127	241017477.1	660321.8551	0.728	1.63E+09	4457172.522	4.913
Nassau, NY	40	1.17	6.72	45.36	3.06E+07	35823732.17	98147.21141	0.108	205756820.6	563717.3168	0.621	1.39E+09	3805091.889	4.194
Suffolk, NY	40	1.17	6.72	45.36	3.97E+07	46468437.21	127310.7869	0.140	266895639.4	731220.9298	0.806	1.80E+09	4935741.276	5.441
Westchester, NY	40	1.17	6.72	45.36	2.53E+07	29547501.17	80952.05799	0.089	169708724.6	464955.41	0.513	1.15E+09	3138449.017	3.460
Massachusetts	40	1.17	6.72	45.36	3.83E+08	447571647.9	1226223.693	1.352	2570667926	7042925.826	7.763	1.74E+10	47539749.32	52.403
Rhode Island	40	1.17	6.72	45.36	2.70E+07	31604136.53	86586.67541	0.095	181521194.4	497318.3408	0.548	1.23E+09	3356898.801	3.700
New Hampshire	40	1.17	6.72	45.36	5.98E+07	69942339.68	191622.8484	0.211	401720104.8	1100603.027	1.213	2.71E+09	7429070.431	8.189
Maine	40	1.17	6.72	45.36	1.25E+06	1462030.83	4005.563918	0.004	8397305.28	23006.31584	0.025	5.67E+07	155292.6319	0.171
Vermont	40	1.17	6.72	45.36	2.11E+07	24742481.4	67787.62027	0.075	142110662.4	389344.2805	0.429	9.59E+08	2628073.894	2.897
Connecticut	40	1.17	6.72	45.36	9.70E+07	113545551.6	311083.703	0.343	652159065.6	1786737.166	1.970	4.40E+09	12060475.87	13.294
New Jersey	40	1.17	6.72	45.36	1.24E+08	145328541.9	398160.3888	0.439	834707522.9	2286869.926	2.521	5.63E+09	15436372	17.016
New York	40	1.17	6.72	45.36	2.19E+08	256654650.3	703163.4256	0.775	1474119017	4038682.239	4.452	9.95E+09	27261105.11	30.050
Pennsylvania	40	1.17	6.72	45.36	6.66E+08	779763979.8	2136339.671	2.355	4478644397	12270258.62	13.526	3.02E+10	82824245.69	91.297
Deleware	40	1.17	6.72	45.36	4.77E+07	55837108.08	152978.3783	0.169	320705441.3	878645.0446	0.969	2.16E+09	5930854.051	6.538
District of Columbia	40	1.17	6.72	45.36	1.27E+07	14877552.69	40760.41833	0.045	85450559.04	234111.1207	0.258	5.77E+08	1580250.064	1.742
Maryland	40	1.17	6.72	45.36	2.67E+08	312660522.7	856604.1718	0.944	1795793772	4919982.936	5.423	1.21E+10	33209884.82	36.607
Virginia	40	1.17	6.72	45.36	9.59E+07	112201983.3	307402.6939	0.339	644442160.3	1765594.96	1.946	4.35E+09	11917765.98	13.137
W Virginia	40	1.17	6.72	45.36	4.94E+06	5782858.38	15843.44762	0.017	33214366.08	90998.26323	0.100	2.24E+08	614238.2768	0.677
							Total	9.665		Total	55.511		Total	374.700

2060 No Build Scenario A

Destination	Speed	VOC	NOx	PM_{10}	VMT	VOC SUM	ADJ VOC SUM (g/day)	VOC (ton/day)	NOx SUM	ADJ NOx SUM (g/day)	NOx (ton/day)	PM10 SUM	ADJ PM10 SUM (g/day)	PM_{10} (ton/day)
Bergen, NJ	40	1.17	6.72	45.36	1.10E+08	128371165.7	351701.8237	0.388	737311310.4	2020030.987	2.227	4.98E+09	13635209.16	15.030
Essex, NJ	40	1.17	6.72	45.36	6.77E+07	79156885.86	216868.1804	0.239	454644677.8	1245601.857	1.373	3.07E+09	8407812.534	9.268
Hudson, NJ	40	1.17	6.72	45.36	2.46E+08	288309443.8	789888.887	0.871	1655931164	4536797.71	5.001	1.12E+10	30623384.54	33.756
Middlesex, NJ	40	1.17	6.72	45.36	1.98E+08	231157761.1	633308.9346	0.698	1327675346	3637466.701	4.010	8.96E+09	24552900.23	27.065
Morris, NJ	40	1.17	6.72	45.36	2.91E+07	34082685	93377.21918	0.103	195756960	536320.4384	0.591	1.32E+09	3620162.959	3.991
Passaic, NJ	40	1.17	6.72	45.36	6.56E+07	76715620.02	210179.7809	0.232	440623048.3	1207186.434	1.331	2.97E+09	8148508.428	8.982
Somerset, NJ	40	1.17	6.72	45.36	2.69E+07	31439133.18	86134.61145	0.095	180573482.9	494721.8709	0.545	1.22E+09	3339372.629	3.681
Union, NJ	40	1.17	6.72	45.36	6.06E+07	70855360.29	194124.2748	0.214	406964120.6	1114970.194	1.229	2.75E+09	7526048.806	8.296
Rockland, NY	40	1.17	6.72	45.36	9.11E+06	10655994.96	29194.50674	0.032	61203663.36	167681.2695	0.185	4.13E+08	1131848.569	1.248
Richmond, NY	40	1.17	6.72	45.36	5.27E+06	6168684.6	16900.50575	0.019	35430393.6	97069.57151	0.107	2.39E+08	655219.6077	0.722
Bronx, NY	40	1.17	6.72	45.36	3.49E+07	40822816.32	111843.3324	0.123	234469509.1	642382.2168	0.708	1.58E+09	4336079.963	4.780
Kings, NY	40	1.17	6.72	45.36	1.01E+08	117639489.2	322299.9705	0.355	675672963.8	1851158.805	2.041	4.56E+09	12495321.93	13.774
New York, NY	40	1.17	6.72	45.36	1.51E+08	176798863.8	484380.4488	0.534	1015460141	2782082.578	3.067	6.85E+09	18779057.4	20.700
Queens, NY	40	1.17	6.72	45.36	7.11E+07	83142380.88	227787.3449	0.251	477535726.1	1308317.058	1.442	3.22E+09	8831140.14	9.735
Nassau, NY	40	1.17	6.72	45.36	5.91E+07	69173267.67	189515.8018	0.209	397302870.7	1088501.016	1.200	2.68E+09	7347381.856	8.099
Suffolk, NY	40	1.17	6.72	45.36	8.38E+07	98032903.02	268583.2959	0.296	563060776.3	1542632.264	1.700	3.80E+09	10412767.78	11.478
Westchester, NY	40	1.17	6.72	45.36	5.01E+07	58589916.84	160520.3201	0.177	336516445.4	921962.8642	1.016	2.27E+09	6223249.333	6.860
Massachusetts	40	1.17	6.72	45.36	6.88E+08	804411218.5	2203866.352	2.429	4620208024	12658104.18	13.953	3.12E+10	85442203.19	94.183
Rhode Island	40	1.17	6.72	45.36	4.85E+07	56767482.72	155527.3499	0.171	326049131.5	893285.2918	0.985	2.20E+09	6029675.72	6.647
New Hampshire	40	1.17	6.72	45.36	1.03E+08	120670114.5	330603.0534	0.364	693079632	1898848.307	2.093	4.68E+09	12817226.07	14.128
Maine	40	1.17	6.72	45.36	2.32E+06	2713768.2	7434.98137	0.008	15586771.2	42703.48274	0.047	1.05E+08	288248.5085	0.318
Vermont	40	1.17	6.72	45.36	3.84E+07	44887096.8	122978.3474	0.136	257813068.8	706337.1748	0.779	1.74E+09	4767775.93	5.256
Connecticut	40	1.17	6.72	45.36	1.74E+08	203722552.8	558143.9803	0.615	1170098765	3205750.041	3.534	7.90E+09	21638812.77	23.852
New Jersey	40	1.17	6.72	45.36	1.34E+08	157012082.4	430170.0887	0.474	901812985.9	2470720.509	2.723	6.09E+09	16677363.44	18.383
New York	40	1.17	6.72	45.36	2.92E+08	341188925.2	934764.1787	1.030	1959649212	5368901.949	5.918	1.32E+10	36240088.16	39.947
Pennsylvania	40	1.17	6.72	45.36	7.38E+08	863405290.8	2365493.947	2.607	4959045773	13586426.77	14.976	3.35E+10	91708380.73	101.090
Deleware	40	1.17	6.72	45.36	3.20E+07	37403514.72	102475.3828	0.113	214830443.5	588576.5576	0.649	1.45E+09	3972891.764	4.379
District of Columbia	40	1.17	6.72	45.36	4.21E+06	4930812.9	13509.07644	0.015	28320566.4	77590.59288	0.086	1.91E+08	523736.5019	0.577
Maryland	40	1.17	6.72	45.36	9.12E+07	106690011.5	292301.4013	0.322	612783655.7	1678859.331	1.851	4.14E+09	11332300.48	12.492
Virginia	40	1.17	6.72	45.36	6.13E+07	71672280.03	196362.411	0.216	411656172.5	1127825.13	1.243	2.78E+09	7612819.628	8.392
W Virginia	40	1.17	6.72	45.36	2.38E+06	2786233.32	7633.515945	0.008	16002981.12	43843.78389	0.048	1.08E+08	295945.5413	0.326
							Total	13.347		Total	76.657		Total	517.434

2060 No Build Scenario B

Destination	Speed	VOC	NOx	PM_{10}	VMT	VOC SUM	ADJ VOC SUM (g/day)	VOC (ton/day)	NOx SUM	ADJ NOx SUM (g/day)	NOx (ton/day)	PM10 SUM	ADJ PM10 SUM (g/day)	PM_{10} (ton/day)
Bergen, NJ	40	1.17	6.72	45.36	2.17E+08	254230581.2	696522.1401	0.768	1460196158	4000537.42	4.410	9.86E+09	27003627.59	29.766
Essex, NJ	40	1.17	6.72	45.36	1.55E+08	181595505.8	497521.9336	0.548	1043010084	2857561.875	3.150	7.04E+09	19288542.66	21.262
Hudson, NJ	40	1.17	6.72	45.36	5.79E+08	677579816.2	1856383.058	2.046	3891740483	10662302.69	11.753	2.63E+10	71970543.17	79.333
Middlesex, NJ	40	1.17	6.72	45.36	4.88E+08	570786610.7	1563798.933	1.724	3278364123	8981819.515	9.901	2.21E+10	60627281.72	66.829
Morris, NJ	40	1.17	6.72	45.36	6.19E+07	72474751.44	198560.9628	0.219	416265239	1140452.71	1.257	2.81E+09	7698055.79	8.486
Passaic, NJ	40	1.17	6.72	45.36	1.34E+08	156637432	429143.6493	0.473	899661147.8	2464825.063	2.717	6.07E+09	16637569.17	18.340
Somerset, NJ	40	1.17	6.72	45.36	6.72E+07	78627513.51	215417.8452	0.237	451604180.2	1237271.726	1.364	3.05E+09	8351584.154	9.206
Union, NJ	40	1.17	6.72	45.36	1.47E+08	171793142.2	470666.1431	0.519	986709329.8	2703313.232	2.980	6.66E+09	18247364.32	20.114
Rockland, NY	40	1.17	6.72	45.36	1.71E+07	20018737.44	54845.856	0.060	114979415	315012.096	0.347	7.76E+08	2126331.648	2.344
Richmond, NY	40	1.17	6.72	45.36	1.29E+07	15120027	41424.73151	0.046	86843232	237926.663	0.262	5.86E+08	1606004.975	1.770
Bronx, NY	40	1.17	6.72	45.36	7.43E+07	86887004.49	238046.5876	0.262	499043307.8	1367241.939	1.507	3.37E+09	9228883.09	10.173
Kings, NY	40	1.17	6.72	45.36	2.32E+08	271033701.1	742558.0853	0.819	1556706386	4264949.003	4.701	1.05E+10	28788405.77	31.733
New York, NY	40	1.17	6.72	45.36	3.41E+08	399199788	1093698.049	1.206	2292839808	6281752.899	6.924	1.55E+10	42401832.07	46.740
Queens, NY	40	1.17	6.72	45.36	1.58E+08	184532156.6	505567.5524	0.557	1059877002	2903772.609	3.201	7.15E+09	19600465.11	21.606
Nassau, NY	40	1.17	6.72	45.36	1.23E+08	143744335.6	393820.0975	0.434	825608491.7	2261941.073	2.493	5.57E+09	15268102.24	16.830
Suffolk, NY	40	1.17	6.72	45.36	1.51E+08	176675306	484041.9341	0.534	1014750475	2780138.288	3.065	6.85E+09	18765933.45	20.686
Westchester, NY	40	1.17	6.72	45.36	9.39E+07	109866585.5	301004.3437	0.332	631028593.4	1728845.461	1.906	4.26E+09	11669706.86	12.864
Massachusetts	40	1.17	6.72	45.36	9.96E+08	1165792659	3193952.49	3.521	6695834759	18344752.76	20.221	4.52E+10	123827081.2	136.495
Rhode Island	40	1.17	6.72	45.36	7.50E+07	87748790.81	240407.646	0.265	503993054.9	1380802.89	1.522	3.40E+09	9320419.508	10.274
New Hampshire	40	1.17	6.72	45.36	1.33E+08	155595325.3	426288.5624	0.470	893675714.4	2448426.615	2.699	6.03E+09	16526879.65	18.218
Maine	40	1.17	6.72	45.36	2.57E+06	3005176.59	8233.360521	0.009	17260501.44	47289.04504	0.052	1.17E+08	319201.054	0.352
Vermont	40	1.17	6.72	45.36	5.10E+07	59655304.8	163439.1912	0.180	342635596.8	938727.6625	1.035	2.31E+09	6336411.722	6.985
Connecticut	40	1.17	6.72	45.36	3.25E+08	380436217.2	1042291.006	1.149	2185069555	5986491.932	6.599	1.47E+10	40408820.54	44.543
New Jersey	40	1.17	6.72	45.36	4.86E+08	569140589.2	1559289.285	1.719	3268910051	8955917.947	9.872	2.21E+10	60452446.14	66.637
New York	40	1.17	6.72	45.36	6.01E+08	702655320.5	1925083.07	2.122	4035763892	11056887.38	12.188	2.72E+10	74633989.79	82.269
Pennsylvania	40	1.17	6.72	45.36	1.87E+09	2189639345	5999011.905	6.613	12576390086	34455863.25	37.981	8.49E+10	232577076.9	256.370
Deleware	40	1.17	6.72	45.36	1.42E+08	166638897.4	456544.9243	0.503	957105461.8	2622206.745	2.890	6.46E+09	17699895.53	19.511
District of Columbia	40	1.17	6.72	45.36	3.29E+07	38439010.35	105312.3571	0.116	220777905.6	604870.9742	0.667	1.49E+09	4082879.076	4.501
Maryland	40	1.17	6.72	45.36	7.03E+08	822168812.8	2252517.295	2.483	4722200361	12937535.23	14.261	3.19E+10	87328362.83	96.262
Virginia	40	1.17	6.72	45.36	2.08E+08	243836432.2	668045.0197	0.736	1400496431	3836976.523	4.229	9.45E+09	25899591.53	28.549
W Virginia	40	1.17	6.72	45.36	1.15E+07	13463421.66	36886.08674	0.041	77328370.56	211858.5495	0.234	5.22E+08	1430045.209	1.576
							Total	30.710		Total	176.388		Total	1190.620

2060 Build Scenario A

Destination	Speed	VOC	NOx	PM_{10}	VMT	VOC SUM	ADJ VOC SUM (g/day)	VOC (ton/day)	NOx SUM	ADJ NOx SUM (g/day)	NOx (ton/day)	PM10 SUM	ADJ PM10 SUM (g/day)	PM_{10} (ton/day)
Bergen, NJ	40	1.17	6.72	45.36	7.44E+07	87010560	238385.0959	0.263	499752960	1369186.192	1.509	3.37E+09	9242006.795	10.187
Essex, NJ	40	1.17	6.72	45.36	4.51E+07	52769574	144574.1753	0.159	303086784	830374.7507	0.915	2.05E+09	5605029.567	6.178
Hudson, NJ	40	1.17	6.72	45.36	1.59E+08	185840928	509153.2274	0.561	1067394048	2924367.255	3.224	7.20E+09	19739478.97	21.759
Middlesex, NJ	40	1.17	6.72	45.36	1.35E+08	158279378.4	433642.1326	0.478	909091814.4	2490662.505	2.745	6.14E+09	16811971.91	18.532
Morris, NJ	40	1.17	6.72	45.36	2.05E+07	24017011.2	65800.03068	0.073	137943859.2	377928.3814	0.417	9.31E+08	2551016.574	2.812
Passaic, NJ	40	1.17	6.72	45.36	4.62E+07	54090714.6	148193.7386	0.163	310674873.6	851164.0373	0.938	2.10E+09	5745357.252	6.333
Somerset, NJ	40	1.17	6.72	45.36	1.85E+07	21645608.4	59303.03671	0.065	124323494.4	340612.3134	0.375	8.39E+08	2299133.116	2.534
Union, NJ	40	1.17	6.72	45.36	3.91E+07	45727110	125279.7534	0.138	262637760	719555.5068	0.793	1.77E+09	4856999.671	5.354
Rockland, NY	40	1.17	6.72	45.36	6.71E+06	7856082	21523.51233	0.024	45122112	123622.2247	0.136	3.05E+08	834450.0164	0.920
Richmond, NY	40	1.17	6.72	45.36	3.34E+06	3906630	10703.09589	0.012	22438080	61474.19178	0.068	1.51E+08	414950.7945	0.457
Bronx, NY	40	1.17	6.72	45.36	2.39E+07	27945918	76564.1589	0.084	160509888	439753.1178	0.485	1.08E+09	2968333.545	3.272
Kings, NY	40	1.17	6.72	45.36	6.59E+07	77083461	211187.5644	0.233	442735776	1212974.729	1.337	2.99E+09	8187579.419	9.025
New York, NY	40	1.17	6.72	45.36	1.00E+08	116997192	320540.2521	0.353	671983872	1841051.704	2.029	4.54E+09	12427099	13.698
Queens, NY	40	1.17	6.72	45.36	4.73E+07	55295136	151493.5233	0.167	317592576	870116.6466	0.959	2.14E+09	5873287.364	6.474
Nassau, NY	40	1.17	6.72	45.36	4.15E+07	48579219	133093.7507	0.147	279019104	764435.9014	0.843	1.88E+09	5159942.334	5.688
Suffolk, NY	40	1.17	6.72	45.36	5.98E+07	69942436.2	191623.1129	0.211	401720659.2	1100604.546	1.213	2.71E+09	7429080.684	8.189
Westchester, NY	40	1.17	6.72	45.36	3.64E+07	42595043.4	116698.749	0.129	244648454.4	670269.7381	0.739	1.65E+09	4524320.732	4.987
Massachusetts	40	1.17	6.72	45.36	5.84E+08	683781789.6	1873374.766	2.065	3927362074	10759896.09	11.861	2.65E+10	72629298.62	80.059
Rhode Island	40	1.17	6.72	45.36	4.04E+07	47280121.2	129534.5786	0.143	271557619.2	743993.4773	0.820	1.83E+09	5021955.972	5.536
New Hampshire	40	1.17	6.72	45.36	9.28E+07	108536922	297361.4301	0.328	623391552	1707922.06	1.883	4.21E+09	11528473.91	12.708
Maine	40	1.17	6.72	45.36	2.08E+06	2432383.2	6664.063562	0.007	13970611.2	38275.64712	0.042	9.43E+07	258360.6181	0.285
Vermont	40	1.17	6.72	45.36	3.33E+07	38927070	106649.5068	0.118	223581120	612551.0137	0.675	1.51E+09	4134719.342	4.558
Connecticut	40	1.17	6.72	45.36	1.35E+08	157931280	432688.4384	0.477	907092480	2485184.877	2.739	6.12E+09	16774997.92	18.491
New Jersey	40	1.17	6.72	45.36	1.05E+08	122831923.5	336525.8178	0.371	705496176	1932866.236	2.131	4.76E+09	13046847.09	14.382
New York	40	1.17	6.72	45.36	2.66E+08	311338053	852980.9671	0.940	1788198048	4899172.734	5.400	1.21E+10	33069415.96	36.452
Pennsylvania	40	1.17	6.72	45.36	7.08E+08	828408672	2269612.8	2.502	4758039552	13035724.8	14.369	3.21E+10	87991142.4	96.993
Deleware	40	1.17	6.72	45.36	3.62E+07	42369912	116081.9507	0.128	243355392	666727.1014	0.735	1.64E+09	4500407.934	4.961
District of Columbia	40	1.17	6.72	45.36	7.90E+06	9240355.8	25316.04329	0.028	53072812.8	145404.9666	0.160	3.58E+08	981483.5244	1.082
Maryland	40	1.17	6.72	45.36	1.65E+08	193499572.5	530135.8151	0.584	1111382160	3044882.63	3.356	7.50E+09	20552957.75	22.656
Virginia	40	1.17	6.72	45.36	8.50E+07	99440757	272440.4301	0.300	571146912	1564786.06	1.725	3.86E+09	10562305.91	11.643
W Virginia	40	1.17	6.72	45.36	3.76E+06	4399200	12052.60274	0.013	25267200	69225.20548	0.076	1.71E+08	467270.137	0.515
							Total	11.265		Total	64.699		Total	436.720

2060 Build Scenario B

Destination	Speed	VOC	NOx	PM_{10}	VMT	VOC SUM	ADJ VOC SUM (g/day)	VOC (ton/day)	NOx SUM	ADJ NOx SUM (g/day)	NOx (ton/day)	PM10 SUM	ADJ PM10 SUM (g/day)	PM_{10} (ton/day)
Bergen, NJ	40	1.17	6.72	45.36	1.41E+08	165184110	452559.2055	0.499	948749760	2599314.411	2.865	6.40E+09	17545372.27	19.340
Essex, NJ	40	1.17	6.72	45.36	9.95E+07	116396046	318893.2767	0.352	668531136	1831592.153	2.019	4.51E+09	12363247.04	13.628
Hudson, NJ	40	1.17	6.72	45.36	3.65E+08	427623768	1171571.967	1.291	2456095488	6729028.734	7.417	1.66E+10	45420943.96	50.068
Middlesex, NJ	40	1.17	6.72	45.36	3.16E+08	369228974.4	1011586.231	1.115	2120699750	5810136.302	6.405	1.43E+10	39218420.04	43.230
Morris, NJ	40	1.17	6.72	45.36	4.09E+07	47863015.2	131131.5485	0.145	274905523.2	753165.817	0.830	1.86E+09	5083869.265	5.604
Passaic, NJ	40	1.17	6.72	45.36	8.87E+07	103731591.6	284196.1414	0.313	595791705.6	1632306.043	1.799	4.02E+09	11018065.79	12.145
Somerset, NJ	40	1.17	6.72	45.36	4.36E+07	50955161.4	139603.1819	0.154	292665542.4	801823.4038	0.884	1.98E+09	5412307.976	5.966
Union, NJ	40	1.17	6.72	45.36	9.27E+07	108421384.5	297044.889	0.327	622727952	1706103.978	1.881	4.20E+09	11516201.85	12.694
Rockland, NY	40	1.17	6.72	45.36	1.17E+07	13671450	37456.0274	0.041	78523200	215132.0548	0.237	5.30E+08	1452141.37	1.601
Richmond, NY	40	1.17	6.72	45.36	8.09E+06	9466470	25935.53425	0.029	54371520	148963.0685	0.164	3.67E+08	1005500.712	1.108
Bronx, NY	40	1.17	6.72	45.36	4.83E+07	56557215	154951.274	0.171	324841440	889976.5479	0.981	2.19E+09	6007341.699	6.622
Kings, NY	40	1.17	6.72	45.36	1.47E+08	172359369	472217.4493	0.521	989961504	2712223.299	2.990	6.68E+09	18307507.27	20.180
New York, NY	40	1.17	6.72	45.36	2.18E+08	255134412	698998.389	0.771	1465387392	4014759.978	4.425	9.89E+09	27099629.85	29.872
Queens, NY	40	1.17	6.72	45.36	1.01E+08	118270152	324027.8137	0.357	679295232	1861082.827	2.051	4.59E+09	12562309.08	13.847
Nassau, NY	40	1.17	6.72	45.36	8.11E+07	94896652.5	259990.8288	0.287	545047440	1493280.658	1.646	3.68E+09	10079644.44	11.111
Suffolk, NY	40	1.17	6.72	45.36	1.02E+08	118788649.2	325448.354	0.359	682273267.2	1869241.828	2.060	4.61E+09	12617382.34	13.908
Westchester, NY	40	1.17	6.72	45.36	6.36E+07	74443905.9	203955.9066	0.225	427575254.4	1171439.053	1.291	2.89E+09	7907213.609	8.716
Massachusetts	40	1.17	6.72	45.36	7.76E+08	908242311.6	2488335.1	2.743	5216571226	14291975.96	15.754	3.52E+10	96470837.73	106.340
Rhode Island	40	1.17	6.72	45.36	5.69E+07	66523169.7	182255.2595	0.201	382081795.2	1046799.439	1.154	2.58E+09	7065896.213	7.789
New Hampshire	40	1.17	6.72	45.36	1.11E+08	130229599.5	356793.4233	0.393	747985392	2049275.047	2.259	5.05E+09	13832606.56	15.248
Maine	40	1.17	6.72	45.36	2.23E+06	2613382.2	7159.951233	0.008	15010195.2	41123.82247	0.045	1.01E+08	277585.8016	0.306
Vermont	40	1.17	6.72	45.36	4.11E+07	48099870	131780.4658	0.145	276265920	756892.9315	0.834	1.86E+09	5109027.288	5.632
Connecticut	40	1.17	6.72	45.36	2.29E+08	267691320	733400.8767	0.808	1537509120	4212353.753	4.643	1.04E+10	28433387.84	31.342
New Jersey	40	1.17	6.72	45.36	3.24E+08	378812362.5	1037842.089	1.144	2175742800	5960939.178	6.571	1.47E+10	40236339.45	44.353
New York	40	1.17	6.72	45.36	4.58E+08	535851342	1468085.868	1.618	3077710272	8432082.937	9.295	2.08E+10	56916559.82	62.739
Pennsylvania	40	1.17	6.72	45.36	1.41E+09	1652156532	4526456.252	4.990	9489309312	25998107.7	28.658	6.41E+10	175487227	193.440
Deleware	40	1.17	6.72	45.36	1.05E+08	122640336	336000.9205	0.370	704395776	1929851.441	2.127	4.75E+09	13026497.23	14.359
District of Columbia	40	1.17	6.72	45.36	2.57E+07	30052900.8	82336.71452	0.091	172611532.8	472908.309	0.521	1.17E+09	3192131.086	3.519
Maryland	40	1.17	6.72	45.36	5.45E+08	637896343.5	1747661.215	1.926	3663814896	10037849.03	11.065	2.47E+10	67755480.95	74.687
Virginia	40	1.17	6.72	45.36	1.76E+08	206375013	565410.9945	0.623	1185333408	3247488.789	3.580	8.00E+09	21920549.33	24.163
W Virginia	40	1.17	6.72	45.36	9.43E+06	11030994	30221.90137	0.033	63357504	173582.2027	0.191	4.28E+08	1171679.868	1.292
							Total	22.050		Total	126.644		Total	854.848

FEIS APPENDIX B-1.11

NOISE

APPENDIX

NOISE

Section 1 - Introduction

This technical appendix presents the results of noise analyses which were conducted to assess the impact of the proposed project and the no action alternative. This analysis considers the four sites at which cargo will be received and off-loaded onto trucks for transport to cargo destinations. Noise impacts are primarily expected to result from trucks and automobiles transporting employees and cargo to and from the sites. Noise emissions from the terminals themselves are sufficiently distant from residential areas and sensitive receptors so as not to present a significant impact. At each of the four terminal sites, evaluations have been made to determine the impact of projected increases in traffic at critical nearby intersections. This analysis quantifies the noise impacts associated with these increases in traffic.

The four sites include Port Newark/Elizabeth, Port Jersey/MOTBY, Howland Hook, and South Brooklyn. The proposed project includes deepening the shipping channels used to access these sites to allow fully loaded deeper draft container vessels to call at these terminals. Independent of the implementation of further channel deepening, a program of improvements will be carried out at the existing terminal sites. These actions will include the deployment of more efficient cranes; development of a modern container terminal at South Brooklyn; enhancement of the cross harbor movement of cargo; reconfiguration of terminal operations at Port Newark/Elizabeth, including the conversion of 100 acres of warehouse space to container terminal; and at Port Jersey, the conversion of the 80 acre NEAT facility and the development of 130 acres at MOTBY into container terminal. The result of these non-project dependent actions will be increased terminal throughput capacity from a present level of 3.0 million TEUs/year to 9.6 million TEUs/year by the year 2060. As discussed above, in order to accomplish this increase in throughput, the present acreage of container terminals will be increased from 1197 to 1607 acres, and productivity, currently estimated at 1500 lifts/acre is assumed to increase to a level of 3500 lifts/acre by 2040.

The "no action" alternative assumes that the shipping channels will not be deepened. As a result, cargo passing through the container terminals will be carried by a greater number of shallower draft vessels. It is expected that the actual cargo throughput will expand to 9.6 million TEUs as described above. Thus, the primary difference between the "no action" alternative and the "Proposed Action" or "With Project" alternative is the number and size vessels anticipated to pass through the Harbor.

In order to meaningfully assess the proposed project and no action alternatives, a benchmark is needed for comparison. This benchmark is defined as the current throughput level at each site imposed upon future traffic and air quality conditions in the analysis years (2030 and 2060). That is to say, no expansion in the acreage of the

container terminals is assumed, and no increases in productivity are assumed. This is defined as the "benchmark" scenario.

The current and future container acreage and throughput capacities for each site are shown below, representing both the "proposed project" and "no action" alternatives:

Table 1
Acreage and Throughput Capacities for Container Terminal Sites

Site	Existing Area	Existing Throughput Capacity (M TEU/year	Area - 2060	Throughput 2060 (M TEU/year)
Port Newark/ Elizabeth	950	2.42	1050	6.25
Port Jersey/ MOTBY	100	.26	310	1.84
Howland Hook	147	.38	147	.87
South Brooklyn	0	0	100	.60
Total	1197	3.06	1607	9.56

This Appendix is organized into three sections, including this Appendix, Existing Conditions (at each of the four sites), and Projected Impacts (at each of the four sites).

Section 2 – Existing Conditions

PORT NEWARK/ELIZABETH

Noise in the study area is affected by a variety of sources including highway traffic, railroad vehicles, aircraft from nearby airports, industrial machinery, and ship operations. The project will generate significant additional vehicle trips (trucks and autos) into the region potentially increasing highway related traffic noise. The criteria used in the evaluation of traffic noise impacts for this study are based upon the Federal Highway Administration (FHWA) Noise Abatement Criteria (NAC) for land use categories described in 23 CFR 772 and set forth in Table 2. In accordance with these criteria, Category B receptors are residences, school, churches and playgrounds, and Category C receptors are commercial properties. The FHWA NAC for Category B receptors is 67 dBA and for Category C receptors is 72 dBA. The FHWA considers feasible mitigation measures for receptors approaching (within 3dBA) or above their respective NAC.

Studies were available for the noise exposure levels from Newark Airport flights affecting this study area, but specific receptors along the access routes affected by the project have not been addressed for the other sources in the area including traffic. Only one study, completed in 1994, which addressed the improvements to North Avenue East at Kapkowski Road, was available. This study addressed noise concerns qualitatively

based on the projected change in traffic volumes. The study for the N.J. Metro Mall and Center (1995) provided noise measurements in the port area near Kapkowski Road to establish existing noise levels affecting the study area. The results of this study indicated maximum noise levels ranging from 68 dB to 95 dB, with an A-weighted level of 85 dB during aircraft landing and take-offs. The DNL sound level contours projected for the port region due to the airport traffic ranged from 65 dB to 75 dB in the Metro Mall study. It is reasonable to assume that this noise data was representative of the Port Newark/Elizabeth area and that the maximum noise levels adjacent to the major access roads to the port, influenced by the airport noise, would likely be on the order of 65-75 dBA based on the existing traffic and airport related activities in the port area. There are no Category B receptors affected by this project, and most of the Category C commercial receptors would be below the NAC of 72 dBA.

Table 2 Threshold For Noise Interference and Noise Abatement Criteria (dBA)					
Activity Category	Interference* L10	Leq	Criteria L10	Leq	Description of Activity Category
A (Exterior)	48	45	60	57	Tracts of land where serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, open spaces, or historic districts which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
B (Exterior)	58	55	70	67	Picnic areas, recreation areas, playgrounds, active sports areas, and parks which are not included in Category A and residencies, motels, hotels, public meeting rooms, schools, churches, libraries, and hospitals.
C (Exterior)	63	60	75	72	Developed lands, properties, or activities not included in Categories A and B above.
D	--	- -	--	- -	For requirements on undeveloped lands, see paragraphs 11a and c of Federal Air Highway Program Manual, Volume 9, Chapter 7, Section 3.
E (Exterior)		43 40	55	52	Residencies, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

* Source: FHWA Report "A Field Review of the Highway Traffic Noise Impact Identification and Mitigation Decisionmaking Processes" (Appendix B, Table 5)

PORT JERSEY/MOTBY

Existing noise levels in the study area were obtained from the Bayonne Extension Project which examined the impacts of extending the Hudson-Bergen Light Rail Transit System (DEIS-NJ Transit, 1995) and addressed existing noise levels at ten sensitive receptors along the access routes affected by the project. These same receptors are anticipated to be affected by project generated traffic. The NJ Transit study was performed in 1995 and did not address additional traffic noise sources in the study area that might affect 1999 noise levels. However, based on the order of magnitude of Existing traffic volumes, the small increase in traffic volumes due to normal growth between 1995 and 1999 would not significantly change the measured noise levels. Therefore, it was assumed the measured noise levels provided in Table 3 were representative of 1999 Existing noise levels in the study area. According to the noise data in Table 3, the residential receptors in the vicinity of Port Jersey/MOTBY, although somewhat removed from the port area, experience Existing peak hour noise levels in the range of 54-67 dBA. Therefore, the residences are below the NAC of 67 dBA for Category B receptors and commercial properties are below the NAC for Category C receptors.

Table 3 Existing Peak L_{eq} Traffic Noise Levels		
LOCATION	**PEAK HOUR**	**L_{eq} (dBA) Existing**
1. End of Richard Street, by residence, at fence	AM PM	55 62
2. Bayside Avenue, halfway down street, next to first fire hydrant on the north side of road.	AM PM	57 62
3. Corner of Brown Place and Princeton Avenue, on sidewalk, by train tracks, near residence.	AM PM	60 63
4. Corner of Centre Street and Avenue E, on walkway of bridge, even with the fence line of gas station.	AM PM	64 65
5. Avenue E and East 40th Street, behind playground on path 50 feet from access road	AM PM	67 55
6. East 30th Street, across from hospital parking lot entrance.	AM PM	63 59
7. East 23rd Street and Prospect Avenue, in vacant lot, even with residential property line, 25 feet from track.	AM PM	64 54
8. Avenue E and East 21st Street apartment complex Courtyard	AM PM	62 63
9. Eighth Street LRT Stop, middle of vacant parking lot.	AM PM	72 61
10 North Street and Avenue A, in a small field on corner, even with apartment building.	AM PM	63 59

Source: Technical Report: Noise and Vibration Impact Analysis for the Bayonne Extension of the Proposed Hudson-Bergen Light Rail Transit System, for NJ Transit by Lewis S. Goodfriend & Associates

HOWLAND HOOK

Noise in the project area is affected by a variety of sources including highway and local street traffic, aircraft from nearby airports, and port operations. The focus of this study was to address the impact of project generated traffic noise on the receptors adjacent to the local site access roads. The FHWA NAC provided in Table 2 were used to assess traffic related noise impacts from port generated traffic. The Draft EIS for the Staten Island Bridges Program (USCG, 1995) provided the ambient noise data assumed to be representative of Existing Conditions at receptors near the project area off the Staten Island Expressway at the Goethals Bridge. The existing noise levels shown in Table 4 ranged from 69-73 dBA at residential receptor Sites 1 and 2 near the S.I.Expressway. These noise levels were assumed to be conservative estimates of any receptors along the local streets providing access to the Howland Hook port site which are further away from the S.I.Expressway. Based the FHWA criteria in Table 2, there is one Category B receptor, residential land use, that currently exceeds the NAC of 67 dBA. Most of the commercial receptors in the study area are currently below the NAC of 72 dBA for Category C land use. According to the local noise regulations for New York City, the existing noise levels near the project site fall into the categories of marginally acceptable and marginally unacceptable noise exposure levels.

Table 4 Howland Hook – Existing Noise Levels (1999)				
Site #	Description	Land Use	Ambient Measurement Peak Hour Leq (dBA)	
			AM	PM
1	15 Nina Ave. between Willow Road East and Wyona Avenue (NY)	Residential	69	69
2	Trailer Park Unit Number B1 adjacent to Goethals Road North between Row "B" and "C" Streets (NY)	Residential (Trailer Park)	70	73

Source: Staten Island Bridges DEIS (1995)

SOUTH BROOKLYN

Noise in the project area is affected by a variety of sources including highway and local street traffic, aircraft from nearby airports, and port operations. The Gowanus Expressway EIS study (USDOT, 1995) provided measured noise levels near the highway and on local streets and in the project area. The measured noise levels in the Gowanus EIS were assumed to be representative of existing noise levels in the South Brooklyn study area. The existing noise levels at various receptor locations are presented in Table 5, and indicated that L_{eq} noise levels ranged from 63-81 dBA in the project area. Additional noise data available from the Generic DEIS for the New York City Sludge Management Plan (Stone & Webster Engineering Corporation & Hazen Sawyer, P.C., 1991), also presented in Table 5, indicated the hourly L_{eq} noise levels at Sunset Park receptors along First, Second and Fifth Avenues ranged from 61-76 dBA, within the range of noise levels found in the Gowanus EIS study. Based the FHWA criteria in Table 2, there are no Category B receptors in the immediate South Brooklyn port area affected by the project, and most of the Category C commercial receptors would experience

Table 5
EXISTING NOISE LEVELS IN SOUTH BROOKLYN AREA (dBA)

Receptor	Type	Location	Gowanus Meters	Gowanus Feet	L_{eq} Day1	L_{eq} Day2	Time Day1	Time Day2	Day1 (minutes)	Day2 (minutes)	Additional Comments
R1	Playground	Clinton & Nelson	18.3	60	77	76	9:25	8:29	15	16	Heavy Hamilton Ave. Traffic
R2	Residential	40th St. & Third Ave.	13.1	43	81	81	1:54	11:55	16.5	18	Rooftop Location
R3	Residential/Commercial	4308 Third Ave.	13.1	43	78	79	2:18	10:29	18	18	
R4	Residential	267 50th St.	58.5	192	69	68	2:45	12:22	18	18	Side Street
R5	Residential	66th St. & Seventh Ave.	30.5	100	75	N/A	12:15	N/A	15	N/A	
R6	Residential	314 53rd St.	25	82	70	69	3:36	1:13	16.5	16	Backyard
R7	Residential	332 50th St.	54.9	180	68	67	3:11	12:46	16.5	18	Side Street
R8	Residential	457 64th St.	54.9	180	70	71	1:42	11:09	18	18	
R9	Park	66th St. (between Fourth and Fifth)	85.3	280	63	66	2:05	11:34	17	18	Leif Ericson Park
R10	Commercial	Ninth and Court Sts.	103.6	340	70	75	9:58	8:54	15	18	Local truck traffic
R11	Residential	Fourth Place and Henry St.	82.3	270	68	66	10:28	9:32	15	18	
R12	Commercial/Residential	Clinton & Mills Sts.	74.7	245	70	72	10:59	10:02	18	18	
R13	Residential	Dwight & Delavan Sts.	253	830	68	68	11:24	10:27	18	18	
R14	Residential/Commercial	598 16th St. (Third Ave. & Sixth St.)	118.9	390	75	75	12:02	4:40	18	18	Includes Third Ave. and Prospect Expressway noise
R15	Residential	138 20th St.	57.9	190	70	69	12:29	4:15	18	18	Side Street
R16	Residential	30th St. & Third Ave.	14.3	47	77	77	12:55	3:50	18	18	
R17	Hospital/Playground	Lutheran Hosp./56th St. & Second Ave	176.8	580	70	68	4:43	8:39	18	18	Day 1 - Ambulance siren
R18	Residential	324 64th St.	22.9	75	69	69	2:27	11:58	18	18	
R19	Park	Hicks & Rapelye Sts.	24.4	80	73	73	10:45	N/A	15	N/A	DiMattina Playground

Table 5
EXISTING NOISE LEVELS IN SOUTH BROOKLYN AREA (dBA)

Receptor	Type	Location	Gowanus Meters	Gowanus Feet	L_{eq} Day1	L_{eq} Day2	Time Day1	Time Day2	Day1 (minutes)	Day2 (minutes)	Additional Comments
S1	School	JHS 136	128	420	51	46	9:25	2:30	15	18	Int - Closed Window
		4004Fourth Avenue			68	65			15	18	Int - Open Window
											Day 2 - No Students present
S2	School	PS 1	70.1	230	55	51	11:15	1:22	20	18	Int - Closed Window
		309 47th Ave.,Rm327	7.6	25	74	72			20	18	Int - Open Window
											Day 2 - No Students present
S3	School	PS 314	7.6	25	43-61	N/A	9:32	N/A	10	N/A	Int - Closed Window
		59th/60th & Third Ave.			48-68		10:08		10		Int - Open Window
1	Residential	First Ave and 48th St.			72	73	-	-	-	-	-
2	Residential	2nd Ave and 47th St.			73	65	-	-	-	-	-
3	Residential	2nd Ave and 43rd St.			58	67	-	-	-	-	-
4	Residential	5th Ave and 45th St.			64	65	-	-	-	-	-

Source: Gowanus EIS (1995) 0 r1 to r19 and s1 to s3, NYCDEP Sludge Management Plan EIS (1991) Receptor 1 to 4

Table 6 2060 Benchmark Scenario Noise Levels in South Brooklyn Area (dBA)					
			Gowanus		
Receptor	Type	Location	Meters	Feet	Leq
R1	Playground	Clinton & Nelson	18.3	60	77
R2	Residential	40th St. & Third Ave.	13.1	43	82
R3	Residential/Commercial	4308 Third Ave.	13.1	43	79
R4	Residential	267 50th St.	58.5	192	69
R5	Residential	66th St. & Seventh Ave.	30.5	100	75
R6	Residential	314 53rd St.	25	82	70
R7	Residential	332 50th St.	54.9	180	68
R8	Residential	457 64th St.	54.9	180	71
R9	Park	66th St. (between Fourth and Fifth)	85.3	280	67
R10	Commercial	Ninth and Court Sts.	103.6	340	76
R11	Residential	Fourth Place and Henry St.	82.3	270	69
R12	Commercial/Residential	Clinton & Mills Sts.	74.7	245	73
R13	Residential	Dwight & Delavan Sts.	253	830	69
R14	Residential/Commercial	598 16th St. (Third Ave. & Sixth St.)	118.9	390	76
R15	Residential	138 20th St.	57.9	190	70
R16	Residential	30th St. & Third Ave.	14.3	47	78
R17	Hospital/Playground	Lutheran Hosp./56th St. & Second A	176.8	580	70
R18	Residential	324 64th St.	22.9	75	70
R19	Park	Hicks & Rapelye Sts.	24.4	80	74
S1	School	JHS 136	128	420	52
		4004Fourth Avenue			69
S2	School	PS 1	70.1	230	56
		309 47th Ave.,Rm327	7.6	25	75
S3	School	PS 314	7.6	25	62

Table 6 2060 Benchmark Scenario Noise Levels in South Brooklyn Area (dBA)					
Receptor	Type	Location	Gowanus		Leq
			Meters	Feet	
		59th/60th & Third Ave.			69
1	Residential	First Ave and 48th St.			73
2	Residential	2nd Ave and 47th St.			74
3	Residential	2nd Ave and 43rd St.			68
4	Residential	5th Ave and 45th St.			65

SOURCE: Gowanus EIS (1995) – R1 to R19 and S1 to S3/NYCDEP Sludge Management Plan EIS (1991) Receptors 1 to 4

FEIS APPENDIX B-1.12

AREAS DISTURBED BY CHANNEL CONSTRUCTION

NEW JERSEY

MANHATTAN

PORT NEWARK

FIGURE 16
PE1

FIGURE 14
NB4

ELIZABETH CHANNEL

ELIZABETH PORT AUTHORITY MARINE TERMINAL

HUDSON RIVER

FIGURE 3
PJ5

PORT JERSEY CHANNEL

FIGURE 2
PJ4

SPE1
FIGURE 15

NEWARK BAY

SOUTH ELIZABETH CHANNEL

FIGURE 13
NB2

FIGURE 12
NB1

KVK3
FIGURE 4

FIGURE 5
KVK6

FIGURE 10
AK3

FIGURE 9
AK2

FIGURE 6
KVK8

KVK9
FIGURE 7

FIGURE 11
AK4

BROOKLYN

UPPER BAY

AK1
FIGURE 8

SHOOTERS ISLAND

KILL VAN KULL

HOWLAND HOOK MARINE TERMINAL

ARTHUR KILL

STATEN ISLAND

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New York District Corps of Engineers
New York, New York

FIGURE 1
DISTURBED LITTORAL AND SUBLITTORAL ZONES

DIAGRAM OF FIGURE LOCATIONS

NY & NJ HARBOR NAVIGATION STUDY

DECEMBER 1999

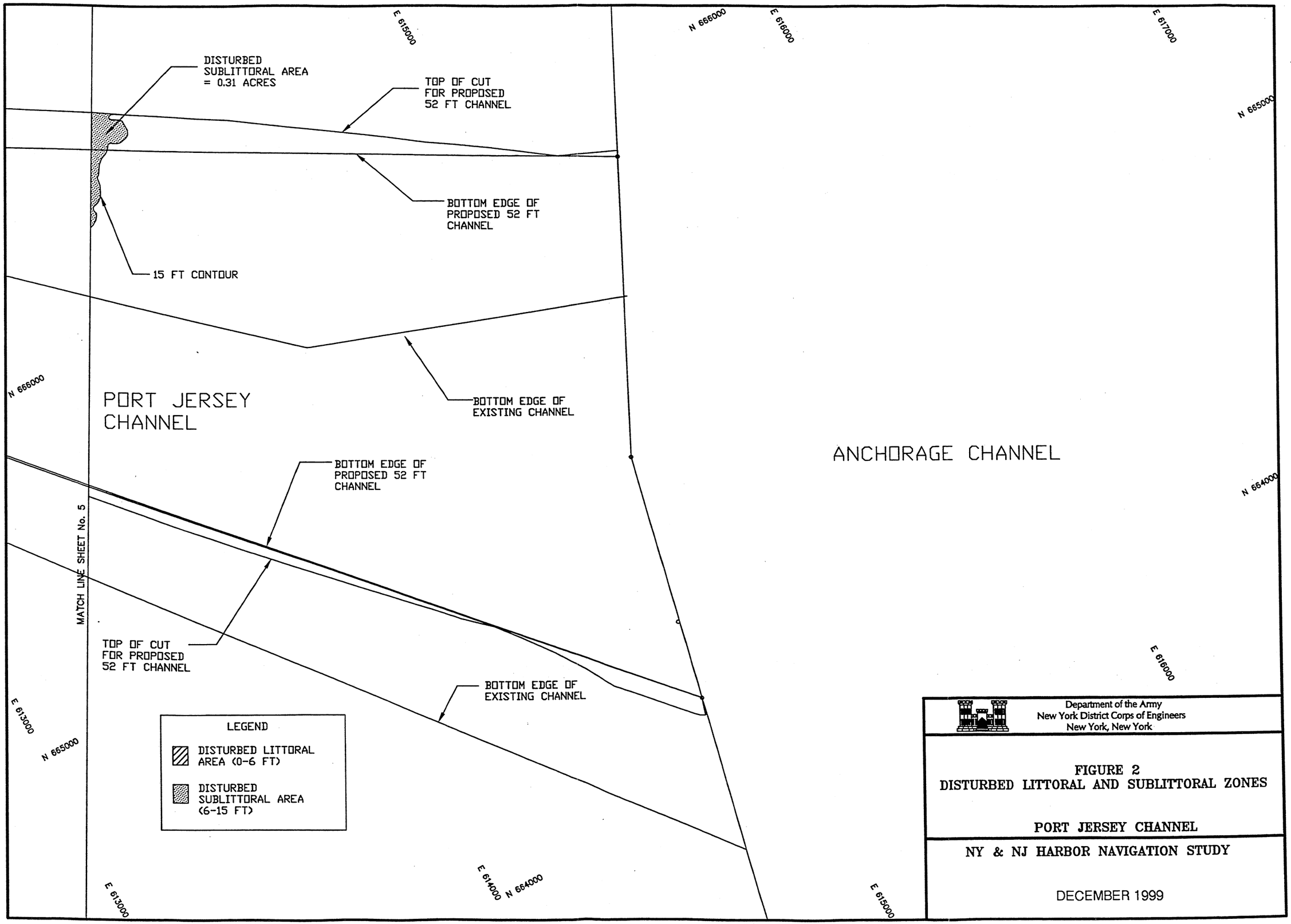

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FIGURE 2
DISTURBED LITTORAL AND SUBLITTORAL ZONES

PORT JERSEY CHANNEL

NY & NJ HARBOR NAVIGATION STUDY

DECEMBER 1999

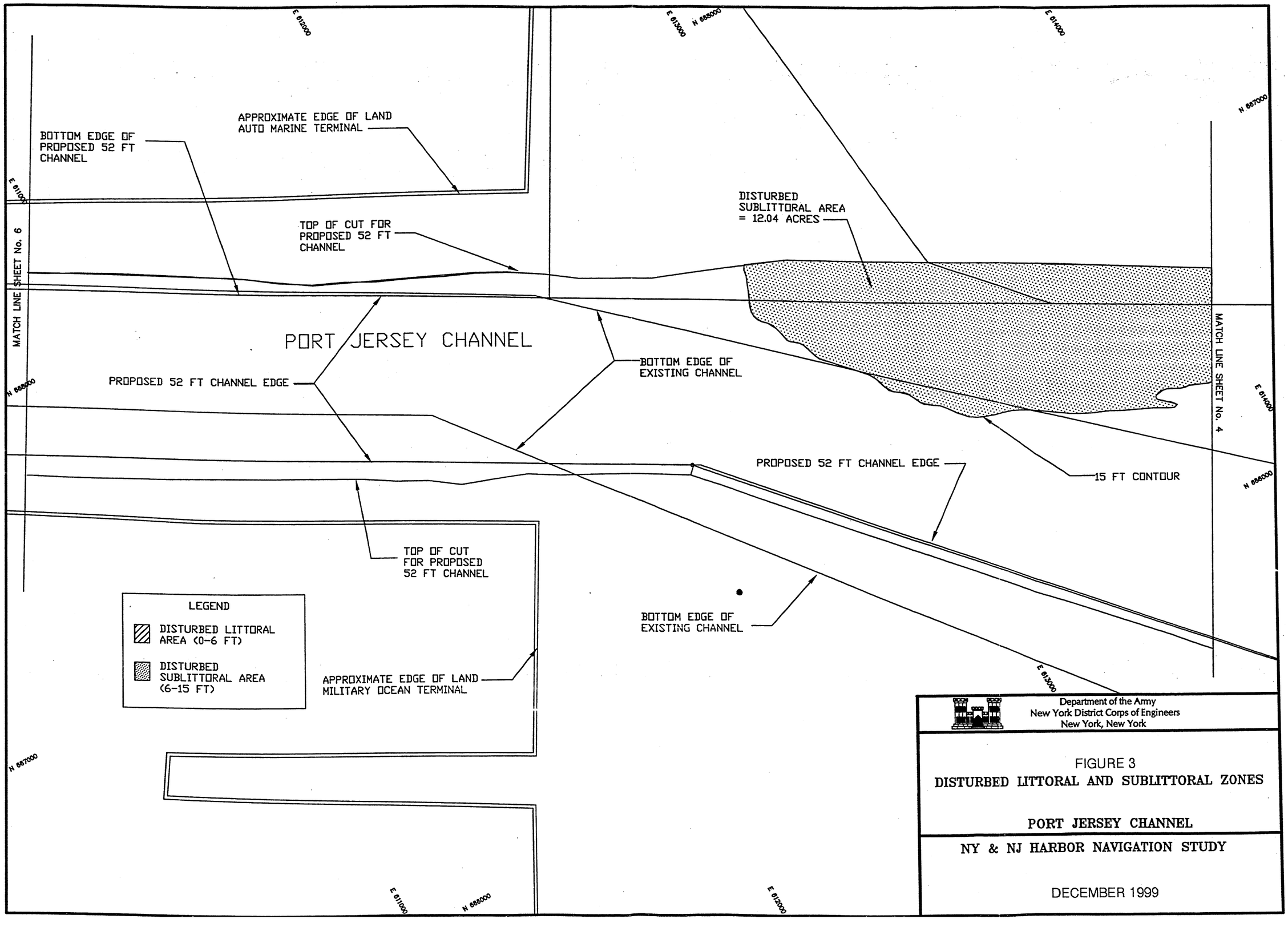

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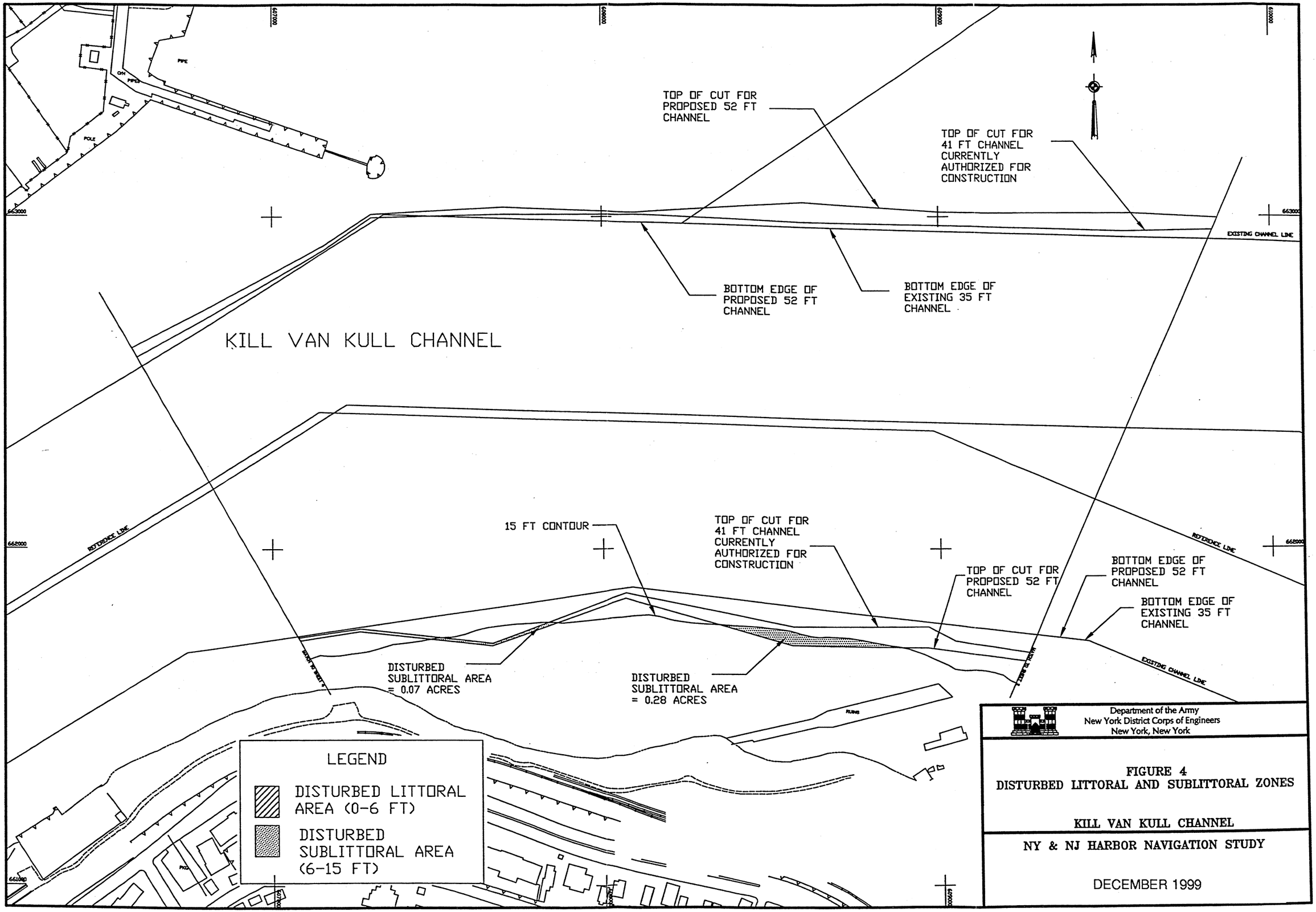
FIGURE 3

DISTURBED LITTORAL AND SUBLITTORAL ZONES

PORT JERSEY CHANNEL

NY & NJ HARBOR NAVIGATION STUDY

DECEMBER 1999



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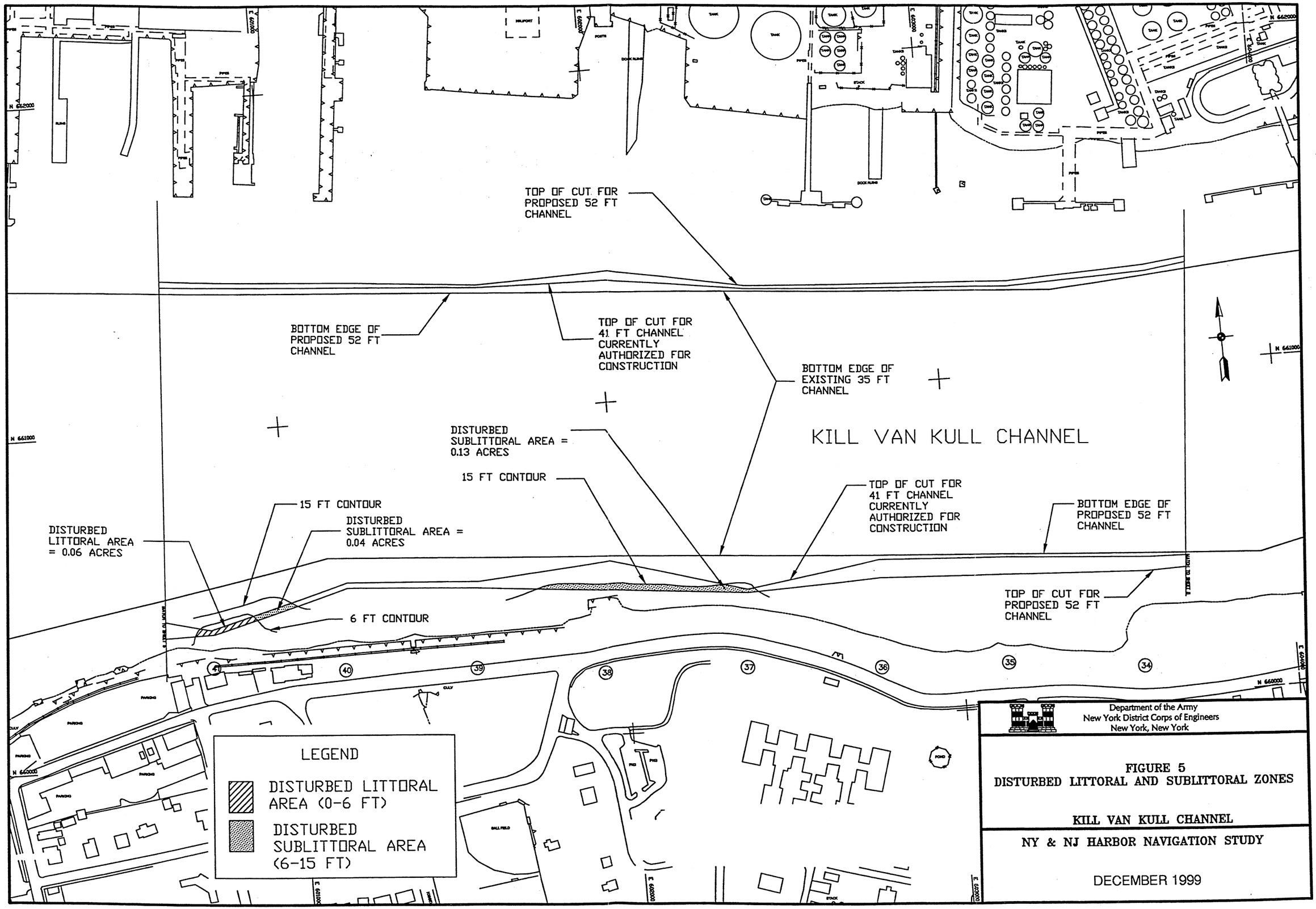
New York, New York

FIGURE 4
DISTURBED LITTORAL AND SUBLITTORAL ZONES

KILL VAN KULL CHANNEL

NY & NJ HARBOR NAVIGATION STUDY

DECEMBER 1999


TOP OF CUT FOR PROPOSED 52 FT CHANNEL
BOTTOM EDGE OF PROPOSED 52 FT CHANNEL
TOP OF CUT FOR 41 FT CHANNEL CURRENTLY AUTHORIZED FOR CONSTRUCTION
BOTTOM EDGE OF EXISTING 35 FT CHANNEL
KILL VAN KULL CHANNEL
DISTURBED SUBLITTORAL AREA = 0.13 ACRES
15 FT CONTOUR
TOP OF CUT FOR 41 FT CHANNEL CURRENTLY AUTHORIZED FOR CONSTRUCTION
BOTTOM EDGE OF PROPOSED 52 FT CHANNEL
15 FT CONTOUR
DISTURBED SUBLITTORAL AREA = 0.04 ACRES
DISTURBED LITTORAL AREA = 0.06 ACRES
6 FT CONTOUR
TOP OF CUT FOR PROPOSED 52 FT CHANNEL
LEGEND
DISTURBED LITTORAL AREA (0-6 FT)
DISTURBED SUBLITTORAL AREA (6-15 FT)
Department of the Army
New York District Corps of Engineers
New York, New York
FIGURE 5
DISTURBED LITTORAL AND SUBLITTORAL ZONES
KILL VAN KULL CHANNEL
NY & NJ HARBOR NAVIGATION STUDY
DECEMBER 1999

TOP OF CUT FOR PROPOSED 52 FT CHANNEL

TOP OF CUT FOR 41 FT CHANNEL CURRENTLY AUTHORIZED FOR CONSTRUCTION

BOTTOM EDGE OF PROPOSED 52 FT CHANNEL

BOTTOM EDGE OF EXISTING 35 FT CHANNEL

DISTURBED SUBLITTORAL AREA = 0.06 ACRES

15 FT CONTOUR

KILL VAN KULL CHANNEL

BOTTOM EDGE OF PROPOSED 52 FT CHANNEL

TOP OF CUT FOR PROPOSED 52 FT CHANNEL

TOP OF CUT FOR 41 FT CHANNEL CURRENTLY AUTHORIZED FOR CONSTRUCTION

LEGEND

DISTURBED LITTORAL AREA (0-6 FT)

DISTURBED SUBLITTORAL AREA (6-15 FT)

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New York, New York

FIGURE 6
DISTURBED LITTORAL AND SUBLITTORAL ZONES

KILL VAN KULL CHANNEL

NY & NJ HARBOR NAVIGATION STUDY

DECEMBER 1999

KILL VAN KULL
CHANNEL

15 FT CONTOUR

TOP OF CUT FOR
PROPOSED 52 FT
CHANNEL

BOTTOM EDGE OF
PROPOSED 52 FT
CHANNEL

BOTTOM EDGE OF
EXISTING 35 FT
CHANNEL

DISTURBED
SUBLITTORAL AREA =
0.62 ACRES

TOP OF CUT FOR
41 FT CHANNEL
CURRENTLY
AUTHORIZED FOR
CONSTRUCTION

DISTURBED
SUBLITTORAL AREA =
0.21 ACRES

TOP OF CUT FOR
41 FT CHANNEL
CURRENTLY
AUTHORIZED FOR
CONSTRUCTION

15 FT CONTOUR

BOTTOM EDGE OF
PROPOSED 52 FT
CHANNEL

TOP OF CUT FOR
PROPOSED 52 FT
CHANNEL

LEGEND

DISTURBED LITTORAL
AREA (0-6 FT)

DISTURBED
SUBLITTORAL AREA
(6-15 FT)

Department of the Army
New York District Corps of Engineers
New York, New York

FIGURE 7
DISTURBED LITTORAL AND SUBLITTORAL ZONES

KILL VAN KULL CHANNEL

NY & NJ HARBOR NAVIGATION STUDY

DECEMBER 1999

15 FT CONTOUR

6 FT CONTOUR

DISTURBED SUBLITTORAL AREA = 0.07 ACRES

DISTURBED LITTORAL AREA = 0.33 ACRES

BOTTOM EDGE OF PROPOSED 52 FT CHANNEL

TOP OF CUT FOR PROPOSED 52 FT CHANNEL

NEWARK BAY ENTRANCE CHANNEL

APPROX LOCATION OF DIKE REMAINS

TOP OF CUT FOR 41 FT CHANNEL CURRENTLY AUTHORIZED FOR CONSTRUCTION

BOTTOM EDGE OF EXISTING 35 FT CHANNEL

15 FT CONTOUR

BOTTOM EDGE OF PROPOSED 52 FT CHANNEL

ARTHUR KILL CHANNEL

6 FT CONTOUR

TOP OF CUT FOR 41 FT CHANNEL CURRENTLY AUTHORIZED FOR CONSTRUCTION

DISTURBED SUBLITTORAL AREA = 0.01 ACRES

DISTURBED LITTORAL AREA = 0.12 ACRES

DISTURBED SUBLITTORAL AREA = 0.01 ACRES

DISTURBED LITTORAL AREA = 0.03 ACRES

SHOOTERS ISLAND N. Y.

TOP OF CUT FOR PROPOSED 52 FT CHANNEL

LEGEND

DISTURBED LITTORAL AREA (0-6 FT)

DISTURBED SUBLITTORAL AREA (6-15 FT)

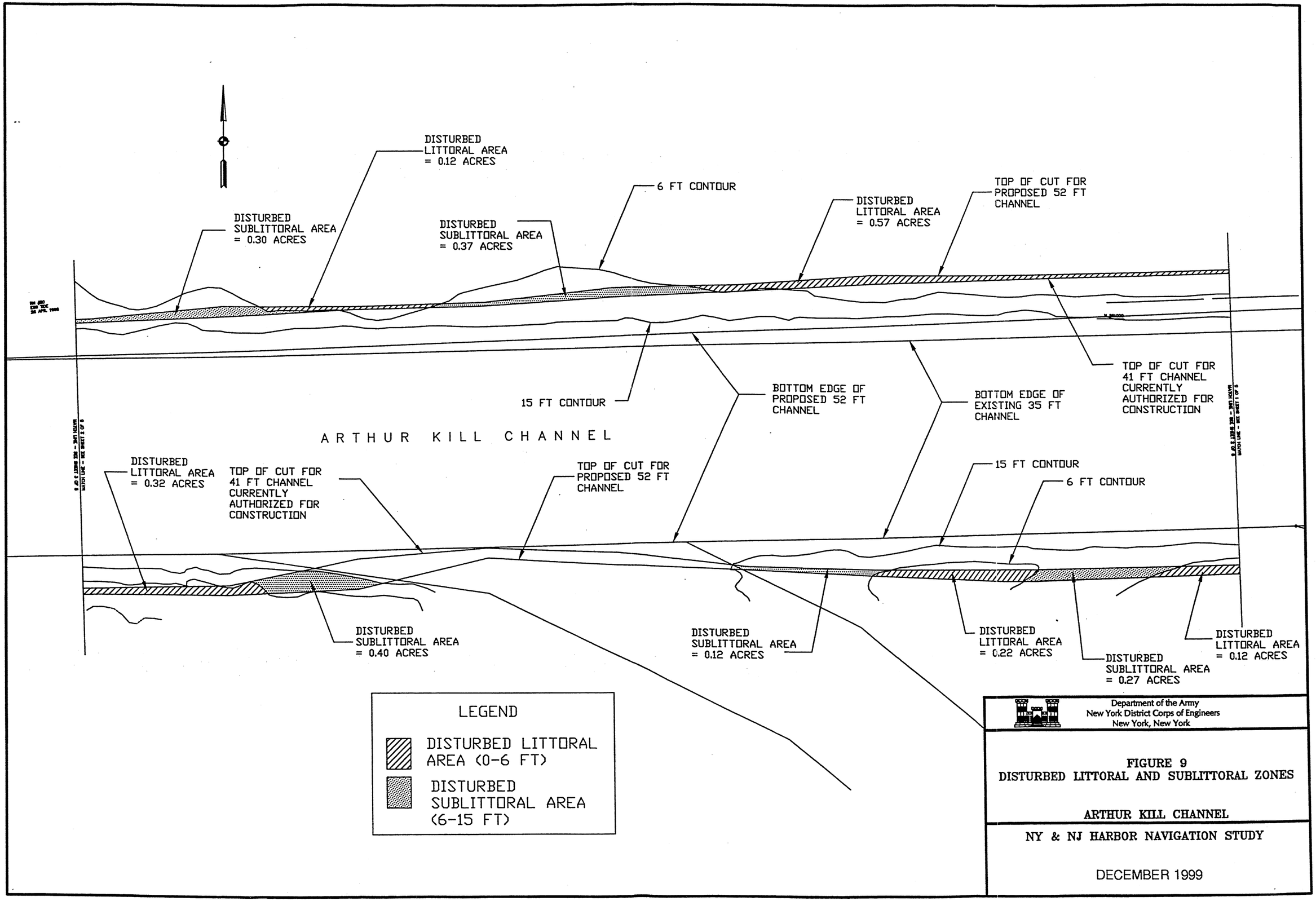
Department of the Army
New York District Corps of Engineers
New York, New York

FIGURE 8
DISTURBED LITTORAL AND SUBLITTORAL ZONES

ARTHUR KILL CHANNEL

NY & NJ HARBOR NAVIGATION STUDY

DECEMBER 1999



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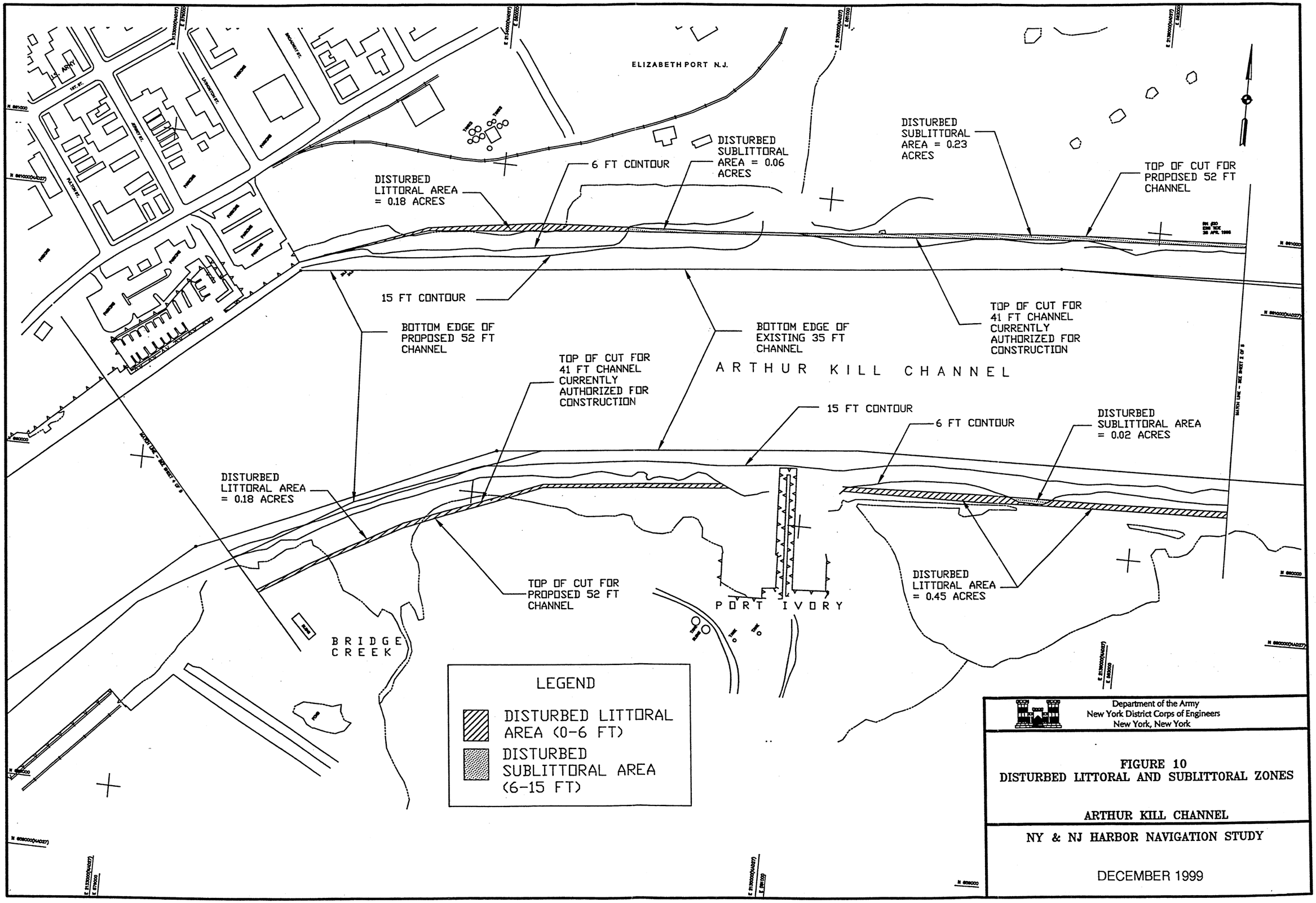
New York District Corps of Engineers
New York, New York

FIGURE 9
DISTURBED LITTORAL AND SUBLITTORAL ZONES

ARTHUR KILL CHANNEL

NY & NJ HARBOR NAVIGATION STUDY

DECEMBER 1999


ELIZABETH PORT N.J.
DISTURBED LITTORAL AREA = 0.18 ACRES
6 FT CONTOUR
DISTURBED SUBLITTORAL AREA = 0.06 ACRES
DISTURBED SUBLITTORAL AREA = 0.23 ACRES
TOP OF CUT FOR PROPOSED 52 FT CHANNEL
15 FT CONTOUR
BOTTOM EDGE OF PROPOSED 52 FT CHANNEL
TOP OF CUT FOR 41 FT CHANNEL CURRENTLY AUTHORIZED FOR CONSTRUCTION
BOTTOM EDGE OF EXISTING 35 FT CHANNEL
TOP OF CUT FOR 41 FT CHANNEL CURRENTLY AUTHORIZED FOR CONSTRUCTION
ARTHUR KILL CHANNEL
15 FT CONTOUR
6 FT CONTOUR
DISTURBED SUBLITTORAL AREA = 0.02 ACRES
DISTURBED LITTORAL AREA = 0.18 ACRES
TOP OF CUT FOR PROPOSED 52 FT CHANNEL
PORT IVORY
DISTURBED LITTORAL AREA = 0.45 ACRES
BRIDGE CREEK
LEGEND
DISTURBED LITTORAL AREA (0-6 FT)
DISTURBED SUBLITTORAL AREA (6-15 FT)
Department of the Army
New York District Corps of Engineers
New York, New York
FIGURE 10
DISTURBED LITTORAL AND SUBLITTORAL ZONES
ARTHUR KILL CHANNEL
NY & NJ HARBOR NAVIGATION STUDY
DECEMBER 1999

ELIZABETH RIVER

ELIZABETH PORT N.J.

TOP OF CUT FOR PROPOSED 52 FT CHANNEL PLAN

DISTURBED LITTORAL AREA = 0.53 ACRES

6 FT CONTOUR

BARGES

BOATS

BOTTOM EDGE OF PROPOSED 52 FT CHANNEL

15 FT CONTOUR

DISTURBED SUBLITTORAL AREA = 1.35 ACRES

BOTTOM EDGE OF EXISTING 35 FT CHANNEL

TOP OF CUT FOR 41 FT CHANNEL CURRENTLY AUTHORUZED FOR CONSTRUCTION

ARTHUR KILL CHANNEL

6 FT CONTOUR

15 FT CONTOUR

DISTURBED LITTORAL AREA = 0.06 ACRES

H O W L A N D H O O K M A R I N E T E R M I N A L

DISTURBED SUBLITTORAL AREA = 0.01 ACRES

BRIDGE CREEK

LEGEND

DISTURBED LITTORAL AREA (0-6 FT)

DISTURBED SUBLITTORAL AREA (6-15 FT)

Department of the Army
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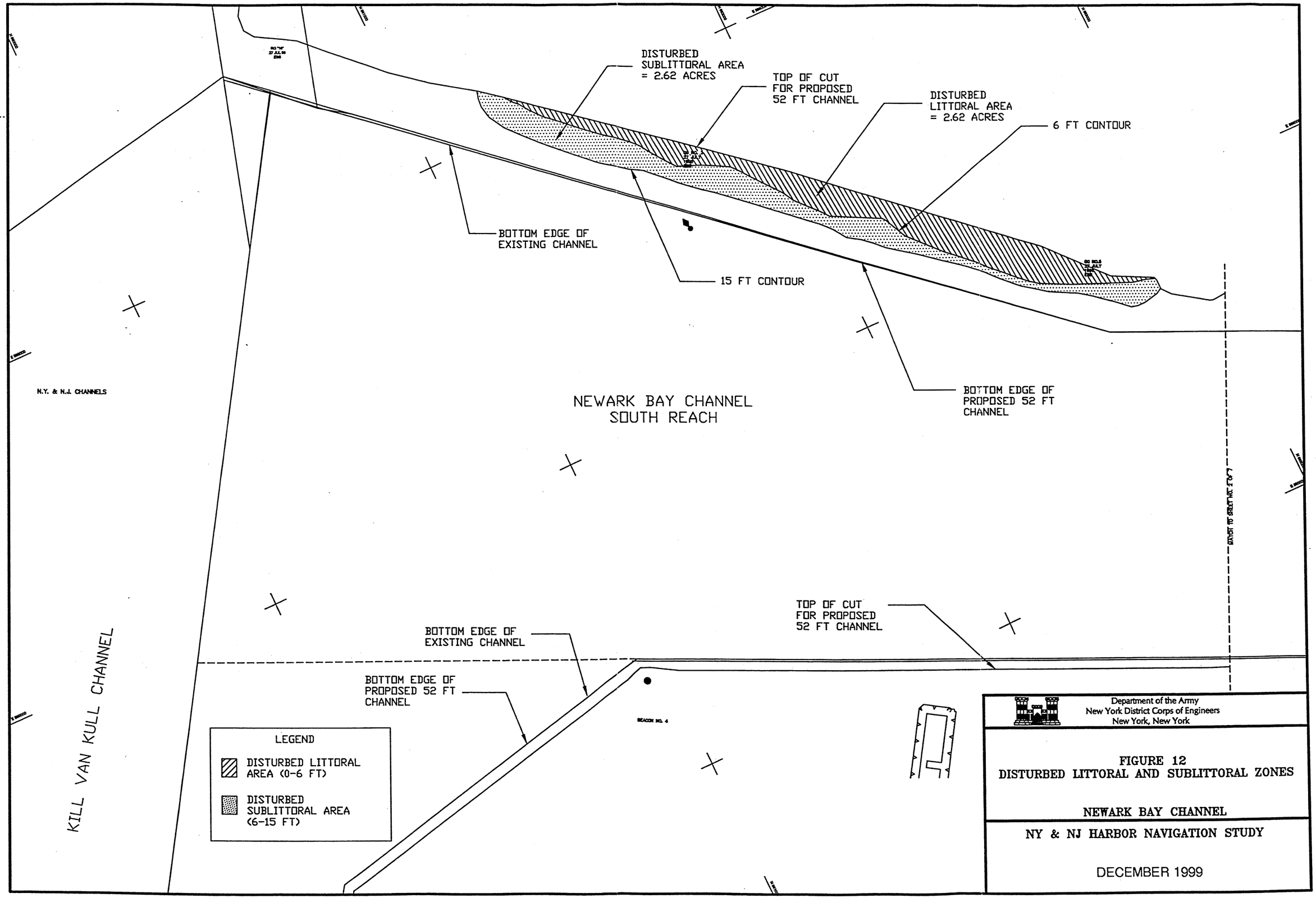
New York, New York

FIGURE 11
DISTURBED LITTORAL AND SUBLITTORAL ZONES

ARTHUR KILL CHANNEL

NY & NJ HARBOR NAVIGATION STUDY

DECEMBER 1999


DISTURBED
SUBLITTORAL AREA
= 2.62 ACRES
TOP OF CUT
FOR PROPOSED
52 FT CHANNEL
DISTURBED
LITTORAL AREA
= 2.62 ACRES
6 FT CONTOUR
BOTTOM EDGE OF
EXISTING CHANNEL
15 FT CONTOUR
BOTTOM EDGE OF
PROPOSED 52 FT
CHANNEL
N.Y. & N.J. CHANNELS
NEWARK BAY CHANNEL
SOUTH REACH
KILL VAN KULL CHANNEL
BOTTOM EDGE OF
EXISTING CHANNEL
BOTTOM EDGE OF
PROPOSED 52 FT
CHANNEL
TOP OF CUT
FOR PROPOSED
52 FT CHANNEL
BEACON NO. 4
LEGEND
DISTURBED LITTORAL
AREA (0-6 FT)
DISTURBED
SUBLITTORAL AREA
(6-15 FT)
Department of the Army
New York District Corps of Engineers
New York, New York
FIGURE 12
DISTURBED LITTORAL AND SUBLITTORAL ZONES
NEWARK BAY CHANNEL
NY & NJ HARBOR NAVIGATION STUDY
DECEMBER 1999

PORT ELIZABETH

500'

SOUTH ELIZABETH CHANNEL

150'

DISTURBED SUBLITTORAL AREA = 0.91 ACRES

BOTTOM EDGE OF PROPOSED 52 FT CHANNEL

TOP OF CUT FOR PROPOSED 52 FT CHANNEL

15 FT CONTOUR

BOTTOM EDGE OF EXISTING CHANNEL

NEWARK BAY CHANNEL
SOUTH REACH

MATCH TO SHEET NO. 1 OF 7

MATCH TO SHEET NO. 3 OF 7

LEGEND

DISTURBED LITTORAL AREA (0-6 FT)

DISTURBED SUBLITTORAL AREA (6-15 FT)

Department of the Army
New York District Corps of Engineers
New York, New York

FIGURE 13
DISTURBED LITTORAL AND SUBLITTORAL ZONES

NEWARK BAY CHANNEL

NY & NJ HARBOR NAVIGATION STUDY

DECEMBER 1999

PORT ELIZABETH

150' BERTHING AREA

ELIZABETH CHANNEL

6 FT CONTOUR

DISTURBED SUBLITTORAL AREA = 1.16 ACRES

DISTURBED LITTORAL AREA = 0.10 ACRES

TOP OF CUT FOR PROPOSED 52 FT CHANNEL

15 FT CONTOUR

1000'

BOTTOM EDGE OF PROPOSED 52 FT CHANNEL

MATCH TO SHEET NO. 3 OF 7

MATCH TO SHEET NO. 5 OF 7

NEWARK BAY CHANNEL
MIDDLE REACH

BOTTOM EDGE OF EXISTING CHANNEL

15 FT CONTOUR

DISTURBED SUBLITTORAL AREA = 3.10 ACRES

TOP OF CUT FOR PROPOSED 52 FT CHANNEL

LEGEND

DISTURBED LITTORAL AREA (0-6 FT)

DISTURBED SUBLITTORAL AREA (6-15 FT)

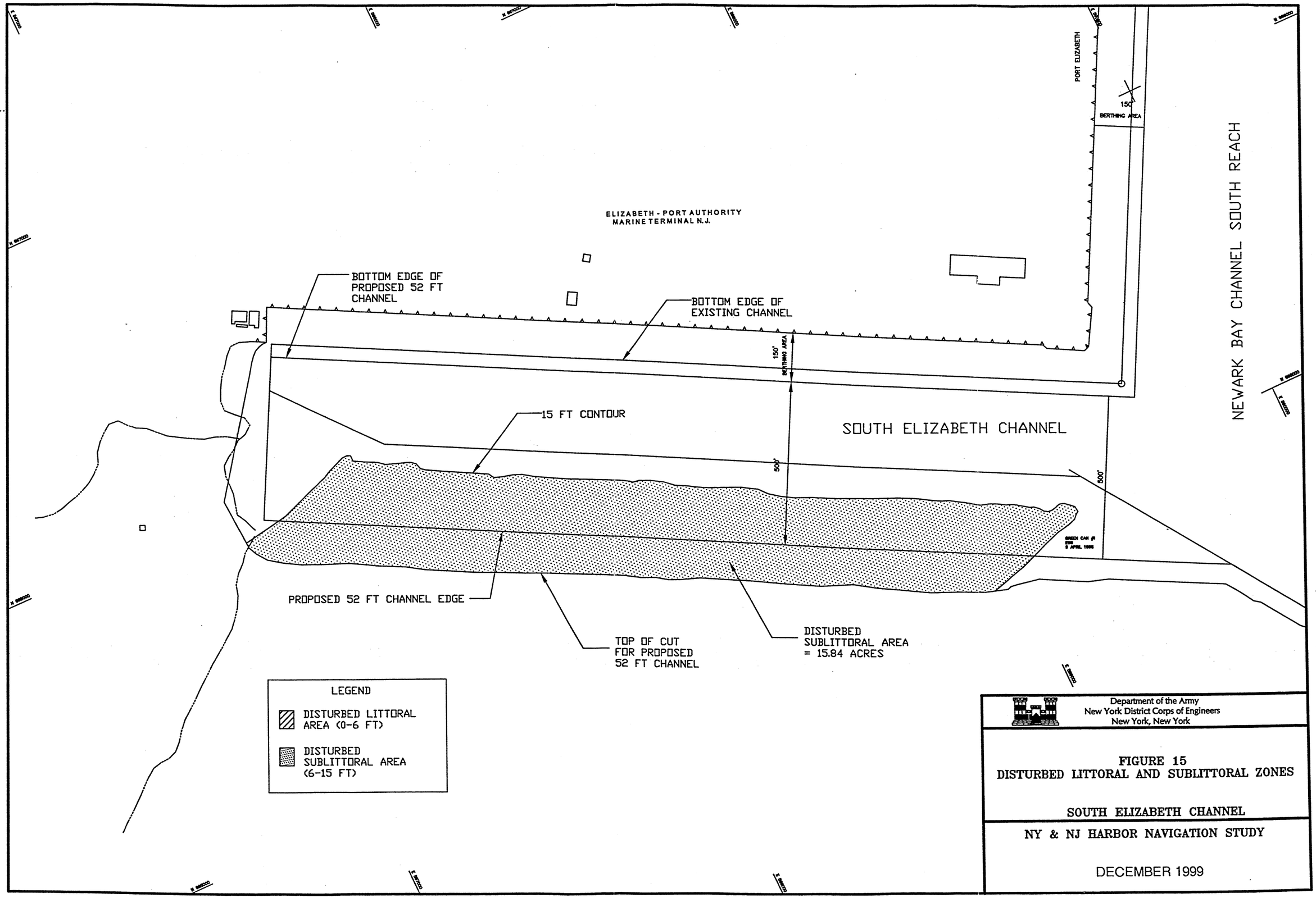
Department of the Army
New York District Corps of Engineers
New York, New York

FIGURE 14
DISTURBED LITTORAL AND SUBLITTORAL ZONES

NEWARK BAY CHANNEL

NY & NJ HARBOR NAVIGATION STUDY

DECEMBER 1999



Department of the Army
New York District Corps of Engineers
New York, New York

FIGURE 15
DISTURBED LITTORAL AND SUBLITTORAL ZONES

SOUTH ELIZABETH CHANNEL

NY & NJ HARBOR NAVIGATION STUDY

DECEMBER 1999

DISTURBED LITTORAL AREA = 0.12 ACRES

DISTURBED LITTORAL AREA = 0.05 ACRES

ENTRANCE TO NBCDF

DISTURBED LITTORAL AREA = 0.02 ACRES

6 FT CONTOUR

TOP OF CUT FOR PROPOSED 52 FT CHANNEL

DISTURBED LITTORAL AREA = 0.06 ACRES

PORT NEWARK N.J.

6 FT CONTOUR

DISTURBED SUBLITTORAL AREA = 0.71 ACRES

15 FT CONTOUR

BOTTOM EDGE OF EXISTING CHANNEL

DISTURBED SUBLITTORAL AREA = 0.71 ACRES

BOTTOM EDGE OF PROPOSED 52 FT CHANNEL

ELIZABETH CHANNEL

MATCH LINE - SEE SHEET 2 OF 3

NEWARK BAY CHANNEL MIDDLE REACH

150' BERTHING AREA

EXISTING CHANNEL EDGE

PROPOSED 52 FT CHANNEL EDGE

150' BERTHING AREA

FLOOD

ELIZABETH - PORT AUTHORITY MARINE TERMINAL N.J.

PORT ELIZABETH

LEGEND

DISTURBED LITTORAL AREA (0-6 FT)

DISTURBED SUBLITTORAL AREA (6-15 FT)

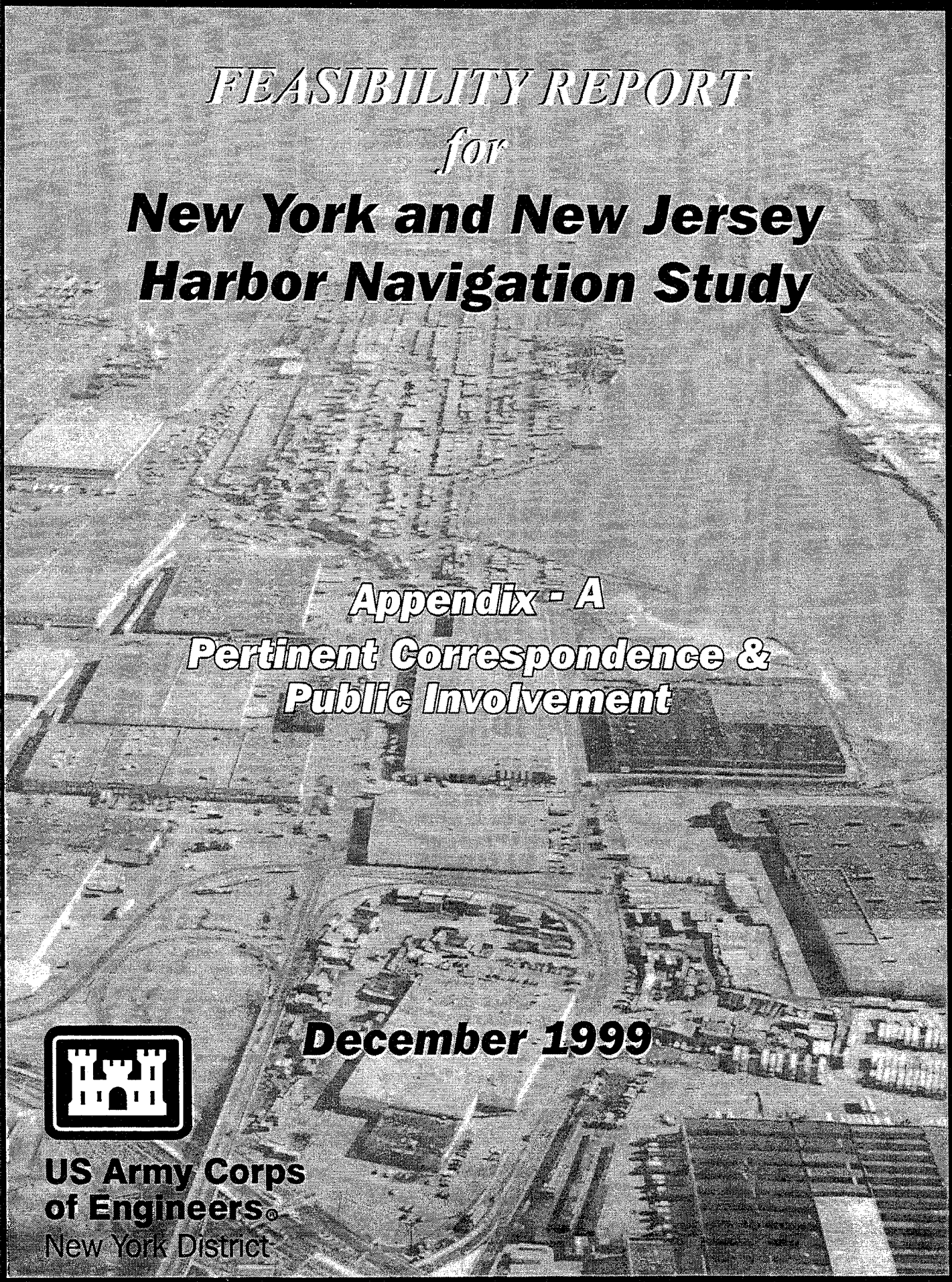
Department of the Army
New York District Corps of Engineers
New York, New York

FIGURE 16
DISTURBED LITTORAL AND SUBLITTORAL ZONES

ELIZABETH CHANNEL

NY & NJ HARBOR NAVIGATION STUDY

DECEMBER 1999



FEASIBILITY REPORT
for
New York and New Jersey Harbor Navigation Study

Appendix - A
Pertinent Correspondence & Public Involvement

December 1999

US Army Corps of Engineers®
New York District

Financial Analysis
and
Letters of Intent

New York City
Economic Development
Corporation

Seth O. Kaye
Chief of Staff

December 20, 1999

Mr. Frank Santomauro, P.E.
Chief, Planning Division
New York District, U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

Re: New York and New Jersey Harbor Navigation Study Feasibility Report

Dear Mr. Santomauro:

Further to my letter of October 25, 1999, please be advised that the New York City Economic Development Corporation (EDC) has reviewed the New York and New Jersey Harbor Navigation Study Feasibility Report Final Report and generally concurs with the findings and recommendations contained therein. In light of this, EDC fully intends to assist the project sponsors complete the necessary steps leading to the construction of the recommended project.

Sincerely,

Seth O. Kaye

cc: Gene Brickman
Tom Shea

110 William Street New York, NY 10038 212/312 3744 FAX 212/312 3918

CHRISTINE TODD WHITMAN
GOVERNOR

JAMES WEINSTEIN
COMMISSIONER

STATE OF NEW JERSEY
DEPARTMENT OF TRANSPORTATION
1035 PARKWAY AVENUE
P.O. BOX 601
TRENTON, N.J. 08625-0601
609-530-3536

PLEASE REPLY TO:
NJ MARITIME RESOURCES
PO BOX 837
TRENTON, NEW JERSEY 08625-0837
TELEPHONE: (609)984-6694
FACSIMILE: (609)984-1468

December 21, 1999

Mr. Frank Santomauro, P.E.
Chief, Planning Division
New York District
US Army Corps of Engineers
26 Federal Plaza
New York, New York 10278-0090

Dear Mr. Santomauro:

Please be advised that New Jersey Maritime Resources has reviewed the New York and New Jersey Harbor Navigation Study Feasibility Report and generally concurs with the findings and recommendations contained therein. In light of this, New Jersey Maritime Resources in cooperation with its partners at the Port Authority of New York and New Jersey and at the City and State of New York, fully intends to support the Pre-construction Engineering and Design Phase, to enter into a cost sharing agreement in support of that effort as appropriate and, ultimately, to proceed to construction of the recommended project.

Sincerely,

Frank M. McDonough
Executive Director, NJ Maritime Resources

FMM/mlw

Empire Development

Kevin S. Corbett
Chief Operating Officer,
Executive Vice-President and
Executive Deputy Commissioner

December 21, 1999

Mr. Frank Santomauro, P.E.
Chief, Planning Division
New York District, U.S. Army Corps of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0900

Dear Mr. Santomauro:

I would like this letter to serve as notification that the State of New York has reviewed the finding of the "New York and New Jersey Harbor Navigation Feasibility Study" and concurs with its findings and recommendations.

For those projects recommended in the report which are to the benefit New York, the State intends to serve as a local sponsor (in collaboration with the Port Authority of N.Y. & N.J., the State of N.J., and/or the City of New York) and to enter into cost sharing agreements with the U.S. Army Corps of Engineers leading to commencement of the Pre-construction Engineering and Design and, ultimately, construction. In the event that New York elects not to serve as the local sponsor for such projects which are to the benefit of the State, it will work to ensure that an alternate, appropriate entity acts as cost sharing local sponsor.

Let me express my gratitude for the diligent and effective work that the Corps has devoted to the Harbor Navigation Study and our expectation for a continued productive collaboration with the Corps in the future.

Sincerely,

Empire State Development Corporation
633 Third Avenue New York, New York 10017-6754 Tel 212 803 3730 Fax 212 803 3734

THE PORT AUTHORITY OF NEW YORK & NEW JERSEY

LILLIAN C. BORRONE
DIRECTOR
PORT COMMERCE DEPARTMENT

ONE WORLD TRADE CENTER, 34S
NEW YORK, NY 10048-0682

(212) 435-6001
(212) 435-6030 FAX
borrone _ l @ panynj. gov

December 9, 1999

Mr. Frank Santomauro, P.E.
Chief, Planning Division
New York District, U.S. Army Corps of Engineers
Jacob K. Javits Federal building
New York, NY 10278-0900

Dear Mr. Santomauro:

Please be advised that the Port Authority of New York and New Jersey has reviewed the New York and New Jersey Harbor Navigation Study Feasibility Report and concurs with the findings and recommendations contained therein. In light of this, the Port Authority of New York and New Jersey fully intends to enter into a cost-sharing agreement with the U.S. Army Corps of Engineers leading to commencement of the Pre-construction Engineering and Design and, ultimately, to proceed to construction of the recommended project.

Sincerely,

Lillian C. Borrone

Lillian C. Borrone
Director
Port Commerce Department

THE PORT AUTHORITY OF NEW YORK & NEW JERSEY

LILLIAN C. BORRONE
DIRECTOR
PORT COMMERCE DEPARTMENT

ONE WORLD TRADE CENTER, 34S
NEW YORK, NY 10048-0682

(212) 435-6001
(212) 435-6030 FAX
borrone_l@panynj.gov

December 17, 1999

Colonel William H. Pearce
District Engineer
Department of the Army
New York District, Corps of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0090

Dear Colonel Pearce:

I am pleased to submit herewith the Port Authority's Financial Plan for the construction of the channel improvements recommended in the NY-NJ Harbor Navigation Study Final Report.

To implement this Plan, we will seek Board authorization for the Port Authority to act as the Local Sponsor for all of the recommended improvements described in the Final Report. Prior to this, we plan to seek approval from the State of New York, the State of New Jersey, and the City of New York to enable the Port Authority to act (on their behalf) as the Local Sponsor for all channels in which they have a beneficial interest. Subject to the yet-to-be-determined provisions of the related cost recovery agreements that we plan to enter into with these parties, it is planned that Local Sponsor funds for the channel improvements would come directly from the Port Authority and indirectly from the parties above. A statement of the Port Authority's financial capability to proceed with this plan follows below. (It is recognized that the other three parties each have their own taxing and bonding capabilities. Separate financial capability statements can be provided from each of these parties, if necessary.)

The Port Authority raises the funds necessary for the improvement, construction, or acquisition of its facilities upon the basis of its own credit, taking into account its financial performance, its reserve funds and its future revenues. The Port Authority has no power to levy taxes, or assessments, and its bonds and other obligations are not the obligations of the State of New York or the State of New Jersey, and (except for the New York State Commuter Car Funds) they are not guaranteed by either of the States.

As requested by your staff, we have prepared a schedule (Attachment A) showing the planned allocation of Local Sponsor funds based on the Corps' allocation of Federal funds during the construction and based on the construction schedule outlined in the Harbor Navigation Study Final Report. These schedules illustrate dollar amounts in 1999 dollars as requested by the Corps. They also show, for each channel, which of the above named parties may be beneficiaries, and cost sharing partners, with the Port Authority. (It should also be noted that the Port Authority, the two States, and NY District USACE staff are currently working together to develop an accelerated construction schedule for these channel improvement projects. As soon as this schedule is completed, a revised and compatible financial plan will also be developed.)

Enclosed with this letter, for general information purposes, is a copy of the most recent Official Statement of the Port Authority, issued on September 22, 1999, in connection with the sale on that date of Port Authority Consolidated Bonds, One Hundred Eighteenth Series.

I trust that this information will prove satisfactory to the Secretary of the Army.

Sincerely,

Lillian C. Borrone
Director
Port Commerce Department

Enc.

OFFICIAL STATEMENT DATED SEPTEMBER 22, 1999

$100,000,000 THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY CONSOLIDATED BONDS, ONE HUNDRED EIGHTEENTH SERIES

The Bonds are direct and general obligations of The Port Authority of New York and New Jersey pledging the full faith and credit of the Port Authority for the payment of principal thereof and interest thereon. The Bonds are secured equally and ratably with all other Consolidated Bonds (which includes Consolidated Notes) heretofore or hereafter issued by a pledge of (a) the net revenues of all existing facilities of the Port Authority and any additional facilities which may hereafter be financed or refinanced in whole or in part through the medium of Consolidated Bonds, (b) the General Reserve Fund of the Port Authority equally with other obligations of the Port Authority secured by the General Reserve Fund and (c) the Consolidated Bond Reserve Fund established in connection with Consolidated Bonds. The Port Authority has no power to levy taxes or assessments. The Port Authority's bonds, notes and other obligations are not obligations of the States of New York and New Jersey or of either of them, and are not guaranteed by said States or by either of them.

Dated: September 15, 1999.

Maturities:

FIRST INSTALLMENT $46,000,000 SERIAL BONDS
Not Subject to Redemption Prior to Maturity

Principal Amount	Maturity Date	Stated Rate of Interest	Yield	Principal Amount	Maturity Date	Stated Rate of Interest	Yield
$6,500,000	September 15, 2000	3.750%	3.750%	$6,500,000	September 15, 2004	4.250%	4.450%
6,500,000	September 15, 2001	4.000	4.050	6,750,000	September 15, 2005	4.375	4.580
6,500,000	September 15, 2002	4.200	4.200	6,750,000	September 15, 2006	4.500	4.680
6,500,000	September 15, 2003	4.250	4.330				

SECOND INSTALLMENT $54,000,000 SERIAL BONDS
Subject to Redemption Prior to Maturity as Set Forth Below

Principal Amount	Maturity Date	Stated Rate of Interest	Yield	Principal Amount	Maturity Date	Stated Rate of Interest	Yield
$6,750,000	September 15, 2007	4.750%	4.780%	$6,750,000	September 15, 2011	5.125%	5.250%
6,750,000	September 15, 2008	4.750	4.880	6,750,000	September 15, 2012	5.200	5.370
6,750,000	September 15, 2009	4.900	4.900	6,750,000	September 15, 2013	5.250	5.456
6,750,000	September 15, 2010	5.000	5.180	6,750,000	September 15, 2014	5.350	5.520

Optional Redemption: The Second Installment shall be subject to redemption prior to maturity in whole, or, from time to time, in part at the Port Authority's option, on prior notice on the date to be fixed for redemption in such notice, at 101% of face value on any such date of redemption beginning on September 15, 2006 and thereafter prior to and including September 15, 2007; at 100½% of face value on any such date of redemption thereafter prior to and including September 15, 2008; and at 100% of face value on any such date of redemption thereafter prior to maturity, plus accrued interest until the date fixed for redemption.

Interest: Interest on each maturity of the Bonds shall accrue on and after September 15, 1999 until the maturity or, to the extent applicable, the prior redemption of such maturity and shall be payable semiannually commencing on March 15, 2000 and on each September 15 and March 15 thereafter until the maturity or, to the extent applicable, the prior redemption of such maturity, at the stated rate of interest per annum for such maturity.

Ratings: Each rating below reflects only the view of the ratings service issuing such rating and is not a recommendation by such ratings service to purchase, sell or hold any maturity of the Bonds or as to market price or suitability of any maturity of the Bonds for a particular investor. An explanation of the significance of a rating may be obtained from the ratings service issuing such rating. There is no assurance that any rating will continue for any period of time or that it will not be revised or withdrawn. A revision or withdrawal of a rating may have an effect on market price.

Moody's Investors Service: A1 Standard & Poor's: AA- Fitch IBCA, Inc.: AA-

Delivery: The Bonds shall be delivered upon original issuance on or about October 13, 1999, on a full book-entry basis for certain authorized purposes. (See "*Purposes,*" p. I-10, "*Denominations, Registration and Exchange,*" p. I-11, and "*Delivery,*" p. I-15.)

Legal Opinion: In connection with the delivery upon original issuance of the Bonds by the Port Authority to the underwriters, General Counsel of the Port Authority shall render a legal opinion on such date of delivery, to the effect that interest (including that portion of any original issue discount accruing in any year) on the Bonds will not be includible in gross income for Federal income tax purposes; interest (including that portion of any original issue discount accruing in any year) on the Bonds will not be treated as a preference item in calculating the Federal alternative minimum tax; and the Bonds and interest (including that portion of any original issue discount accruing in any year) thereon will be exempt from any and all taxation (except estate, inheritance and gift taxes) imposed directly thereon by the States of New York and New Jersey or by any political subdivision thereof, to the extent and as set forth in the legal opinion of General Counsel of the Port Authority. (See "*Delivery,*" p. I-15, and "*Form of Legal Opinion of General Counsel of the Port Authority,*" pp. VII-13–VII-15.) Certain legal matters will be passed upon for the underwriters by Orrick, Herrington & Sutcliffe, LLP, New York, N.Y., and McCarter & English, LLP, Newark, N.J., co-counsel to the underwriters.

This cover page contains certain information for quick reference only; it is not a summary of the terms of the Bonds. This Official Statement must be read in its entirety to obtain information essential to the making of an informed decision with respect to the Bonds. The information and expressions of opinion in this Official Statement are subject to change without notice after September 22, 1999, and future use of this Official Statement shall not otherwise create any implication that there has been no change in the matters referred to in this Official Statement since September 22, 1999.

Merrill Lynch & Co.

Attachment A ($Thousands)

CHANNEL	Possible PA Partners	Total Channel Cost	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Ambrose	ESDC															
Construction	NJS	131,463	20,744	39,210	60,674	10,835										
30/31		12,021	1,897	3,586	5,548	991										
Total Costs for cost sharing (GNF)		143,485	22,641	42,796	66,222	11,826	0	0	0	0	0	0	0	0	0	0
Federal Share of GNF		71,742	11,320	21,398	33,111	5,913	0	0	0	0	0	0	0	0	0	0
Non-Federal Share of GNF		71,742	11,320	21,398	33,111	5,913	0	0	0	0	0	0	0	0	0	0
non-cost shared Non Federal		0														
Total Costs		143,485	22,641	42,796	66,222	11,826	0	0	0	0	0	0	0	0	0	0
Anchorage	ESDC															
Construction	NJS	91,340		13,699	51,906	25,734										
30/31		10,984		1,647	6,242	3,095										
Total Costs for cost sharing (GNF)		102,323	0	15,347	58,148	28,828	0	0	0	0	0	0	0	0	0	0
Federal Share of GNF		51,162	0	7,673	29,074	14,414	0	0	0	0	0	0	0	0	0	0
Non-Federal Share of GNF		51,162	0	7,673	29,074	14,414	0	0	0	0	0	0	0	0	0	0
non-cost shared Non Federal		0														
Total Costs		102,323	0	15,347	58,148	28,828	0	0	0	0	0	0	0	0	0	0
Port Jersey	NJS															
Construction		92,838		23,072	17,889	17,889	17,889	16,098								
30/31		10,778		2,679	2,077	2,077	2,077	1,869								
Total Costs for cost sharing (GNF)		103,617	0	25,751	19,966	19,966	19,966	17,967	0	0	0	0	0	0	0	0
Federal Share of GNF		74,405	0	18,491	14,337	14,337	14,337	12,902	0	0	0	0	0	0	0	0
Non-Federal Share of GNF		29,212	0	7,260	5,629	5,629	5,629	5,065	0	0	0	0	0	0	0	0
non-cost shared Non Federal		16,819				625	5,455	10,738								
Total Costs		120,435	0	25,751	19,966	20,592	25,422	28,705	0	0	0	0	0	0	0	0
KVK	ESDC															
Construction	NJS	499,509	21,717	21,512	65,265	72,514	52,008	60,371	54,005	36,238	74,582	41,297				
30/31		52,942	2,302	2,280	6,917	7,686	5,512	6,399	5,724	3,841	7,905	4,377				
Total Costs for cost sharing (GNF)		552,451	24,018	23,792	72,182	80,199	57,520	66,770	59,728	40,079	82,487	45,674	0	0	0	0
Federal Share of GNF		276,225	12,009	11,896	36,091	40,100	28,760	33,385	29,864	20,039	41,243	22,837	0	0	0	0
Non-Federal Share of GNF		276,225	12,009	11,896	36,091	40,100	28,760	33,385	29,864	20,039	41,243	22,837	0	0	0	0
non-cost shared Non Federal		0														
Total Costs		552,451	24,018	23,792	72,182	80,199	57,520	66,770	59,728	40,079	82,487	45,674	0	0	0	0
Newark Bay	NJS															
Construction		272,740	10,895	41,592	49,745	18,408	29,949	38,053	29,176	38,766	16,156					
30/31		24,633	984	3,757	4,493	1,663	2,705	3,437	2,635	3,501	1,459					
Total Costs for cost sharing (GNF)		297,373	11,879	45,349	54,237	20,070	32,653	41,490	31,811	42,267	17,616	0	0	0	0	0
Federal Share of GNF		148,687	5,940	22,674	27,119	10,035	16,327	20,745	15,906	21,133	8,808	0	0	0	0	0
Non-Federal Share of GNF		148,687	5,940	22,674	27,119	10,035	16,327	20,745	15,906	21,133	8,808	0	0	0	0	0
non-cost shared Non Federal		61,672								8,368	32,154	21,150				
Total Costs		359,045	35,638	136,046	162,712	60,211	97,960	124,470	95,434	135,168	85,001	21,150				
Arthur Kill to Howland Hook	ESDC															
Construction	NYCEDC	296,993					30,151	38,287	22,479	22,733	22,733	38,388	32,809	36,724	46,653	6,037
30/31		31,858					3,234	4,107	2,411	2,438	2,438	4,118	3,519	3,939	5,004	648
Total Costs for cost sharing (GNF)		328,851	0	0	0	0	33,385	42,394	24,890	25,171	25,171	42,506	36,329	40,663	51,657	6,685
Federal Share of GNF		208,633	0	0	0	0	21,181	26,896	15,791	15,969	15,969	26,967	23,048	25,798	32,773	4,241
Non-Federal Share of GNF		120,218	0	0	0	0	12,205	15,498	9,099	9,202	9,202	15,539	13,281	14,865	18,884	2,444
non-cost shared Non Federal															8,379	8,379
Total Costs		328,851	0	0	0	0	33,385	42,394	24,890	25,171	25,171	42,506	36,329	40,663	60,036	15,064
Bay Ridge	ESDC															
Construction	NYCEDC	105,873						41,510	13,427	45,051	5,885					
30/31		11,925						4,675	1,512	5,074	663					
Total Costs for cost sharing (GNF)		117,798	0	0	0	0	0	46,185	14,939	50,126	6,547	0	0	0	0	0
Federal Share of GNF		73,294	0	0	0	0	0	28,737	9,295	31,188	4,074	0	0	0	0	0
Non-Federal Share of GNF		44,503	0	0	0	0	0	17,449	5,644	18,937	2,474	0	0	0	0	0
non-cost shared Non Federal									1,476	2,214	8,117					
Total Costs		117,798	0	0	0	0	0	46,185	16,415	52,339	14,665	0	0	0	0	0
Construction Total		**1,490,766**	**53,356**	**139,087**	**245,479**	**145,380**	**129,997**	**194,319**	**119,086**	**142,787**	**119,356**	**79,686**	**32,809**	**36,724**	**46,653**	**6,037**
30/31 Total		**155,141**	**5,183**	**13,948**	**25,277**	**15,510**	**13,528**	**20,487**	**12,282**	**14,855**	**12,465**	**8,495**	**3,519**	**3,939**	**5,004**	**648**
Total Costs for cost sharing (GNF)		**1,645,897**														
Federal Share of GNF		**904,148**														
Non-Federal Share of GNF		**741,749**														
non-cost shared Non Federal Total		**78,491**	**0**	**0**	**0**	**625**	**5,455**	**10,738**	**1,476**	**10,582**	**40,271**	**21,150**	**0**	**0**	**8,379**	**8,379**
Total Costs		***1,724,388***	***58,539***	***153,035***	***270,756***	***161,516***	***148,980***	***225,544***	***132,844***	***168,224***	***172,092***	***109,330***	***36,329***	***40,663***	***60,036***	***15,064***

Pertinent Correspondence Received during the Public Review Period

Parsons Brinckerhoff
One Penn Plaza
New York, NY 10119-0061
212-465-5000
Fax: 212-465-5096

November 10, 1999

Mr. Thomas J. Shea, III
Project Planner
Flood Control & Navigation Section
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

Dear Mr. Shea:

We are writing in support of the U.S. Army Corps of Engineers' recommendations in your draft Environmental Impact Statement (draft EIS) for the New York and New Jersey Harbor Navigation Study, to deepen the major channels in the New York/New Jersey Harbor to 50 feet. It is imperative that this project goes forward without delay, as our port is already faced with very severe competition both from other U.S. ports as well as the port of Halifax.

Recent technological advances in processing and beneficially utilizing dredged sediments have solved what would have been one of the project's biggest challenges, the environmentally sound disposal of dredged materials.

Today, dredged material is no longer a waste requiring disposal but a resource that can be utilized beneficially and economically for site remediation, as well as on construction projects.

It has been well documented that if this project is not implemented quickly our regional economy will suffer a major irreversible setback. The deepening of our navigation channels to 50 feet is necessary and overdue. We cannot afford to wait any longer.

Sincerely,

M. Michael Francese, P.E.
Senior Vice President
Metro District Manager

Vahan Tanal, P.E.
Vice President
Director, Marine & Coastal
Engineering Division

VT/mjr
Mmf4-#03

11-22-99P01:42 RCVD

HUDSON COUNTY
Chamber of Commerce

November 18, 1999

Mrs. Lillian C. Borrone, Director
Port Commerce Department
One World Trade Center, 34S
New York, NY 10048-0682

Dear Mrs. Borrone:

With regards to the attached correspondence sent to us on October 29th, this is to confirm the Hudson County Chamber of Commerce continued interest and support for the dredging projects as proposed by the Port Authority. Over the years, we have not only verbally supported these projects that appeared but also testified in support of them. Our major contact throughout this period of time has been Mr. Richard Codd who also serves as an executive member of our Board of Trustees at the Chamber of Commerce.

I am sorry to report that I was unable to appear at one of the meeting locations for the November 3, 4th and 8th public meetings. I would normally have appeared at the Newark meeting on November 3rd. You will see from the attached that the correspondence was sent to our former address on Summit Avenue, Jersey City and not to our current address at 253 Washington Street, Jersey City. I'm sure that this is an oversight on both our parts and I apologize for any inconvenience we may have caused you with regards to this.

Please accept this letter as our support for the Army Corps of Engineers Draft steady for the fifty-foot dredgen. In addition, I would ask that your staff make the appropriate changes for the mailings.

Best regards and wishes for a happy holiday season.

Sincerely,

Peter T.D. Murphy
President

PTDM/zm

Enclosures

253 Washington Street • Jersey City, New Jersey 07302 • 201 435-7400 • Fax 201 435-7490
Website: www.hudsonchamber.org • E-mail: info@hudsonchamber.org

Bechtel

21 East 40th Street, 6th Floor
New York, NY 10016
(212) 689-0100
Fax: (212) 689-4829

November 9, 1999

Mr. Thomas J. Shea, III
Project Planner
Flood Control & Navigation Section
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

Re: Draft Main Report and Draft Environmental Impact Statement for the New York and New Jersey Harbor Navigation Study

Dear Mr. Shea:

Bechtel Infrastructure Corporation strongly supports the Army Corps' recommendations as stated in the New York and New Jersey Harbor Navigation Study.

Sincerely yours,

Kurt A. Goddard
Vice President

Commerce and Industry Association of New Jersey
South 61 Paramus Road • PO Box 768 • Paramus, New Jersey 07653-0768
(201) 368-2100 • FAX (201) 368-3438

November 8, 1999

Mr. Thomas J. Shea III, Project Planner
Flood Control & Navigation Section
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, New York 10278

Mr. Shea:

On behalf of nearly 1,000 businesses and more than two hundred thousand employees, the Commerce and Industry Association fully supports the Army Corps' recommendation to deepen the region's ports to fifty feet.

The port deepening project is environmentally sensible as dredged materials will be used for remediation and environmental improvement at other sites. It will also enable the expanded delivery of goods by sea, thus preventing additional pollution and congestion from road and rail traffic.

The fifty-foot depth is also an economic imperative if our region is to continue to be one of the world's economic powerhouses. Every day, businesses both small and large are entering and expanding their international markets. These broadening horizons add thousands of jobs and greater opportunities at all employment levels.

There is no question that increasing the depths of our channels and harbors will be beneficial. It must be a priority project that moves ahead with all due speed.

Sincerely,

Chip Hallock
President

Railroad Construction Company, Inc.

RCC

Contractors - Engineers

75-77 Grove Street • Paterson, NJ 07503 Est. 1926 (973) 684-0362 • Fax (973) 684-1355

November 8, 1999

Mr. Thomas J. Shea, III
Project Planner
Flood Control & Navigation Section
New York District
US Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

RE: New York and New Jersey Harbor Navigational Study
Recommending Dredging Major Channels to 50-feet depth

Dear Mr. Shea,

We strongly support the findings of the Army Corp of Engineers study recommending that all major channels in the harbor be deepened to a depth of 50-feet. Fifty-foot channels are key to the Port of New York and New Jersey's ability to continue to compete and grow into the next century.

If the channels are not deepened to the fifty-foot depth, our region risks losing cargo to another port that has deeper channels. The consumers of the New York and New Jersey metropolitan region will continue to generate cargo at increasing volumes. Improvements to our port infrastructure, such as channel deepening, improve the flow of that cargo to the consumer.

Ships like the Regina Maersk that require up to 50 feet of water currently call on the port at a greatly reduced efficiency level bringing lightened loads to accommodate the current shallower channel depth. Deepening the channels in our harbor has both economic and environmental benefits for the port and the New York-New Jersey region.

Yours very truly,
Railroad Construction Co., Inc.

Alfonso Daloisio, Jr.
President

AD:pc

C:\WINWORD\RCCLTR99\Shea.doc

GYPSUM®

Continental Gypsum Company

MoreRock®
Gypsumboard Products

November 9, 1999

Mr. Thomas J. Shea, III
Project Planner
Flood Control & Navigation Section
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

Subject: Draft Environmental Impact Statement for the New York and New Jersey Harbor Navigation Study

Dear Mr. Shea:

I am in receipt of a copy of your letter dated October 15, 1999, relating to the project to deepen the Kill Van Kull/ Newark Bay channels to 50 feet.

Each month we import approximately 38 thousand metric tons of gypsum ore from Spain to our unloading facility and manufacturing plant at Port Newark. The deepening of these channels is very important to us. It is becoming increasingly important for us to bring in larger and larger cargo in order to stay competitive on costs.

We employ approximately one hundred people at our Port Newark facility and this subject is important to all of us. Thank you for you consideration.

Sincerely yours,
CONTINENTAL GYPSUM COMPANY

Rhyne Simpson, Jr.
President and Chief Executive Officer

RSjr/lf

265 Distribution Street • Port Newark, New Jersey 07114 • 973-465-0165 • Fax 973-466-9531

THE STATE CHAMBER

November 5, 1999

Mr. Thomas J. Shea, III
Project Planner - Flood Control & Navigation Section
New York District
US Army Corps of Engineers
26 Federal Plaza
New York, New York 10278

Dear Mr. Shea:

I am writing on behalf of the Board of Directors of the New Jersey Chamber of Commerce to endorse the draft recommendations contained in the New York and New Jersey Harbor Navigation Study. We have reviewed the document and are particularly pleased by the conclusion that recognizes the need to deepen channels to 50 feet; to do so is absolutely necessary if we are to remain competitive.

Our Port has faced many challenges in recent years, not the least of which was the close of the mud dump off Sandy Hook. The Corps and the Port Authority, with the cooperation of business organizations and state government, found creative ways to mitigate the loss. A positive outcome of the challenges we faced is greater awareness of the value of our Port and greater commitment to maintaining its place as the number one port on the East Coast.

The proposed fifty-foot channels will insure that the Port of NY/NJ experiences the same level of growth as competing ports, as the number of ships calling increases. In addition, the increased cargo volume will be able to arrive on ships the size of the Regina Maersk, increasing efficiency and decreasing the number of trucks needed to service our regional population. The projects recommended by the report, when completed, will directly impact our economic viability, our air quality and our overall quality of life. The investment proposed by the study is necessary and long overdue, and the Chamber supports the recommendations wholeheartedly.

Sincerely,

Joan Verplanck

JOAN VERPLANCK
President

JV:1643

NEW JERSEY CHAMBER OF COMMERCE • 216 WEST STATE STREET
TRENTON, NJ 08608 • PHONE: 609-989-7888 • FAX: 609-989-9696

NATION'S PORT

Supporting the Port of New York and New Jersey

216 West State Street • Trenton, NJ 08608

November 5, 1999

Mr. Thomas J. Shea, III
Project Planner
Flood Control & Navigation Section
New York District
US Army Corps of Engineers
26 Federal Plaza
New York, New York 10278

Dear Mr. Shea:

I am writing on behalf of Nation'sPort, a bi-state coalition of business, labor and community leaders who support investments to improve and modernize the Port of New York and New Jersey. Nation'sPort supports the findings of the newly completed New York and New Jersey Harbor Navigation Study, which was released in September.

In particular, we recognize the fact that fifty-foot channels are key to our port's ability to compete into the next century; the report's recommendation that all of the major channels in the harbor be deepened to fifty feet will secure our future.

Nation'sPort is an environmentally concerned organization that understands that economic vitality need not mean a compromised environment. We are able to strongly endorse the study's recommendations in light of the fact that the EIS component concludes that simply deepening existing channels will cause no significant environmental impacts.

Finally, we applaud the Army Corps of Engineers' pledge to work with the Port Authority and our two states to advance the completion dates for the projects identified. We feel that early completion will serve to bring the projects in under budget and will further position our port as the premier port in the country.

Sincerely,

Doug Kennedy

DOUG KENNEDY
Chairman

CITY OF

JERSEY CITY

BRET SCHUNDLER
MAYOR

CITY HALL
JERSEY CITY, NJ 07302
(201) 547-5200

November 4, 1999

Mr. Thomas J. Shea, III
Project Planner
Flood Control & Navigation Section
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York NY 10278

Dear Mr. Shea:

The City of Jersey City strongly supports the deepening of the Port Jersey channel and other Harbor channels to a 50 foot operating depth. This will greatly enhance the trade growth potential of our ports and ensure their ability to compete and thrive in to the 21st Century. Improvements to the port infrastructure serving the maritime facilities in both New York and New Jersey are vital to the economic success of the region and the preservation and increase in the job opportunities they provide to our residents.

Toward that end, we support the current efforts of the Army Corp of Engineers and urge the rapid implementation of port improvements.

Sincerely,

Bret Schundler
Mayor

BS:EJ:eb

COUNTY OF ESSEX
DEPARTMENT OF PUBLIC WORKS
DIVISION OF ENGINEERING
900 BLOOMFIELD AVENUE
VERONA, NEW JERSEY 07044-1393
☎ (973) 226-8506
🖷 (973) 226-7469

JAMES W. TREFFINGER
COUNTY EXECUTIVE
Coleen L. D'Alessandro
Director
Rajashekar R. Ravilla, P.E., P.P.
A/County Engineer
Dennis R. Sedaille
Assistant County Engineer

November 5, 1999

Mr. Thomas J. Shea, III
Project Planner
Flood Control & Navigation Section
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

Dear Mr. Shea:

I write to express my support for the recommendation that all major channels in the New York and New Jersey Harbor be deepened to 50-feet.

The New York- New Jersey metropolitan region is one of the largest and wealthiest consumer regions in the world. These consumers generate the projected cargo volumes of the future. Improvements to our port infrastructure, such as channel deepening, improve the flow of that cargo to the consumer. If we don't deepen our channels, the region risk losing cargo to another port that has deeper channels. Once at that distant port, the goods must be delivered to the consumer in our region either by rail or, more likely by truck. The result will be congestion, lower air quality and higher consumer prices. Therefore, deepening the channels in our harbor has both economic and environmental benefits for the port and the New York- New Jersey region.

Fifty-foot channels are key to the port of New York and New Jersey's ability to continue to compete and grow into the next millennium.

Sincerely,

Rajashekar R. Ravilla, P.E., P.P.
Acting County Engineer/
Deputy Director of Public Works

RRR/BH/ema

Thomas Shea

ESSEX COUNTY IS AN EQUAL OPPORTUNITY EMPLOYER

New Jersey Motor Truck Association

PORT NEWARK FIELD OFFICE 973-344-0617 FAX 973-344-6335
118 Export Street, Port Newark, NJ 07114

BI-STATE HARBOR CARRIERS CONFERENCE

November 1,1999

Mr. Thomas J. Shea III
Project Planner
Flood Control & Navigation Section
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

Dear Mr. Shea:

The Bi-State Harbor Carriers Conference is a subgroup of the New Jersey Motor Truck Association which represents motor carriers engaged primarily in the transportation of ocean going containers in the Port of New York-New Jersey. Our members provide services which include the handling of nearly 75% of the truck traffic in this port.

Since the channel deepening projects recommended by the U.S. Army Corps of Engineers will enable our port to remain competitive with other ports, it will enhance the economic and the environmental benefits to the area, and will allow this port to grow in accordance with projected future demands, we strongly urge that this project be started as soon as possible.

Very truly yours,
NJMTA-BSHCC

Dick Jones
Executive Director

OFFICE OF THE MAYOR

CITY OF BAYONNE

630 AVENUE C • BAYONNE, NEW JERSEY 07002-3898
TEL. (201) 858-6010 • FAX (201) 858-6077

JOSEPH V. DORIA, JR., *MAYOR*

October 28, 1999

Mr. Thomas J. Shea, III
Project Planner, Flood Control & Navigation Section
New York District, USACE
26 Federal Plaza, Room 2145
New York, New York 10278-0090

Re: New York/New Jersey Harbor Navigation Study Draft Main Report

Dear Mr. Shea:

I was pleased to learn the Army Corps of Engineers decided not to pursue the Bayonne-Newark Bay Canal. However, what I did find most disturbing is that the non-federal partners requested that the plan be eliminated from consideration, not the Army Corps.

I don't understand how the Army Corps of Engineers could fathom such a plan, when even the listed disadvantages far outweigh any reported advantage. The disadvantages mentioned in the report do not taken into consideration the significant disruptions of everyday life for the residents of Bayonne, nor the effect on the municipal economic structure. It does not even mention the removal of a significant portion of parkland, this at a time when we are trying to add parkland, the removal of wetlands and other natural resources as well as other environmental damages.

As I indicated in ***The Star Ledger*** on Monday, October 11, 1999, "It really is a hare-brained scheme." It is one that never should have been considered, much less get to a point where federal moneys were spent to examine it. This proposal and any similar plans will have strong opposition from the City of Bayonne, should it ever be considered again.

Sincerely,

Joseph V. Doria, Jr.
Mayor

JVD/cl

New Jersey
ALLIANCE for ACTION INC.

PHILIP K. BEACHEM
President

GERALD T. KEENAN
Vice President

CLIFFORD HEATH
Vice President

P.O. Box 6438 • Raritan Plaza II • Edison, New Jersey 08818-6438
(732) 225-1180 • FAX (732) 225-4694

ELLIS S. VIESER
President-Emeritus

November 2, 1999

Mr. Frank Santomauro, P.E.
Chief, Planning Division
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

RE: New York and New Jersey Harbor Navigation Study

Dear Mr. Santomauro:

The Alliance for Action is a non-profit, non-partisan statewide coalition of nearly 600 business, labor, professional, academic and governmental organizations. Our commitment is to improve the quality of life in New Jersey through economic progress, job creation, responsible protection of our natural resources and by cutting bureaucratic red tape that impedes those goals.

The Alliance for Action strongly supports the Army Corps of Engineers' draft recommendations that propose deepening all of the major channels in the harbor serving marine terminal facilities in both New York and New Jersey. The Alliance takes this position for several reasons:

- Fifty foot channels are key to the Port Authority of New York and New Jersey's ability to continue to compete and grow into the next century – when the continued growth of the container ships will make the channels at their current depth obsolete.
- The Harbor Navigation Study Environmental Impact Statement concludes the channel deepening projects will have no significant environmental impacts.
- Dredged material removed from the channels for deepening projects will be used either as remediation material at the Historic Area Remediation Site (the former ocean Mud Dump) or in beneficial re-use projects at upland locations.
- Ships like the Regina Maersk that require up to 50 feet of water are already calling on the port, but are operating less efficiently with lightened loads to accommodate the current shallower channel depths.
- If the channels are not deepened, the region risks losing cargo to another port, meaning consumer prices will jump because the cost to deliver goods to the area by truck or train is more expensive than on container ship.

Deepening the channels in our harbor makes both economic and environmental sense for the port and the New York-New Jersey region, which is why the Alliance for Action calls on officials to implement the Army Corps of Engineers harbor deepening recommendations as expeditiously as possible.

Sincerely,

Philip K. Beachem

Philip K. Beachem
President

Cc: Ellis S. Vieser, President-Emeritus
Gerald T. Keenan, Vice President
Clifford J. Heath, Vice President

Vanguard Pest Control Co., Inc.

November 4, 1999

Mr. Thomas J. Shea, III
Project Planner
Flood Control and Navigation Section
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, NY 10278

Dear Mr. Shea:

Thank you very much for the opportunity to comment on the Army Corps of Engineers' New York and New Jersey Harbor Navigation Study. I wholeheartedly support the Corps' recommendation to deepen all major channels in the port to fifty feet. The deepening of the port will help protect the environment and allow the Port of New York and New Jersey to continue to thrive economically.

Deepening the channels is essential to allow the Port of New York and New Jersey to compete with deeper ports. If the port channels are not deepened, larger shipping lines will be lured to other ports with deeper channels. Cargo will then need to be shipped by truck to from the distant port to the New York-New Jersey region. Such shipments will result in greater road congestion, increased greenhouse gas emissions and higher consumer prices. Channel deepening will allow cargo to reach New York and New Jersey consumers in a less costly, more environmentally friendly manner.

In addition to the cleaner air associated with the dredging project, the dredged material will be used in a beneficial manner. It will either be used as remediation material at the Historic Area Remediation Site or in beneficial re-use projects at upland locations.

Again, thanks for the opportunity to comment. The deepening of the major channels in the port -- Ambrose Channel, Anchorage Channel, Port Jersey Channel, Kill Van Kull/ Newark Bay Channels, Arthur Kill Channel; and Bay Ridge Channel -- has both economic and environmental benefits for the port and the New York-New Jersey region.

Sincerely,

Gerald Sweeney

Gerald Sweeney
President

P. O. Box 1286 • Newark, New Jersey 07101 • (201) 344-9100 • Fax: (201) 344-9103

Beatrice A. De Sapio
Chair

Eugene Moore
District Manager

THE CITY OF NEW YORK
BOROUGH OF BROOKLYN
COMMUNITY BOARD #7

HOWARD GOLDEN
Borough President

November 18, 1999

Thomas J. Shea III, Project Planner
Flood Control & Navigation Section
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York. N.Y. 10278

Dear Mr. Shea:

On behalf of Community Board Seven (A board which borders the entire Bay Ridge Channel) I want to extend our support for deepening the Bay Ridge Channel. This action will have a significant economic impact on our community and it follows the Port Development planning process which is presently being undertaken by the New York Economic Development Corporation as well as the Port Authority.

Although deepening the channel is subject to rehabilitation of the South Brooklyn Marine Terminal and improved cross harbor freight movement, we feel the inclusion of the channel deepening is a strong statement for renewed interest in Brooklyn Waterfront Development and are encouraged by the proposal.

Sincerely,

Beatrice A. DeSapio
Chairperson

Eugene Moore
District Manager

CC: Hon. Howard Golden, Borough President
Hon. Angel Rodriguez, N.Y.C Council
Hon. Joan Millman, N.Y.S. Assembly
Hon. Jerry Nadler, House of Representatives

EM:nc

WRITTEN COMMENT FORM

Public Information Meeting for the
New York and New Jersey Harbor Navigation Draft Feasibility Report and Environmental Impact Statement

Please provide your written comments on the scope of work for the Draft Feasibility Report and Environmental Impact Statement below. Your comments will be used to finalize the topics and subjects included in the evaluation of potential impacts from the Recommended Plan under consideration. This form can be copied and used by multiple individuals, or a letter containing your comments can be substituted. **Comments will be accepted through November 15, 1999,** and should be addressed to:

Ms. Jenine P. Gallo
U.S. Army Corps of Engineers
Attn: CENAN-PL-EA
26 Federal Plaza
New York, NY 10278-0090
(212) 264-0912

NAME: ANDREW M^C GOVERN

ADDRESS: PO Box 327
GREAT RIVER, NY
11739

PHONE: 631 - 859 - 3138

AFFILIATION: CHAIRMAN - HARBOR SAFETY, NAVIGATION + OPERATIONS COMM.
(if any)

COMMENTS

(continue on back of this form or append additional pages as needed)

ON BEHALF OF THE ENTIRE "HARBOR OPS" COMMITTEE I AM INFORMING YOU OF OUR FULL SUPPORT AND APPROVAL OF THE PLAN, OUR ONLY WISH IS THAT IT WOULD CALL FOR EVEN DEEPER CHANNELS.

WE ARE ALSO HAPPY TO SEE THAT ONLY A SMALL PERCENTAGE OF THE MATERIAL IS NOT SUITABLE FOR HARS,

Additional Comments: HOPEFULLY THIS IS AN INDICATION THAT MOST OF THE CONTAMINATED MATERIAL HAS ALREADY BEEN REMOVED AND IS NOT BEING REPLACED.

SIGNATURE: C. M. Hoover

Congress of the United States

Washington, D.C. 20515

November 15, 1999

Colonel William H. Pearce
New York District Engineer
U.S. Army Corps of Engineers
New York, New York 10278

Dear Colonel Pearce:

We write in support of the planned channel improvements discussed in the draft feasibility report on the New York and New Jersey Harbor Navigation Study. We agree with the recommendations that the Federal entrance channels and those channels serving the marine terminal areas of Bayonne, Brooklyn, Elizabeth, Newark, and Staten Island should be dredged to depths of at least fifty feet. We urge the swift completion of the study process so that when Federal water resources legislation is considered next year we will be able to authorize the recommendations contained within the New York and New Jersey Harbor Navigation Study.

The navigation improvements evaluated by the New York District are essential to the future capacity of the bistate Port to meet the technological demands of ocean shipping and the anticipated flood of international cargo. More than 80 steamship lines call on the Port of New York and New Jersey each year, carrying over two million containers of general cargo on more than 4,500 ships. In five years, cargo volume is expected to double, and many of the ships that will carry the projected increases will be of the newer, post-Panamax generation of vessels which require deeper channels. One steamship company, Maersk Lines, is already operating such a vessel, the Regina Maersk, which must arrive at the Port with less than a full load to navigate our shallow channels.

We believe that the Nation's interest will be served by ensuring that the largest and busiest international gateway on the Eastern Seaboard is physically prepared to accommodate larger vessels and greater cargoes. To this end, the State of New York, the State of New Jersey, the City of New York, the Port Authority of New York and New Jersey, and maritime businesses are investing billions of dollars in the transportation networks that serve the Port of New York and New Jersey. Timely completion of the Harbor Navigation Study is essential to the success of these efforts.

Not only is the Port of New York and New Jersey a vital asset to the Nation, but it is also an extraordinary economic engine for the region. New jobs and services are being generated and it is estimated that 166,000 jobs are directly or indirectly attributable to the Port's commerce. We look forward to reviewing the Army Corps' final recommendations and moving forward with the important work of deepening the channels that serve the Port of New York and New Jersey. With so much at stake, we must move forward in an expeditious manner.

Sincerely,

Charles Schumer

Robert G. Torricelli

Vito Fossella

Peter King

Marge Roukema

Joseph Crowley

Michael P. Owens

Carolyn McCarthy

Donald M. Payne

Gregory W. Meeks

Bill Pascrell Jr.

Steve Rothman

Jerrold Nadler

Robert A. Menendez

Carolyn B. Maloney

Peter Frank

Ben Gilman

Eliot L. Engel

Michael P. Forbes

José E. Serrano

Rita M. Lavery

cc: Dr. Joseph Westphal, Assistant Secretary of the U.S. Army Corps of Engineers for Civil Works

Planning

WRITTEN COMMENT FORM

Public Information Meeting for the New York and New Jersey Harbor Navigation Draft Feasibility Report and Environmental Impact Statement

Please provide your written comments on the scope of work for the Draft Feasibility Report and Environmental Impact Statement below. Your comments will be used to finalize the topics and subjects included in the evaluation of potential impacts from the Recommended Plan under consideration. This form can be copied and used by multiple individuals, or a letter containing your comments can be substituted. **Comments will be accepted through November 15, 1999**, and should be addressed to:

Ms. Jenine P. Gallo
U.S. Army Corps of Engineers
Attn: CENAN-PL-EA
26 Federal Plaza
New York, NY 10278-0090
(212) 264-0912

NAME: Capt. Richard J. Schoenlank

ADDRESS: 201 Edgewater St.
United N.Y. Sandy Hook Pilots, Benevolent Association
Staten Island, New York 10305

PHONE: 718-448-3900

AFFILIATION: Marine pilot
(if any)

COMMENTS

(continue on back of this form or append additional pages as needed)

Please know that I fully endorse and support any and all efforts to responsibly dredge the channels and berths of this port. Additionally, I support the alternative methods of dredge spoils disposal in an effort to remain environmentally sensitive, yet economically realistic. The fact remains that this port - this economic engine - must be able to accommodate large dredge-draft vessels, now and in the future. Keep up the good work!

Richard J. Schoenlank

MAERSK CONTAINER SERVICE CO., INC.

December 1, 1999

Mr. Thomas Shea
U.S. Army Corps of Engineers
Room 2145
26 Federal Plaza
New York, New York 10278

Re: New York/New Jersey Harbor Navigation Study

Dear Mr. Shea:

The Maersk organization has very carefully studied the subject study, and wishes to set out its comments accordingly. We are grateful for the opportunity afforded us in that regard, and wish to thank the Corps of Engineers for providing that opportunity.

Maersk Line operates the largest fleet of container carrying vessels in the world. We serve virtually each of the globe's ocean trade routes. Amongst our container fleet we have a host of K and S class vessels, which are the largest and most technologically advanced intermodal container-carrying ships ever built. In deploying these assets, Maersk has set the standard in an industry that is ceaselessly endeavoring to optimize its relationships between capital investment, safety, environment, client satisfaction and capital return. Our comments should be considered in that light.

Our K and S class vessels, when fully laden, require fifty feet of draft to safely navigate and berth. Currently, in the North American port rotation, such vessels cannot come directly to New York/New Jersey from their European or Far Eastern deployments. Rather, they must call first at Halifax and lighten their load so as to safely enter the New York/New Jersey port. We, and many of our customers, find such a circumstance inconvenient, financially stifling, and incompatible with customary business environments we compete in throughout the world.

Giralda Farms, Madison Avenue, P.O. Box 882, Madison, NJ 07940-0882, USA
Telephone: 201-514-5000. Telex: MCI 6733476. Telecopier: 201-514-5410.

Even given the current negatives in continuing a pre-eminent presence in the Port of New York/New Jersey, our organization has made a commitment to the region and to its political, business and labor leaders, to center its commercial activity at Port Elizabeth. In doing so, we hope to generate very sizeable volumes of business that will contribute in a major way to the region's economy and vitality. Consonant with our goal of maintaining a pro-active husbandry over the environment, we will prepare for and conduct our commercial undertakings in a manner that consistently emphasizes that commitment. We will risk no slight to the environment simply to further our business goals.

We note that other interested parties submitting comments relative to the subject study, have chosen to limit the New York/New Jersey region's economic posture. They do so by suggesting that channel and berth deepening projects should be confined to Brooklyn and Bayonne. We strongly disagree with such a position, and suggest that the rationale used to justify such a narrow view fails to focus on the more salient issues of projected growth and current capital investment. Indeed, even the pro-environmental positions espoused seem to lack the science necessary to be considered compelling.

The Maersk organization supports your continued work on this matter, supports the ACE recommendations thus far advanced and urges the Army Corps of Engineers to persevere in a manner that acknowledges the economic and environmental gravity of **all** the issues revolving around this equation.

Sincerely,

R.L. SIGNORINO

Ronald L. Signorino
Director
Regulatory Affairs

Correspondence Received Prior to Circulation of the Draft Report

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

December 21, 1998

REPLY TO
ATTENTION OF
Planning Division

Mr. Kevin Corbett
Deputy Executive Director for Port Authority Affairs
Empire State Development Corporation
633 Third Avenue, 37th Floor
New York, New York 10017

Dear Mr. Corbett:

I would like to take this time to solidify our discussions from several Executive Committee Meetings concerning disposal of dredged material for the New York and New Jersey Harbor Navigation Study. As we continue to refine the project alternatives and prepare for the selection of the recommended plan, it becomes important to evaluate the data that will be available to yield the best possible cost estimates for the decision process and insure that the requirements for a feasibility report are met.

A key component of the cost estimates is the disposal of dredged material. The outstanding issues concerning dredged material are the options available for material that cannot be used for remediation purposes at the Historic Area Remediation Site and is not rock or sand. Based on the recommendations of the Dredged Material Management Plan for the Port of New York and New Jersey, I would like you to formally designate a disposal site for this material by March 15, 1999. In designating the site, I would also like to request that you provide sufficient cost backup so that we can include that information in our cost estimates.

This approach is consistent with our original agreement to use the DMMP, as a basis upon which to build the information needed to support the feasibility report. Your input will, therefore, affect the remaining course of the study. For instance, if you are not yet in a position to identify a specific site, the District needs to evaluate its options. These include stopping the study; delaying the study; or continuing to develop an array of alternative disposal schemes to which you can concur, however, this will delay the completion. It is the intention and the preference of the District to identify "one specific disposal site".

Please contact Mr. Thomas J. Shea, III, Project Planner, Flood Control and Navigation Section, at (212) 264-5570 or myself at (212) 264-0223 should you have any questions.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

CF: Mr. Andrew Genn, New York City Economic
Development Corporation

Correspondence with Executive Committee

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

December 21, 1998

REPLY TO
ATTENTION OF
Planning Division

Mr. Frank McDonough, Esquire
Director of Maritime Resources
New Jersey Commerce and Economic
Growth Commission
28 West State Street, P.O. Box 837
Trenton, New Jersey 08625-0838

Dear Mr. McDonough:

I would like to take this time to solidify our discussions from several Executive Committee Meetings concerning disposal of dredged material for the New York and New Jersey Harbor Navigation Study. As we continue to refine the project alternatives and prepare for the selection of the recommended plan, it becomes important to evaluate the data that will be available to yield the best possible cost estimates for the decision process and insure that the requirements for a feasibility report are met.

A key component of the cost estimates is the disposal of dredged material. The outstanding issues concerning dredged material are the options available for material that cannot be used for remediation purposes at the Historic Area Remediation Site and is not rock or sand. Based on the recommendations of the Dredged Material Management Plan for the Port of New York and New Jersey, I would like you to formally designate a disposal site for this material by March 15, 1999. In designating the site, I would also like to request that you provide sufficient cost backup so that we can include that information in our cost estimates.

This approach is consistent with our original agreement to use the DMMP, as a basis upon which to build the information needed to support the feasibility report. Your input will, therefore, affect the remaining course of the study. For instance, if you are not yet in a position to identify a specific site, the District needs to evaluate its options. These include stopping the study; delaying the study; or continuing to develop an array of alternative disposal schemes to which you can concur, however, this will delay the completion. It is the intention and the preference of the District to identify "one specific disposal site".

Please contact Mr. Thomas J. Shea, III, Project Planner, Flood Control and Navigation Section, at (212) 264-5570 or myself at (212) 264-0223 should you have any questions.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

December 21, 1998

REPLY TO
ATTENTION OF

Planning Division

Mr. Thomas Wakeman
Port Commerce Department
Port Authority of New York & New Jersey
One World Trade Center, Room 34S
New York, NY 10048-0682

Dear Mr. Wakeman:

I would like to take this time to solidify our discussions from several Executive Committee Meetings concerning disposal of dredged material for the New York and New Jersey Harbor Navigation Study. As we continue to refine the project alternatives and prepare for the selection of the recommended plan, it becomes important to evaluate the data that will be available to yield the best possible cost estimates for the decision process and insure that the requirements for a feasibility report are met.

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Please contact Mr. Thomas J. Shea, III, Project Planner, Flood Control and Navigation Section, at (212) 264-5570 or myself at (212) 264-0223 should you have any questions.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

THE PORT AUTHORITY OF NEW YORK & NEW JERSEY

PORT COMMERCE DEPARTMENT
ONE WORLD TRADE CENTER
NEW YORK, NY 10048-0682

(212) 435-7000
(973) 961-6600

March 17, 1999

Mr. Frank Santomauro, P.E.
Chief, Planning Division
New York District, U.S. Army Corps of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0900

Subject: Dredged Material Disposal Option For The New York and New Jersey Harbor Navigation Study

Dear Mr. Santomauro:

This is in response to your letter of December 21, 1998 in which you requested the designation of a disposal site for dredged material for the New York and New Jersey Harbor Navigation Study. Utilizing information contained in the draft Dredged Material Management Plan (DMMP), we have conducted a thorough evaluation of volumes of material and potential disposal sites in the region. The goal of the Port Authority and the States of New York and New Jersey, as the non-federal sponsors of the Study, is to provide the Corps with the least cost, environmentally acceptable disposal option for material to be generated from construction resulting from the Harbor Navigation Study. Our evaluation also considered and satisfied the disposal needs for concurrent annual maintenance dredging by the Corps and others, as well as material to be generated by upcoming federal channel deepening projects.

The overall preferred management method for disposal of dredged material is beneficial use for site remediation, landfill closure, construction and HARS remediation. Recognizing that sufficient capacity cannot be identified at this time for the Harbor Navigation study, we have designated alternate disposal capacity. These options will be constructed and utilized only as necessary to ensure continued development of our navigation channels while additional cost-effective beneficial use options come on line.

Acting in behalf of the local sponsors, I therefore designate the following disposal options for inclusion into the Harbor Navigation Study for material not suitable for HARS remediation: the construction of new confined aquatic disposal (CAD) facilities and sub-channel placement cells (SPC) in up to five designated areas of the upper portions of the inner New York Harbor (i.e. areas north of Narrows on both the New York and New Jersey sides of the Harbor). We believe that CADs/SPCs are the lowest cost environmentally acceptable disposal option. The advantages of this option are that the sites can be constructed in a relatively short time, the sites can be developed on an as-needed basis, and the sites are located in areas of close proximity to dredging sites and will not disrupt other areas of the harbor.

The total estimated disposal capacity of the five potential CAD/SPC sites is between 28 and 41 million cubic yards. This new capacity will be an addition to the 10 million cubic yards of capacity that the Port Authority plans to construct in sub channel placement cells in the Newark Bay channels, the 3 million cubic yards of capacity at the Seaboard site in South Kearny, New Jersey, and the 4 million cubic yards of capacity at the OENJ landfill remediation site in Bayonne, New Jersey. This total capacity of between 45 and 58 million cubic yards provides ample capacity for volumes generated by future deepening projects, federal and non-federal maintenance, and future projects that arise from the Harbor Navigation Study.

The designation of CADs and SPCs for disposal has been made with the understanding that other potential options for contaminated material (i.e. construction of a containment island, and/or use of existing borrow pits in the lower bay) are not currently implementable. It must be emphasized that the designation of the CAD/SPC option is not to be construed as the only future disposal option to be considered. It is, however, the lowest cost option available at this time. The non-federal sponsors, in concert with other regional stakeholders, will continue to support development of decontamination technologies and beneficial use options (i.e. remediation of brownfield sites, landfill closure, remediation of strip mines, etc.) as the CADs and SPCs are implemented. As the technologies associated with decontamination and dredged material processing and upland placement progresses and their costs become competitive with those of the CAD/SPC option, the need to create the total disposal volumes associated with the CAD/SPC option may eventually diminish.

The cost of disposal associated with the CAD and SPC option will vary among the five areas within the inner harbor that are identified in the December, 1998 draft report of the NY/NJ Harbor Partnership. The user fee at the Newark Bay Confined Disposal Facility has been set by the Port Authority at $29 per cubic yard. The per cubic yard cost estimate for use of the capacity at the planned SPCs in Newark Bay (for which a permit application has been submitted) is approximately $23 per cubic yard of material placed. It is anticipated that the per cubic yard disposal costs at the new CAD/SPCs will be roughly equivalent to those of the Port Authority projects. Additional geotechnical investigations, environmental testing, and a value engineering effort will be necessary to further refine costs for the new CAD/SPC alternatives.
Attached please find the following documentation that supports our designation of the CAD/SPC disposal option:

- Attachment 1. A list of assumptions used in volume estimates and associated disposal locations
- Attachment 2. Spreadsheets indicating estimated volumes to be dredged
- Attachment 3. A graphical representation of volumes and designated disposal sites.
- Attachment 4. Cost analysis

The Port Authority and the States of New Jersey and New York appreciate the US Army Corps of Engineers continuing efforts on the Harbor Navigation Study. We look forward to working with the Corps to complete this comprehensive plan to address the challenges, needs, and opportunities for safe and economically-efficient navigation and cargo movement through the port in an environmentally sound manner.

Sincerely,

Lillian C. Borrone
Director
Port Commerce Department

Attachments

cc: K. Corbett, F. McDonough

March 15, 1999

ATTACHMENT 1

Data Sources

1. 50-foot channel depth quantities are from CENAN 0% Design Cost Estimate Document for NY/NJ Harbor Navigation Study.

2. 50ft channel depths for planned construction estimates were utilized to accommodate harbor Navigation Study Design vessel that is –46 foot K-Class container vessel.

3. New Construction volume estimates for KVK Contracts 1-8 were derived from CENAN Engineering KVK 2005 Schedule PowerPoint Document of 10FEB99 and also include additional non-pay volumes of Rock and HARS material that were not included in that document (However, Non-HARS pay and actual volumes are the same).

4. Volumes for all contracts were spread evenly over the duration of that contract for estimating purposes.

5. NJ Maintenance volumes from data supplied by NJ Maritime resources for CY99-CY05 and NJ maintenance for CY05-CY15 from CENAN DMMP. NY/NJ and NY maintenance volumes from CENAN DMMP. Cell construction quantities from CENAN DMMP.

Assumptions used in volume estimates and associated disposal locations

1. Clean material will be used primarily to remediate the HARS in accordance with the 3 Party Letter of July 24, 1996. Where feasible, the clean material will be beneficially used for beach replenishment or used commercially

2. Rock material will be beneficially used to create artificial reefs for fish habitat in New York and New Jersey waters

3. Placement of O&M material from existing channels and berths takes precedence over placing new material from channel deepening.

4. Construction of a containment island and/or use of borrow pits in the Lower Bay are currently not implementable and are not considered.

5. The placement options for non-HARS material that were considered in this process (Koppers Seaboard site in Kearny, NJ, the Bayonne landfill remediation site, and the Subchannel Placement Cells in Newark Bay) have received permits or in the process of receiving permits. Future cost-effective upland/beneficial use options that are developed may negate the need to construct the entire planned capacity of CADs and SPCs.

ROCK MATERIAL REQUIREMENTS (mcy)

PROJECT	TOTAL	CY99	CY00	CY01	CY02	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10	CY15	Thru CY10 + CY15
DREDGING REQUIREMENTS (Rock Material):															
NEW CONSTRUCTION															
KVK Contract 1	0.280	0.042	0.112	0.112	0.014	-	-	-	-	-	-	-	-	-	0.280
KVK Contract 2	0.360	0.144	0.216	-	-	-	-	-	-	-	-	-	-	-	0.360
KVK Contract 4	0.505	-	0.202	0.278	0.025	-	-	-	-	-	-	-	-	-	0.505
KVK Contract 5	0.771	-	-	-	0.308	0.347	0.116	-	-	-	-	-	-	-	0.771
PLANNED CONSTRUCTION															
AK Contract 1 40 to 41 feet	0.264	-	0.053	0.211	-	-	-	-	-	-	-	-	-	-	0.264
AK Contract 2 40 to 41 feet	0.000	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000
AK Contract 3 40 to 41 feet	0.458	-	-	0.183	0.275	-	-	-	-	-	-	-	-	-	0.458
AK Contract 4 40 to 41 feet	0.078	-	-	-	0.031	0.047	-	-	-	-	-	-	-	-	0.078
Arthur Kill 45 feet	1.490	-	-	-	-	-	-	-	-	1.490	-	-	-	-	1.490
Kill Van Kull to 50 feet	2.262	-	-	-	-	-	-	0.377	0.377	0.377	0.377	0.377	0.377	-	2.262
Newark Bay to 50 feet	0.720	-	-	-	-	-	-	0.120	0.120	0.120	0.120	0.120	0.120	-	0.720
DREDGING REQUIREMENTS Rock Material Grand Total:	7.188	0.186	0.583	0.784	0.653	0.394	0.116	0.497	0.497	1.987	0.497	0.497	0.497	0.000	7.188

ROCK MATERIAL PLACEMENT (mcy)

	PROJECT	TOTAL	CY99	CY00	CY01	CY02	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10	CY15	Thru CY10 + CY15
	PLACEMENT CAPACITY															
FISH REEFS	*NEW CONSTRUCTION*															
	KVK Contract 1	0.280	0.042	0.112	0.112	0.014	-	-	-	-	-	-	-	-	-	0.280
	KVK Contract 2	0.360	0.144	0.216	-	-	-	-	-	-	-	-	-	-	-	0.360
	KVK Contract 4	0.505	-	0.202	0.278	0.025	-	-	-	-	-	-	-	-	-	0.505
	KVK Contract 5	0.771	-	-	-	0.308	0.347	0.116	-	-	-	-	-	-	-	0.771
	PLANNED CONSTRUCTION															
	AK Contract 1 40 to 41 feet	0.264	-	0.053	0.211	-	-	-	-	-	-	-	-	-	-	0.264
	AK Contract 2 40 to 41 feet	0.000	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000
	AK Contract 3 40 to 41 feet	0.458	-	-	0.183	0.275	-	-	-	-	-	-	-	-	-	0.458
	AK Contract 4 40 to 41 feet	0.078	-	-	-	0.031	0.047	-	-	-	-	-	-	-	-	0.078
	Arthur Kill 45 feet	1.490	-	-	-	-	-	-	-	-	1.490	-	-	-	-	1.490
	Kill Van Kull to 50 feet	2.262	-	-	-	-	-	-	0.377	0.377	0.377	0.377	0.377	0.377	-	2.262
	Newark Bay to 50 feet	0.720	-	-	-	-	-	-	0.120	0.120	0.120	0.120	0.120	0.120	-	0.720
	FISH REEFS	7.188	0.186	0.583	0.784	0.653	0.394	0.116	0.497	0.497	1.987	0.497	0.497	0.497	0.000	7.188
TOTALS	PLACEMENT CAPACITY Rock Material Grand Total:	7.188	0.186	0.583	0.784	0.653	0.394	0.116	0.497	0.497	1.987	0.497	0.497	0.497	0.000	7.188
	CAPACITY DEFICIT Total:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

HARS SUITABLE MATERIAL REQUIREMENTS (mcy)

PROJECT	TOTAL	CY99	CY00	CY01	CY02	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10	CY15	Thru CY10 + CY15
DREDGING REQUIREMENTS (HARS Material):															
NEW CONSTRUCTION															
KVK Contract 1	1.000	0.150	0.400	0.400	0.050	-	-	-	-	-	-	-	-	-	1.000
KVK Contract 2	0.400	0.160	0.240	-	-	-	-	-	-	-	-	-	-	-	0.400
KVK Contract 3	1.510	-	-	-	0.302	0.453	0.453	0.302	-	-	-	-	-	-	1.510
KVK Contract 4	0.111	-	0.044	0.061	0.006	-	-	-	-	-	-	-	-	-	0.111
KVK Contract 5	0.520	-	-	-	0.208	0.234	0.078	-	-	-	-	-	-	-	0.520
KVK Contract 6	1.982	-	0.694	1.288	-	-	-	-	-	-	-	-	-	-	1.982
KVK Contract 7	1.151	-	-	0.058	1.093	-	-	-	-	-	-	-	-	-	1.151
KVK Contract 8	1.403	-	-	-	0.070	1.193	0.140	-	-	-	-	-	-	-	1.403
PLANNED CONSTRUCTION															
AK Contract 1 40 to 41 feet	0.366	-	0.073	0.293	-	-	-	-	-	-	-	-	-	-	0.366
Port Jersey to 41 feet	0.555	0.111	0.444	-	-	-	-	-	-	-	-	-	-	-	0.555
Ambrose Channel to 50 feet	8.020	-	-	-	-	-	4.010	4.010	-	-	-	-	-	-	8.020
Anchorage Channel to 50 feet	2.040	-	-	-	-	-	1.020	1.020	-	-	-	-	-	-	2.040
Kill Van Kull to 50 feet	2.592	-	-	-	-	-	-	0.432	0.432	0.432	0.432	0.432	0.432	-	2.592
Newark Bay to 50 feet	4.122	-	-	-	-	-	-	0.687	0.687	0.687	0.687	0.687	0.687	-	4.122
Arthur Kill to 45 feet	2.295	-	-	-	-	-	-	-	-	2.295	-	-	-	-	2.295
Port Jersey to 50 feet	0.900	-	-	-	-	-	0.450	0.450	-	-	-	-	-	-	0.900
Bay Ridge/Red Hook to 50 feet	15.124	-	-	-	-	-	-	-	-	-	-	7.562	7.562	-	15.124
Claremont to 50 feet	1.580	-	-	-	-	-	-	-	-	-	-	-	-	1.580	1.580
O& M															
Federal Maintenance															
NJ Maintenance	5.085	0.000	0.807	0.000	0.900	1.650	0.270	0.890	0.093	0.093	0.093	0.129	0.159		5.085
NY & NJ Maintenance	2.890	0.000	0.000	1.145	0.000	0.000	0.300	0.241	0.241	0.241	0.241	0.241	0.241		2.890
NY Maintenance	1.420	0.000	0.065	0.500	0.080	0.000	0.065	0.118	0.118	0.118	0.118	0.118	0.118		1.420
Non-Federal Maintenance															
NJ Maintenance	0.972	0.000	0.100	0.000	0.000	0.070	0.000	0.000	0.158	0.158	0.158	0.162	0.165		0.972
NY Maintenance	5.253	0.443	0.435	0.531	0.360	0.435	0.410	0.436	0.436	0.436	0.436	0.444	0.452		5.253
CELL CONSTRUCTION															
ACDF Fine Grained	15.724	2.149	3.420	2.828	1.559	1.351	1.056	3.361	-	-	-	-	-	-	15.724
ACDF Sandy	7.880	0.000	1.646	0.758	2.531	0.432	0.272	2.241	-	-	-	-	-	-	7.880
HARS Suitable Material Supply Total:	84.896	3.013	8.368	7.862	7.159	5.818	8.524	14.188	2.166	4.461	2.166	9.775	9.817	1.580	84.896

HARS SUITABLE MATERIAL PLACEMENT (mcy)

	PROJECT	TOTAL	CY99	CY00	CY01	CY02	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10	CY15	thruCY10 + CY15
HARS Remediation (40 MCY)	*O& M*															
	Federal Maintenance															
	NJ Maintenance	5.085	0.000	0.807	0.000	0.900	1.650	0.270	0.890	0.093	0.093	0.093	0.129	0.159		5.085
	NY & NJ Maintenance	2.890	0.000	0.000	1.145	0.000	0.000	0.300	0.241	0.241	0.241	0.241	0.241	0.241		2.890
	NY Maintenance	1.420	0.000	0.065	0.500	0.080	0.000	0.065	0.118	0.118	0.118	0.118	0.118	0.118		1.420
	Non-Federal Maintenance															
	NJ Maintenance	0.972	0.000	0.100	0.000	0.000	0.070	0.000	0.000	0.158	0.158	0.158	0.162	0.165		0.972
	NY Maintenance	5.253	0.443	0.435	0.531	0.360	0.435	0.410	0.436	0.436	0.436	0.436	0.444	0.452		5.253
	CELL CONSTRUCTION															0.000
	ACDF Fine Grained	9.956	2.149	3.420	2.828	1.559	-	-	-	-	-	-	-	-		9.956
	PLANNED CONSTRUCTION															
	AK Contract 1 40 to 41 feet	0.183	-	0.037	0.147	-	-	-	-	-	-	-	-	-	-	0.183
	Port Jersey to 41 feet	0.278	0.056	0.222	-	-	-	-	-	-	-	-	-	-	-	0.278
	Kill Van Kull to 50 feet	1.296	-	-	-	-	-	-	0.216	0.216	0.216	0.216	0.216	0.216	-	1.296
	Newark Bay to 50 feet	2.061	-	-	-	-	-	-	0.344	0.344	0.344	0.344	0.344	0.344	-	2.061
	Arthur Kill to 45 feet	1.148	-	-	-	-	-	-	-	-	1.148	-	-	-	-	1.148
	Port Jersey to 50 feet	0.450	-	-	-	-	-	0.225	0.225	-	-	-	-	-	-	0.450
	NEW CONSTRUCTION															
	KVK Contract 1	1.000	0.150	0.400	0.400	0.050	-	-	-	-	-	-	-	-		1.000
	KVK Contract 2	0.400	0.160	0.240	-	-	-	-	-	-	-	-	-	-		0.400
	KVK Contract 3	1.510	-	-	-	0.302	0.453	0.453	0.302	-	-	-	-	-		1.510
	KVK Contract 4	0.111	-	0.044	0.061	0.006	-	-	-	-	-	-	-	-		0.111
	KVK Contract 5	0.520	-	-	-	0.208	0.234	0.078	-	-	-	-	-	-		0.520
	KVK Contract 6	1.982	-	0.694	1.288	-	-	-	-	-	-	-	-	-		1.982
	KVK Contract 7	1.151	-	-	0.058	1.093	-	-	-	-	-	-	-	-		1.151
	KVK Contract 8	1.403	-	-	-	0.070	1.193	0.140	-	-	-	-	-	-		1.403
	HARS Remediation (40 MCY)	39.069	2.958	6.464	6.958	4.628	4.035	1.941	2.771	1.606	2.754	1.606	1.654	1.695	0.000	39.069
BENEFICIAL USES	*CELL CONSTRUCTION*															
	ACDF Sandy	7.880	0.000	1.646	0.758	2.531	0.432	0.272	2.241	-	-	-	-	-		7.880
	ACDF Fine Grained	5.768	-	-	-	-	1.351	1.056	3.361	-	-	-	-	-		5.768
	PLANNED CONSTRUCTION															
	AK Contract 1 40 to 41 feet	0.183	-	0.037	0.147	-	-	-	-	-	-	-	-	-	-	0.183
	Port Jersey to 41 feet	0.278	0.056	0.222	-	-	-	-	-	-	-	-	-	-	-	0.278
	Ambrose Channel to 50 feet	8.020	-	-	-	-	-	4.010	4.010	-	-	-	-	-	-	8.020
	Anchorage Channel to 50 feet	2.040	-	-	-	-	-	1.020	1.020	-	-	-	-	-	-	2.040
	Kill Van Kull to 50 feet	1.296	-	-	-	-	-	-	0.216	0.216	0.216	0.216	0.216	0.216	-	1.296
	Newark Bay to 50 feet	2.061	-	-	-	-	-	-	0.344	0.344	0.344	0.344	0.344	0.344	-	2.061
	Arthur Kill to 45 feet	1.148	-	-	-	-	-	-	-	-	1.148	-	-	-	-	1.148
	Port Jersey to 50 feet	0.450	-	-	-	-	-	0.225	0.225	-	-	-	-	-	-	0.450
	Bay Ridge/Red Hook to 50 feet	15.124	-	-	-	-	-	-	-	-	-	-	7.562	7.562	-	15.124
	Claremont to 50 feet	1.580	-	-	-	-	-	-	-	-	-	-	-	-	1.580	1.580
	BENEFICIAL USES	45.827	0.056	1.905	0.905	2.531	1.783	6.583	11.417	0.560	1.707	0.560	8.122	8.122	1.580	45.827
TOTAL	HARS Suitable Material Placement	84.896	3.013	8.368	7.862	7.159	5.818	8.524	14.188	2.166	4.461	2.166	9.775	9.817	1.580	84.896
	CAPACITY DEFICIT Total:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Attachment 2

3/17/99 10:34 AM

Non-HARS MATERIAL REQUIREMENTS (mcy)

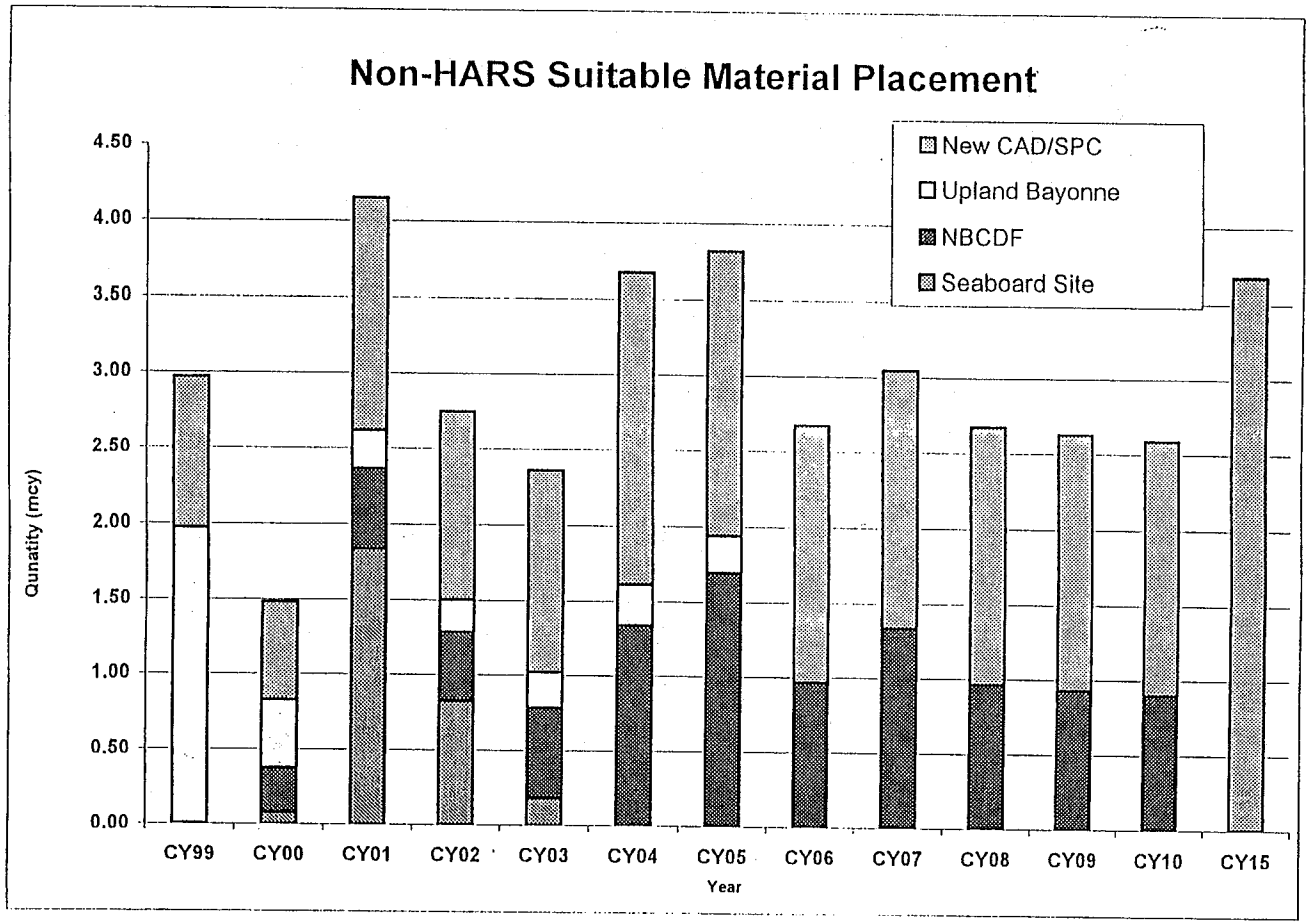
PROJECT	TOTAL	CY99	CY00	CY01	CY02	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10	CY15	Subtotal Thru CY15
DREDGING REQUIREMENTS (Non-HARS Material):															
NEW CONSTRUCTION															
KVK Contract 3	0.540	-	-	-	0.108	0.162	0.162	0.108	-	-	-	-	-	-	0.540
KVK Contract 4	0.211	-	0.084	0.116	0.011	-	-	-	-	-	-	-	-	-	0.211
KVK Contract 5	0.171	-	-	-	0.068	0.077	0.026	-	-	-	-	-	-	-	0.171
KVK Contract 6	0.611	-	0.214	0.397	-	-	-	-	-	-	-	-	-	-	0.611
KVK Contract 7	0.260	-	-	0.013	0.247	-	-	-	-	-	-	-	-	-	0.260
KVK Contract 8	0.431	-	-	-	0.022	0.366	0.043	-	-	-	-	-	-	-	0.431
PLANNED CONSTRUCTION														-	
AK Contract 1 40 to 41 feet	0.383	-	0.077	0.306	-	-	-	-	-	-	-	-	-	-	0.383
AK Contract 2 40 to 41 feet	1.129	-	-	0.847	0.282	-	-	-	-	-	-	-	-	-	1.129
AK Contract 3 40 to 41 feet	0.206	-	-	0.082	0.124	-	-	-	-	-	-	-	-	-	0.206
AK Contract 4 40 to 41 feet	0.300	-	-	-	0.120	0.180	-	-	-	-	-	-	-	-	0.300
Port Jersey to 41 feet	0.261	0.052	0.209	-	-	-	-	-	-	-	-	-	-	-	0.261
Port Jersey to 50 feet	2.100	-	-	-	-	-	1.050	1.050	-	-	-	-	-	-	2.100
Anchorage Channel to 50 feet	0.110	-	-	-	-	-	0.055	0.055	-	-	-	-	-	-	0.110
Kill Van Kull to 50 feet	1.098	-	-	-	-	-	-	0.183	0.183	0.183	0.183	0.183	0.183	-	1.098
Newark Bay to 50 feet	1.770	-	-	-	-	-	-	0.295	0.295	0.295	0.295	0.295	0.295	-	1.770
Arthur Kill to 45 feet	0.366	-	-	-	-	-	-	-	-	0.366	-	-	-	-	0.366
Claremont to 50 feet	3.670	-	-	-	-	-	-	-	-	-	-	-	-	3.670	3.670
O& M															
Federal Maintenance															
NJ Maintenance	4.305	0.000	0.000	0.601	0.300	0.150	0.280	0.642	0.487	0.487	0.487	0.451	0.421		4.305
NY & NJ Maintenance	3.900	0.000	0.000	0.550	0.200	0.200	1.000	0.325	0.325	0.325	0.325	0.325	0.325		3.900
NY Maintenance	6.774	0.580	0.550	0.550	0.819	0.379	0.509	0.565	0.565	0.565	0.565	0.565	0.565		6.774
Non-Federal Maintenance															
NJ Maintenance	5.809	1.918	0.245	0.260	0.220	0.237	0.273	0.249	0.483	0.483	0.483	0.480	0.476		5.809
NY Maintenance	4.069	0.420	0.102	0.422	0.229	0.607	0.268	0.341	0.341	0.341	0.341	0.333	0.325		4.069
DREDGING REQUIREMENTS Non-HARS Material Total:	38.474	2.970	1.481	4.144	2.750	2.358	3.666	3.813	2.679	3.045	2.679	2.631	2.590	3.670	38.474

NON-HARS MATERIAL PLACEMENT (mcy)

	PROJECT	TOTAL	CY99	CY00	CY01	CY02	CY03	CY04	CY05	CY06	CY07	CY08	CY09	CY10	CY15	Thru CY10 + CY15
Seaboard Site	AK Contract 1 40 to 41 feet	0.383	-	0.077	0.306	-	-	-	-	-	-	-	-	-	-	0.383
	AK Contract 2 40 to 41 feet	1.129	-	-	0.847	0.282	-	-	-	-	-	-	-	-	-	1.129
	AK Contract 3 40 to 41 feet	0.206	-	-	0.082	0.124	-	-	-	-	-	-	-	-	-	0.206
	AK Contract 4 40 to 41 feet	0.300	-	-	-	0.120	0.180	-	-	-	-	-	-	-	-	0.300
	Federal Maintenance															
	NJ Maintenance	0.901	0.000	0.000	0.601	0.300	-	-	-	-	-	-	-	-	-	0.901
	Seaboard Site (3.0 MCY)	2.919	0.000	0.077	1.836	0.826	0.180	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.919
In-Channel Cells Newark Bay	*NEW CONSTRUCTION*															
	KVK Contract 3	0.540	-	-	-	0.108	0.162	0.162	0.108	-	-	-	-	-	-	0.540
	KVK Contract 4	0.211	-	0.084	0.116	0.011	-	-	-	-	-	-	-	-	-	0.211
	KVK Contract 5	0.171	-	-	-	0.068	0.077	0.026	-	-	-	-	-	-	-	0.171
	KVK Contract 6	0.611	-	0.214	0.397	-	-	-	-	-	-	-	-	-	-	0.611
	KVK Contract 7	0.260	-	-	0.013	0.247	-	-	-	-	-	-	-	-	-	0.260
	KVK Contract 8	0.431	-	-	-	0.022	0.366	0.043	-	-	-	-	-	-	-	0.431
	PLANNED CONSTRUCTION														-	
	Anchorage Channel to 50 feet	0.110	-	-	-	-	-	0.055	0.055	-	-	-	-	-	-	0.110
	Kill Van Kull to 50 feet	1.098	-	-	-	-	-	-	0.183	0.183	0.183	0.183	0.183	0.183	-	1.098
	Newark Bay to 50 feet	1.770	-	-	-	-	-	-	0.295	0.295	0.295	0.295	0.295	0.295	-	1.770
	Arthur Kill to 45 feet	0.366	-	-	-	-	-	-	-	-	0.366	-	-	-	-	0.366
	Port Jersey to 50 feet	2.100	-	-	-	-	-	1.050	1.050	-	-	-	-	-	-	2.100
	FEDERAL MAINTENANCE															
	NJ Maintenance	2.332	-	-	-	-	-	-	-	0.487	0.487	0.487	0.451	0.421	-	2.332
	NBCDF (10 MCY)	10.000	0.000	0.298	0.526	0.456	0.605	1.336	1.691	0.965	1.331	0.965	0.929	0.899	0.000	10.000
Upland Bayonne	*PLANNED CONSTRUCTION*															
	Port Jersey to 41 feet	0.261	0.052	0.209	-	-	-	-	-	-	-	-	-	-	-	0.261
	Federal Maintenance															
	NJ Maintenance	0.000	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000
	Non-Federal Maintenance															
	NJ Maintenance	3.402	1.918	0.245	0.260	0.220	0.237	0.273	0.249	-	-	-	-	-	-	3.402
	Upland Bayonne (4.0 MCY)	3.663	1.970	0.454	0.260	0.220	0.237	0.273	0.249	0.000	0.000	0.000	0.000	0.000	0.000	3.663
New CAD/SPC	*O& M*															
	Federal Maintenance															
	NY & NJ Maintenance	3.900	0.000	0.000	0.550	0.200	0.200	1.000	0.325	0.325	0.325	0.325	0.325	0.325	-	3.900
	NY Maintenance	6.774	0.580	0.550	0.550	0.819	0.379	0.509	0.565	0.565	0.565	0.565	0.565	0.565	-	6.774
	Non-Federal Maintenance															
	NJ Maintenance	3.479	-	-	-	-	0.150	0.280	0.642	0.483	0.483	0.483	0.480	0.476	-	3.479
	NY Maintenance	4.069	0.420	0.102	0.422	0.229	0.607	0.268	0.341	0.341	0.341	0.341	0.333	0.325	-	4.069
	PLANNED CONSTRUCTION															
	Claremont to 50 feet	3.670	-	-	-	-	-	-	-	-	-	-	-	-	3.670	3.670
	New CAD/SPC	21.892	1.000	0.652	1.522	1.248	1.336	2.057	1.873	1.714	1.714	1.714	1.702	1.691	3.670	21.892
TOTALS	Non-HARS Placement Total:	38.474	2.970	1.481	4.144	2.750	2.358	3.666	3.813	2.679	3.045	2.679	2.631	2.590	3.670	38.474
	Non-HARS Capacity Deficit	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

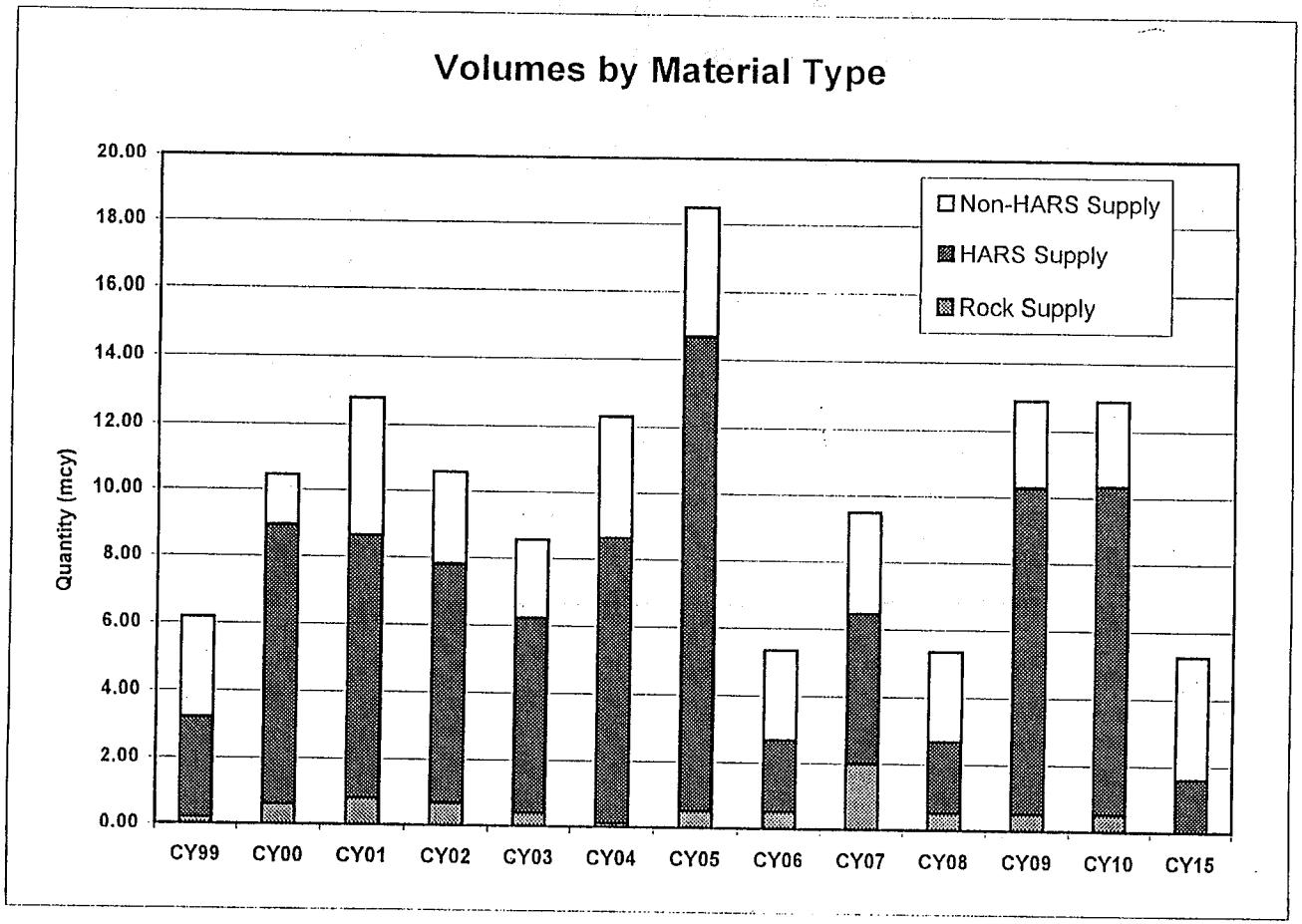
Attachment 2

3/17/99 10:26 AM



Attachment 3

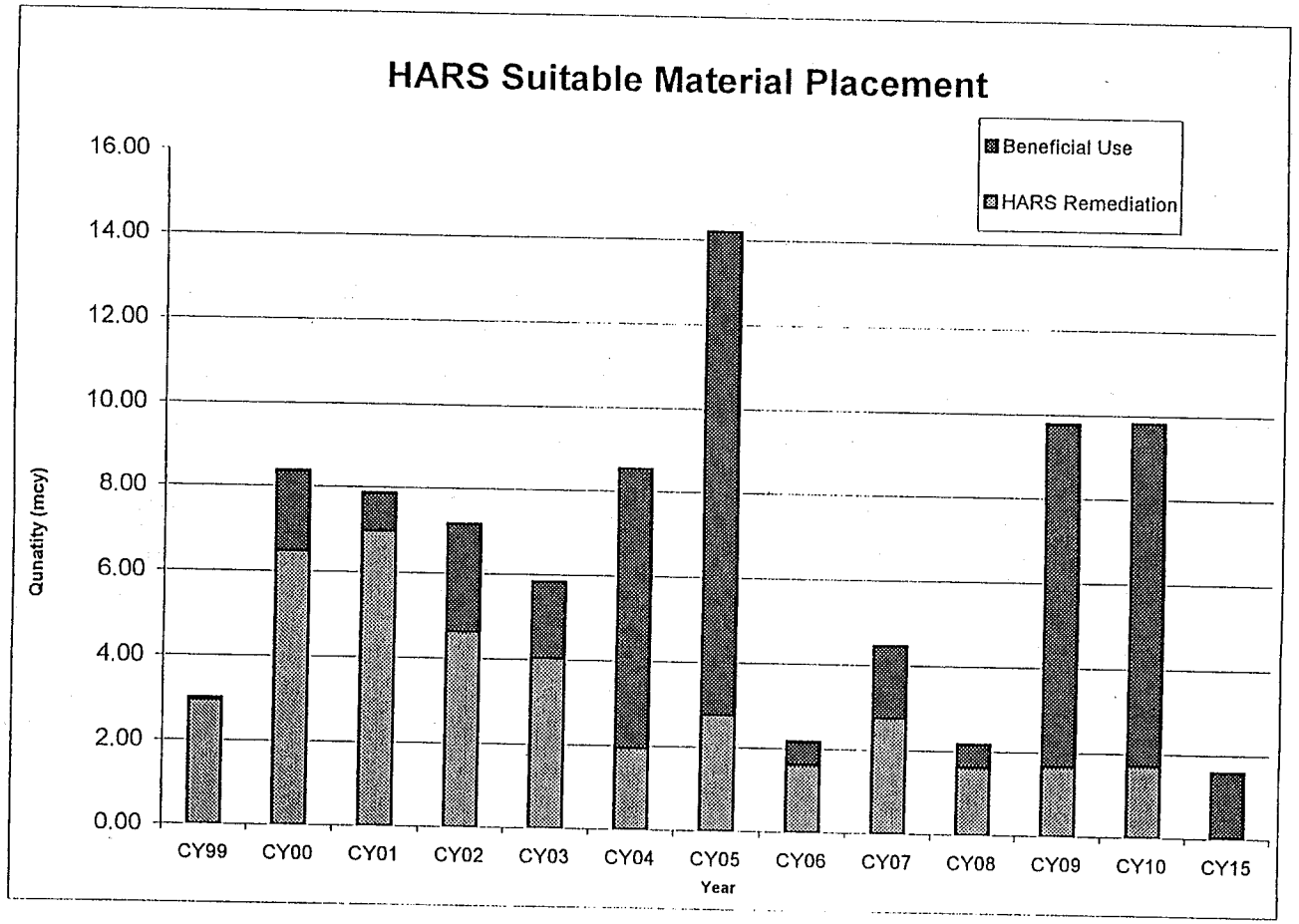
3/17/99 10:39 AM



Attachment 3

3/17/99 10:39 AM

+23.00/cy



Attachment 3

3/17/99 10:39 AM

DRAFT

SCP. GEO. 08 N. LUDEWIG P1/11
CHECK P. DUNLOP
8/19/98

SUMMARY for SCP Cells Side Slopes:1V:1.5H, fill to 50 ft
Material Handling Summary

ATTACHMENT 4

	40 to 42 ft Contaminated Dredged Mat'l Channel C. Y.	40 to 42 ft Contaminated Dredged Mat'l non-Channel C. Y.	40 to 42 ft Contaminated Dredged Mat'l total C. Y.	42 to 45 ft Clean mat'l Channel C. Y.	42 to 45 ft Clean mat'l non-Channel C. Y.	42 ft to Base Depth Total Clean Mat'l C. Y.	Net Increase Clean mat'l to HARS due to SCP C. Y.	Capacity CY	Cost $	Unit Cost = $ Cost / Capacity
CP Cell 1	-	66,235	66,235	-	97,740	840,485	840,485	486,111	$10,505,617	$21.61
SCP Cell 2	128,496	-	128,496	190,235	-	1,097,162	906,927	496,875	$8,552,318	$17.21
SCP Cell 3	73,940	-	73,940	109,027	-	872,609	763,582	488,502	$7,200,579	$14.74
SCP Cell 4	66,157	-	66,157	97,331	-	823,063	725,732	473,148	$6,843,652	$14.46
SCP Cell 5	-	95,285	95,285	-	140,877	1,833,480	1,833,480	1,217,580	$18,237,799	$14.98
Total	268,593	161,519	430,112	396,594	238,617	5,466,800	5,070,206	3,162,216	$51,339,966	$16.24

Contaminated Volume for Channel Deepening Project, CY	2,820,000
Subtotal Contaminated Dredge Material not incl. In Channel Deepening Project	161,519
Subtotal Contaminated Dredge Material	2,981,519
Contingency	180,697
Contingency, percent	6.1%
Total Capacity of Contaminated Volume for Channel Deepening Project, CY	3,162,216
say	3,160,000
Tipping Fee	$16.24
Monitoring	$2.00
Estimated Total Tipping Fee	$18.24
say	$18.20

add O+M contracts
+ additional bathymetry
$23.00/cy

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

June 30, 1999

REPLY TO
ATTENTION OF

Planning Division

Mr. Frank McDonough, Esquire
Director of Maritime Resources
New Jersey Commerce and Economic
Growth Commission
28 West State Street, P.O. Box 837
Trenton, New Jersey 08625-0837

Dear Mr. McDonough:

I would like to invite you and your staff to participate in the Alternative Formulation Briefing for the New York and New Jersey Harbor Navigation Study. This briefing will be held on July 7, 1999 in room 1802, 26 Federal Plaza starting at 9:30 a.m. A copy of the Alternative Formulation Briefing Technical Memorandum was previously provided to you. A copy of the agenda is attached.

The purpose of this briefing is to gain our Headquarters approval to release the draft feasibility report and EIS to the public concurrently with their policy review. As such, the briefing will provide background information concerning the formulation of the recommended plan and the resolution of issues identified by our Headquarters review of the Alternative Formulation Briefing Technical Memorandum. As some of the comments that could be identified may concern items such as disposal of dredged material, the sponsors' support for the recommendation and your ability to carry out our obligations as a local non-Federal sponsor, your active participation will be crucial to the meeting's success. This meeting will also take the place of the monthly Executive Committee Meeting, scheduled for the same day. I look forward to your participation in this important study milestone.

My point of contact is Mr. Thomas J. Shea, III, Project Planner, Flood Control & Navigation Section, at (212) 264-5570.

Sincerely,

Frank Santomauro

Frank Santomauro, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

June 30, 1999

REPLY TO
ATTENTION OF

Planning Division

Mr. Seth O. Kaye
Senior Vice President
New York City Economic Development Corporation
110 William Street, 5th Floor
New York, NY 10038

Dear Mr. Kaye:

I would like to invite you and your staff to participate in the Alternative Formulation Briefing for the New York and New Jersey Harbor Navigation Study. This briefing will be held on July 7, 1999 in room 1802, 26 Federal Plaza starting at 9:30 a.m. A copy of the Alternative Formulation Briefing Technical Memorandum was previously provided to you. A copy of the agenda is attached.

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My point of contact is Mr. Thomas J. Shea, III, Project Planner, Flood Control & Navigation Section, at (212) 264-5570.

Sincerely,

Frank Santomauro

Frank Santomauro, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

June 30, 1999

REPLY TO
ATTENTION OF

Planning Division

Ms. Lillian Borrone
Port Commerce Department
Port Authority of New York & New Jersey
One World Trade Center, Room 34S
New York, NY 10048-0682

Dear Ms. Borrone:

I would like to invite you and your staff to participate in the Alternative Formulation Briefing for the New York and New Jersey Harbor Navigation Study. This briefing will be held on July 7, 1999 in room 1802, 26 Federal Plaza starting at 9:30 a.m. A copy of the Alternative Formulation Briefing Technical Memorandum was previously provided to you. A copy of the agenda is attached.

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Sincerely,

Frank Santomauro

Frank Santomauro, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

June 30, 1999

REPLY TO
ATTENTION OF

Planning Division

Mr. Kevin Corbett
Deputy Executive Director for Port Authority Affairs
Empire State Development Corporation
633 Third Avenue, 37th Floor
New York, New York 10017

Dear Mr. Corbett:

I would like to invite you and your staff to participate in the Alternative Formulation Briefing for the New York and New Jersey Harbor Navigation Study. This briefing will be held on July 7, 1999 in room 1802, 26 Federal Plaza starting at 9:30 a.m. A copy of the Alternative Formulation Briefing Technical Memorandum was previously provided to you. A copy of the agenda is attached.

The purpose of this briefing is to gain our Headquarters approval to release the draft feasibility report and EIS to the public concurrently with their policy review. As such, the briefing will provide background information concerning the formulation of the recommended plan and the resolution of issues identified by our Headquarters review of the Alternative Formulation Briefing Technical Memorandum. As some of the comments that could be identified may concern items such as disposal of dredged material, the sponsors' support for the recommendation and your ability to carry out our obligations as a local non-Federal sponsor, your active participation will be crucial to the meeting's success. This meeting will also take the place of the monthly Executive Committee Meeting, scheduled for the same day. I look forward to your participation in this important study milestone.

My point of contact is Mr. Thomas J. Shea, III, Project Planner, Flood Control & Navigation Section, at (212) 264-5570.

Sincerely,

Frank Santomauro

Frank Santomauro, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF
Planning Division

July 29, 1999

Ms. Lillian Borrone
Port Commerce Department
Port Authority of New York & New Jersey
One World Trade Center, Room 34S
New York, NY 10048-0682

Dear Ms. Borrone:

I am writing in regard to the New York and New Jersey Harbor Navigation Study. In order to determine project cost-sharing, complete the required environmental documentation, and finalize project economics, thereby complying with ER 1110-2-1150 and ER 1105-2-100, the feasibility report needs to clearly and definitively identify sites for the placement of each cubic yard of dredged material to be generated by construction and maintenance of the deepening project through at least the year 2030. Without this specific information, the feasibility report is incomplete and the December 1999 deadline cannot be met.

On December 21, 1998, I wrote to you to ask for your help in identifying disposal sites with sufficient specificity to allow the District to complete the New York and New Jersey Harbor Navigation Study Feasibility Report. The March 17, 1999 joint response of the non-Federal sponsors of the Study was helpful in that it laid out your then current thinking on this topic, but it did not identify specific sites for the management of all the material to be dredged from the project through its construction plus at least 20 years of maintenance.

If the District is to complete the New York and New Jersey Harbor Navigation Study Feasibility Report by December 1999, with its release of the draft report in September, it must identify and have the commitment by both States and the Port Authority for specific sites by August 6, 1999 for the placement of dredged material from each channel or reach. The pre-public draft of the DMMP Implementation Report, currently under review by your office, provides a menu of environmentally acceptable options for the placement of dredged material.

Please contact me at (212) 264-0223 or Mr. Thomas J. Shea, III, Project Planner, Flood Control & Navigation Section at (212) 264-5570, should you have any questions.

Sincerely,

Frank Santomauro

Frank Santomauro, P.E.
Chief, Planning Division

CF
Mr. Kevin Corbett, Empire State Development Corporation
Mr. Frank McDonough, Esq., New Jersey Maritime Resources

THE PORT AUTHORITY OF NEW YORK & NEW JERSEY

LILLIAN C. BORRONE
DIRECTOR
PORT COMMERCE DEPARTMENT

ONE WORLD TRADE CENTER, 34S
NEW YORK, NY 10048-0682

(212) 435-6001
(212) 435-6030 FAX
borrone _ l @ panynj. gov

August 25, 1999

Mr. Frank Santomauro, P.E.
Chief, Planning Division
New York District, U.S. Army Corps of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0900

Subject: Identification of Specific Dredged Material Disposal Options For The New York and New Jersey Harbor Navigation Study

Dear Mr. Santomauro:

We are writing in response to your letter of July 29, 1999 to Lillian Borrone, Director of the Port Commerce Department of the Port Authority of NY & NJ. In your letter you asked the Port Authority and the States to identify specific sites for the management of dredged material generated from the construction and maintenance of projects arising from the New York and New Jersey Harbor Navigation Study (the Study). The New York District of USACE requires this information to be included in the draft of the Study's Feasibility Report to be released in September.

After considerable consultation and discussion, the undersigned have developed and agreed on an approach to manage new work and maintenance dredged material generated by the projects. The basis of our approach is to beneficially use dredged material cost-effectively while providing USACE with management options for dredged material at set prices. We have relied on the estimated volumes of rock, sand, till, clay and contaminated silts that will be generated by the projects. These volumes were identified in the DMMP and the Harbor Navigation Study Alternatives Formulation Briefing document.

We have determined that by using a combination of upland brownfield sites and decontamination technologies, ample capacity exists to accommodate the material generated by the construction and maintenance requirements through the year 2040 (including both existing and incremental maintenance requirements) for each pathway described in the Study. Support documentation to demonstrate engineering, design, environmental, real estate and O&M requirements for disposal sites identified in the attachment to this letter will be provided to USACE for their use in developing economic and planning requirements. As stated in Lillian Borrone's letter to you dated March 17, 1999, if upland disposal becomes unfeasible due to prohibitive costs or unsatisfactory production rates, the Port Authority will seek permits to construct disposal capacity within selected federal channels on an as needed basis. However, the undersigned are committed to seeing these beneficial use sites and decontamination technologies fully developed and able to handle the dredging needs of the region.

Attached please find Placement Designations and associated costs for each of the pathways identified in the Study. The management options outlined on this attachment have been agreed to by the undersigned. These options are provided to USACE at a predetermined cost. If an incremental cost above what is designated for an option must be paid for any outlined management option, the project beneficiary will pay that incremental cost. Please note that volumes of non-HARS material generated by the KVK 45', the AK 41'/40', and the Port Jersey 41' projects can be adequately managed through the excess capacity of the NJDIG Program beyond the requirements of the Harbor Navigation Study volumes. The NJDIG excess volumes included a total of 10 million cubic yards at upland beneficial use sites and a total of 38 million cubic yards by decontamination through the year 2040.

Please contact me at (212) 435-6001 or Mr. Thomas Wakeman, III, Manager, Dredging Programs at (212) 435-6618 if you have any questions regarding this matter.

Sincerely,

Lillian C. Borrone
Director, Port Commerce Department
Port Authority of New York and New Jersey

Concurred by:

Frank McDonough, Esq.
Executive Director, Maritime Resources
NJ Commerce &Economic Growth Comm.

for: Kevin Corbett
Deputy Executive Director
Empire State Development Corporation

Attachments

Attached please find Placement Designations and associated costs for each of the pathways identified in the Study. The management options outlined on this attachment have been agreed to by the undersigned. These options are provided to USACE at a predetermined cost. If an incremental cost above what is designated for an option must be paid for any outlined management option, the State(s) in which the deepening work is being conducted will pay that incremental cost. Please note that volumes of non-HARS material generated by the KVK 45', the AK 41'/40', and the Port Jersey 41' projects can be adequately managed through the excess capacity of the NJDIG Program beyond the requirements of the Harbor Navigation Study volumes. The NJDIG excess volumes included a total of 10 million cubic yards at upland beneficial use sites and a total of 38 million cubic yards by decontamination through the year 2040.

Please contact me at (212) 435-6001 or Mr. Thomas Wakeman, III, Manager, Dredging Programs at (212) 435-6618 if you have any questions regarding this matter.

Sincerely,

Lillian C. Borrone
Director, Port Commerce Department
Port Authority of New York and New Jersey

Concurred by:

For

Michael Carey
President
NYC Economic Development Corporation

Kevin Corbett
Deputy Executive Director
Empire State Development Corporation

Frank McDonough, Esq.
Executive Director, Maritime Resources
NJ Commerce &Economic Growth Comm.

Attachments

Placement Option Worksheet

Project	Construction/ Maintenance	Material Type	Total Volume Req't	Disposal Option Used	Volume Used	Volume Remaining for Disposal Site	Placement Cost / cy	NOTES
Ambrose 53 feet	Construction	HARS Sandy	13.371	Hunterdon Quarry, NJ	13.371	16.629	$0	Note 1
	Maintenance	HARS Sandy	17.504	Hunterdon Quarry, NJ	16.629	0.000	$0	
				HARS	0.875	38.125	$0	Note 2
Anchorage 50 feet	Construction	HARS Glacial	4.159	HARS	4.159	33.966	$2	Note 2
	Construction	Non-HARS	0.717	NJDIG PROGRAM	0.717	39.983	$29	Note 3
Port Jersey 50 feet	Construction	HARS Glacial	2.581	HARS	2.581	31.385	$2	Note 2
	Construction	Non-HARS	0.311	NJDIG PROGRAM	0.311	39.672	$29	Note 3
	Maintenance	Non-HARS	2.762	NJDIG PROGRAM	2.762	36.910	$29	
Kill Van Kull 50 feet	Construction	Rock	3.211	NY/NJ Reef	3.211	N/A	$0	Note 4
	Construction	HARS Glacial	4.019	HARS	4.019	27.366	$2	Note 2
	Construction	Non-HARS	2.212	NJDIG PROGRAM	2.212	34.698	$29	Note 3
	Maintenance	Non-HARS	2.412	NJDIG PROGRAM	2.412	32.286	$29	
Newark Bay 50 feet	Construction	Rock	1.25	NY/NJ Reef	1.25	N/A	$0	Note 4
	Construction	HARS Clay	6.596	HMDC	5	0.000	$0	Note 5
				HARS	1.596	25.770	$2	Note 2
	Construction	Non-HARS	2.356	NJDIG PROGRAM	2.3516	29.934	$29	Note 3
	Maintenance	Non-HARS	14.197	NJDIG PROGRAM	14.197	15.737	$29	
Arthur Kill 50 feet	Construction	Rock	2.695	NY/NJ Reef	3.211	N/A	$0	Note 4
	Construction	HARS Glacial	1.206	HARS	1.206	24.564	$2	Note 2
	Construction	Non-HARS	0.782	NJDIG PROGRAM	0.782	14.955	$29	Note 3
	Maintenance	Non-HARS	5.132	NJDIG PROGRAM	5.132	9.823	$29	
Bay Ridge 50 feet	Construction	HARS Glacial	2.973	HARS	2.973	21.591	$2	Note 2
	Construction	Non-HARS	1.993	Sub-Channel Cells	1.993	7.007	$29	Note 6
	Maintenance	Non-HARS	4.259	Sub-Channel Cells	4.259	2.748	$29	Note 6

8/13/99

NOTES

DATA SOURCES:

(1) Dredged Material Management Plan for the Port of NY & NJ Implementation Report, July 1999

(2) Construction Material:
Non-Pay Quantities spreadsheet of M. Rovi (CENAN-EN), 6 JUNE 1999 updated with S. Weinberg (CENAN-EN) JULY 1999

(2) Maintenance Material (maintenance material computed for Calendar Years CY00 through CY40:

Channel Design Methodology AFB Draft Report June 1999, Table 10 Plan 2

Ambrose Channel:	400,000 base + 64,000 increase after deepening = 464,000 cy/yr annualized
Port Jersey Channel:	58,000 base + 13,900 increase after deepening = 71,900 cy/yr annualized
Kill Van Kull Channel:	24,800 base + 47,500 increase after deepening = 72,300 cy/yr annualized
Newark Bay Channel:	332,000 base + 51,000 increase after deepening = 383,000 cy/yr annualized
Arthur Kill Channel:	122,000 base + 16,000 increase after deepening = 138,000 cy/yr annualized
Bay Ridge Channel:	98,800 base + 18,700 increase after deepening = 117,500 cy/yr annualized

OPTION WORKSHEET NOTES:

1- **HUNTERDON QUARRY:** Initial volume capacity of 30 mcy. Total HARS sandy material requirement for Ambrose 53 feet is 30.875 mcy, of which Hunterdon Quarry can dispose of 30 mcy. The remaining 0.875 mcy will be disposed of at HARS. Cost of transport and placement of material from pierside delivery by dredger to disposal site at Hunterdon Quarry will be borne by the non-federal sponsor.

2- **HARS:** Initial volume capacity of 39 mcy. Disposal of HARS suitable material includes glacial till, sandy and clay materials.

3- **NJDIG PROGRAM:** NJDIG Program has identified upland disposal sites with initial capacity of 40.7 mcy in NJ. Additional yearly decontamination capacity of approximately 950,000 cy of material per year has also been identified by NJDIG. Placement costs at all NJDIG sites, including decontamination, will be at $29/cy. Incremental costs above $29/cy + 10% will be borne by State of NJ for non-HARS material from Newark Bay and Port Jersey Channels. Incremental costs above $29/cy + 10% for non-HARS material from other projects shared by the States of NY and NJ, including Anchorage, KVK, AK Channels, will be borne by the project beneficiary. Total disposal requirements of non-HARS material for NJ portion of harbor navigation pathways (incl. maintenance) is 30.87 mcy. Sites are as follows:

a.	CTI Lehigh Anthracite:	20 mcy
b.	CTI Carteret:	0.8 mcy
c.	SK Services Koppers Coke:	3.4 mcy
d.	SK Services Port Reading:	1.0 mcy
e.	OENJ Bayonne:	4.5 mcy
f.	OENJ Port Reading:	3.0 mcy
g.	Sayreville National Lead:	5.0 mcy
h.	Allied Signal Elizabeth:	3.0 mcy
	TOTAL:	**40.7 mcy**

i.	JCI Upcycle Decon:	0.5 mcy/yr
j.	Biogenesis Kearny Decon:	0.25 mcy/yr
k.	IGT Koppers Decon:	0.1 mcy/yr
l.	Westinghouse Plasma Arc Decon:	0.1 mcy/yr
	TOTAL:	**0.950 mcy/yr**
	CY00-CY40:	**38.0 mcy**

4- **NY/NJ REEF:** Rock material will be disposed of fish reefs off New York and New Jersey. Effectively, there is no known limit to capacity to dispose of rock material at these sites.

5- **Hackensack Meadowlands Development Corporation (HMDC):** Initial volume capacity of 5 mcy. HMDC has identified the need for clay material to be used as capping material. Newark Bay 50 feet will require disposal of 6.596 mcy of clay of which 5 mcy can be disposed of at HMDC and the remaining 1.596 mcy at HARS.

6- **Sub-Channel Cells New York:** Initial volume capacity of 9 mcy for sub channel cells at Bay Ridge/Red Hook as identified in draft report "NY Harbor DMMP Aquatic Placement Option Report" dated December 18, 1998 prepared by New York Harbor Partnership. Cost of placement in sub-channel cells will be at $29/cy, incremental costs above $29/cy + 10% will be borne by State of NY.

THE PORT AUTHORITY OF NEW YORK & NEW JERSEY

LILLIAN C. BORRONE
DIRECTOR
PORT COMMERCE DEPARTMENT

ONE WORLD TRADE CENTER, 34S
NEW YORK, NY 10048-0682

(212) 435-6001
(212) 435-6030 FAX
borrone _ l @ panynj. gov

September 17, 1999

Mr. Frank Santomauro, P.E.
Chief, Planning Division
New York District, U.S. Army Corps of Engineers
Jacob J. Javits Federal Building, 26 Federal Plaza
New York, NY 10278-0090

Dear Mr. Santomauro:

This letter is meant to clarify the Port Authority's position regarding the disposal of dredged material to be generated by construction of channel improvements that may be recommended by the New York-New Jersey Harbor Navigation Study. As you know, the Executive Committee has resolved to be guided in the selection of dredged material placement sites by the District's Dredged Material Management Plan (DMMP). That document serves to order the options for the management of dredged material in this region and its approach to the selection of placement sites should be followed in the formulation of the NED plan in the New York-New Jersey Harbor Navigation Study.

I recognize that the plan formulation process requires a higher degree of certitude with respect to some aspects of the placement of dredged material than can be provided by some of the DMMP options at this time. Therefore, I recommend that the District use the DMMP options that do offer the required degree of certitude at this time, specifically the use of sub-channel placement cells. This is consistent to the position taken by the Port Authority and the two States as expressed in my letter to you dated March 17, 1999. The Port Authority will continue to pursue the placement of dredged material in permitted, cost-effective upland sites and reserves the right to substitute any sites that may later prove to be more environmentally acceptable, or cost effective, or both. In addition, any costs incurred in excess of NED costs as a result of the use of such upland sites will be borne by the project beneficiary.

Sincerely,

Lillian C. Borrone
Director
Port Commerce Department

THE PORT AUTHORITY OF NEW YORK & NEW JERSEY

LILLIAN C. BORRONE
DIRECTOR
PORT COMMERCE DEPARTMENT

ONE WORLD TRADE CENTER, 34S
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September 17, 1999

Mr. Frank Santomauro, P.E.
Chief, Planning Division
New York District, U.S. Army Corps of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0900

Dear Mr. Santomauro:

Please be advised that the Port Authority of New York and New Jersey has reviewed the New York and New Jersey Harbor Navigation Study Feasibility Report and concurs with the findings and recommendations contained therein. In light of this, the Port Authority of New York and New Jersey fully intends to enter into a cost-sharing agreement with the U.S. Army Corps of Engineers leading to commencement of the Pre-construction Engineering and Design and, ultimately, to proceed to construction of the recommended project.

Sincerely,

Lillian C. Borrone
Director
Port Commerce Department

NEW JERSEY COMMERCE & ECONOMIC GROWTH COMMISSION
28 WEST STATE STREET
P.O. BOX 820
TRENTON, NJ 08625-0820
609-777-0885; (FAX) 609-777-4097

CHRISTINE TODD WHITMAN
Governor, Chair

GUALBERTO MEDINA
Chief Executive Officer / Secretary

Please Reply To:
NJ Maritime Resources
PO Box 837
Trenton, New Jersey 08625-0837
(609)984-6594
(609)984-1468

September 22, 1999

Mr. Frank Santomauro, P.E.
Chief, Planning Division
New York District
US Army Corps of Engineers
26 Federal Plaza
New York, New York 10278-0090

Dear Mr. Santomauro:

Please be advised that New Jersey Maritime Resources has reviewed the New York and New Jersey Harbor Navigation Study Feasibility Report and generally concurs with the findings and recommendations contained therein. In light of this, New Jersey Maritime Resources in cooperation with its partners at the Port Authority of New York and New Jersey and at the City and State of New York, fully intends to support the Pre-construction Engineering and Design Phase, to enter into a cost sharing agreement in support of that effort as appropriate and, ultimately, to proceed to construction of the recommended project.

Sincerely,

Frank M. McDonough
Executive Director, NJ Maritime Resources

FMM/mlw

NEW JERSEY COMMERCE & ECONOMIC GROWTH COMMISSION
28 WEST STATE STREET
P.O. BOX 820
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PO Box 837
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(609)984-1468

September 22, 1999

Mr. Frank Santomauro, P.E.
Chief, Planning Division
New York District
US Army Corps of Engineers
26 Federal Plaza
New York, New York 10278-0090

Dear Mr. Santomauro:

I am writing in response to your letter of July 29, 1999 regarding the disposal of dredged material to be generated by construction of channel improvements that may be recommended by the New York-New Jersey Harbor Navigation Study. Let me take this opportunity to reiterate and emphasize to you that it is the stated policy of the State of New Jersey to place dredged material in upland remediation sites whenever practicable.

The Executive Committee resolved long ago to be guided in the selection of dredged material placement sites by the District's Dredged Material Management Plan (DMMP). That document serves to order the options for the management of dredged material in this region, and it remains my view that its approach to the selection of placement sites should be followed in the formulation of the NED plan in the New York-New Jersey Harbor Navigation Study.

I recognize that the plan formulation process requires a higher degree of certitude with respect to some aspects of the placement of dredged material than can be provided by some of the DMMP options at this time. Therefore, we have included in the DMMP "preferred contingency" options such as the in-channel cells. These options may be utilized to provide the degree of certitude necessary in the NED plan. The State of New Jersey will continue to pursue the use/placement of dredged material at upland sites and reserves the right to substitute any sites that may later prove to be more environmentally acceptable, or cost effective, or both. Any costs incurred for projects in New Jersey waters that are in excess of NED costs as a result of the use of such upland sites will be borne by the State of New Jersey.

Sincerely,

Frank M. McDonough
Executive Director, NJ Maritime Resources

FMM/mlw

Input To Without Project Conditions and Sponsors Future Development Plans

New York City
Economic Development
Corporation

September 2, 1998

Frank Santomauro, P.E.
Chief, Planning Division
U.S. Army Corps of Engineers
New York District
26 Federal Plaza
New York, NY 10278-0090

RE: Harbor Navigation Study

Dear Mr. Santomauro:

Pursuant to your request, the New York City Economic Development Corporation has prepared a "project implementation history" statement describing past port and port-related transportation projects implemented by the City of New York. The attached statement completes our submission of "without project conditions" for the U.S. Army Corps of Engineers Harbor Navigation Study.

New York City has made tremendous strides in recent years in returning its port facilities to active use. Investments in the Howland Hook Marine Terminal and Red Hook Container Terminal have resulted in a combined annual container throughput of more than 200,000, 20-foot equivalent units (TEUs) in 1997. The success of these efforts -- which spanned several mayoral administrations -- gave impetus to the City's decision to move forward with developing a strategic plan for the redevelopment of the Port of New York. This study will identify the future phases of port development in New York, capitalizing on expected increases in maritime trade. It reflects a long-term commitment on the part of the City to invest its resources in port development and promote economic development throughout the New York metropolitan region.

Thank you in advance for your consideration of this material. If you have any questions or require further information, please feel free to call me at (212) 312-3669 or Andrew Genn, the study's project manager at (212) 312-3783.

Sincerely,

Michael Canavan
Vice President

cc: Peter Blum

Enclosure

NJCOMMERCE
Business & Prosperity for the New Century

NEW JERSEY COMMERCE & ECONOMIC GROWTH COMMISSION
28 WEST STATE STREET
P.O. BOX 820
TRENTON, NJ 08625-0820
609-777-0885; (FAX) 609-777-4097

CHRISTINE TODD WHITMAN
Governor, Chair

GUALBERTO MEDINA
Chief Executive Officer / Secretary

Please Reply To:
NJ Maritime Resources
PO Box 837
Trenton, New Jersey 08625-0837
(609)984-6694
(609)984-1468

November 9, 1998

Mr. Frank Santomauro, P.E.
Chief, Planning Division
New York District
US Army Corps of Engineers
26 Federal Plaza
Room 2141
New York, New York 10278-0090

RE: New York and New Jersey Harbor Navigation Study Without Project Conditions

Dear Mr. Santomauro:

The purpose of this letter is to express our intention to proceed with the projects previously identified in the Infrastructure Workgroup for without project future conditions. As you know, this Office has been designated as the lead agency for the State of New Jersey in the conduct of the study, is one of the local sponsors for the study, and is authorized by law and policy to enter into Project Cooperation Agreements (PCA) with the United States Army Corps of Engineers. It is our intention to proceed on a number of projects which would satisfy the "without project" portfolio of regional investments on behalf of freight movement, channel deepening, and terminal development. These are all projects that will not only proceed without the study, but in fact were in place prior to the initiation of the study.

Transportation and Intermodal Infrastructure

The first category of regional investments is transportation/intermodal infrastructure improvements. The North Jersey Transportation Planning Authority (NJTPA) on June 25, 1998 provided you with a copy of the relevant portions of its 1998-2002 Transportation Improvement Program (TIP). The TIP is a fiscally constrained document that allocates federal and state funds to transportation projects over a five year period. This particular document includes discrete transportation/intermodal improvements and the "Container Portway" project. I have enclosed an additional copy for your consideration.

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Steps that have already been taken to proceed with this project include the fact that discrete transportation/intermodal projects which are contained in the TIP are the subject of an annual review and consultation with NJTPA's member agencies including the New Jersey Department of Transportation, New Jersey Transit, the Port Authority of New York and New Jersey, the thirteen northern counties plus the cities of Newark and Jersey City. A TIP project can only be included in the list if there is a reasonable expectation that it will be funded. Moreover, projects are prioritized and are the result of negotiations among members of the NJTPA's Board of Trustees.

Each of the projects listed in the 1998-2002 TIP have withstood this rigorous review and have been selected because they will facilitate greater freight flow to the core Port and nearby intermodal/warehouse areas in Northern New Jersey. Moreover, the projects listed in the TIP are already in varying stages of development with funding allocated over the five year period. Some projects are under construction and some are simply identified for future funding and construction. Of particular interest to the without project future conditions for the Harbor Navigation Study, the Portway Project has been allocated $1 million for planning and study and the New Jersey Department of Transportation has assigned an internal Project Manager for the project. Moreover, the Governor specifically addressed this project as a priority project in her "New Jersey First, a Transportation Vision for the 21st Century."

A spread sheet on each of the remaining TIP programs is provided with the enclosure, and identifies funding by fiscal year as well as a full description of the project.

Navigation Channel Improvements

The following Harbor Navigation Projects have also been identified by this Office for completion in the near time frame. Port Jersey Channel, which we recently completed all maintenance projects for, will commence construction to 41' in the summer of calendar year 1999 to be completed 18 months thereafter. New Jersey has agreed to serve as the local sponsor for this project and has contracted with the Port Authority of New York and New Jersey to serve as its agent to negotiate the PCA. Moreover, New Jersey has agreed to provide the local share for the project and awaits a Corps of Engineers' final reconciliation of the costs of the project in order to submit a request to the Dredging Project Facilitation Task Force for funding.

New Jersey is also committed to completion of the study and construction of the Arthur Kill to 45'. New Jersey (and New York) requested that the Port Authority of New York and New Jersey serve as the sponsor for the study and in 1997 the Port Authority Board of Commissioners authorized the project. Additionally, the State of New Jersey has urged the United States Army Corps of Engineers to extend its study of the Arthur Kill from Petroport south to Perth Amboy. The State sought and received a commitment from the Corps of Engineers and Congress to conduct the project. The State has agreed in correspondence to the US Army Corps of Engineers to provide the local share for the study. The project received initial funding in the FY99 budget.

The State of New Jersey is also the sponsor for the State-owned Claremont Channel in Jersey City. Again, the State has engaged the services of the Port Authority of New York and New Jersey to serve as its agent in conducting the various channel redesign and reconnaissance projects in this channel. The channel has been surveyed and redesigned in cooperation with the Harbor Pilots. The State has requested that the Port Authority conduct an analysis of the sediment in the channel, and the State has committed up to $20 million for the dredging and disposal of this sediment in order to bring the channel down to -32'. It is currently anticipated that dredging will commence in March of 1999 and be completed by the end of that calendar year.

THE PORT AUTHORITY OF NEW YORK & NEW JERSEY

LILLIAN C. BORRONE
DIRECTOR
PORT COMMERCE DEPARTMENT

ONE WORLD TRADE CENTER, 34S
NEW YORK, NY 10048-0682

(212) 435-6001
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November 10, 1998

Mr. Frank Santomauro, P.E.
Chief, Planning Division
New York District, U.S. Army Corps of Engineers
26 Federal Plaza, Room 2141
New York, NY 10278-0090

Dear Mr. Santomauro:

The purpose of this letter is to express our intention to proceed with the port expansion projects (Bayonne/ Port Jersey, Howland Hook, South Brooklyn, and Port Elizabeth) that were described in our submission to the Infrastructure Resource Group for inclusion in the New York and New Jersey Harbor Navigation Study. Our intention to proceed with the development plans and schedule indicated in our submission is a serious one, as made evident by the following actions already taken:

1. With the approval of our Board, we contracted with the engineering firms of F.R. Harris and Moffatt & Nichol Engineers to conduct a detailed analysis of Port Development and Investment Options to meet forecasted market requirements through 2040. This $1.2 million study provided the business analyses and preliminary engineering upon which our submission was based.
2. We also contracted with Killam Associates to conduct preliminary environmental assessments for the above cited (and other), port expansion options. An extensive public outreach effort regarding port expansion options is also being conducted.
3. We have programmed approximately $3.0 billion of our proposed 15 year program/ $6.3 billion Port Development Capital Program specifically for the site developments included in our submission.

We anticipate taking the following further actions between now and December 31, 1999, the scheduled time of completion of the New York and New Jersey Harbor Navigation Study:

1. We anticipate obtaining Board approval for our comprehensive Capital Plan by year-end 1998 (or perhaps first quarter 1999).
2. We plan to complete our public outreach efforts in early 1999. During 1999, we plan to negotiate development agreements with the City of Bayonne, the NYCEDC, and New Jersey State, as necessary, to advance the planning for the above mentioned sites.
3. We anticipate initiating Environmental Impact Studies for the Bayonne/ Port Jersey and Howland Hook projects by year-end 1999.

At that point, the remaining major steps to be taken in our project approval process will be to:

1. conduct the necessary planning/ engineering studies to refine project costs estimates, designs, schedules, and mitigation plans,
2. identify public/ private partners who may be interested in forming equity/development partnerships for specific projects, and
3. secure Board authorization for the individual projects cited above (all expected to be done within the next five years).

Also submitted herewith are the following information items, which further substantiate the Port Authority's capability to develop the proposed new facilities:

1. **Port Development History** - This paper describes the history of the Port Authority's role and accomplishments in the development of the Port of New York/ New Jersey.
2. **Capital Project Authorization Process** - This procedure manual describes the internal Port Authority process by which new capital projects are planned and authorized for construction.
3. **Capital Project Listings** - This listing demonstrates the Port Authority's recent (10 year) record of implementing significant capital projects.

Should you have questions regarding this information or require further information, please contact Bill Ellis, Program Manager, Port Development, at (212) 435-8829.

Sincerely,

Lillian C. Borrone
Director
Port Commerce Department

THE CITY OF NEW YORK
OFFICE OF THE MAYOR
NEW YORK, N.Y. 10007

November 10, 1998

Colonel William H. Pearce
U.S. Army Corps of Engineers
New York District
26 Federal Plaza
New York, NY 10278-0090

RE: Harbor Navigation Study

Dear Colonel Pearce:

It is our understanding that the U.S. Army Corps of Engineers (USACE)/New York District is conducting a study for the deepening of the shipping channels into New York Harbor. New York City is represented in this study by the New York City Economic Development Corporation (EDC), which is currently preparing a strategic port redevelopment plan. As part of this effort, the USACE has requested statements regarding the types of port facilities with a reasonable liklihood to be in place over the study's planning period without channel deepening. NYCEDC has submitted several prior statements regarding future port development scenarios, a description of the process by which a commitment to construct a project may be reached, and a statement specifying the point in the process which the City's port effort is currently in and where it will be by the completion of the Harbor Navigation Study in December 1999 (see attached).

On behalf of the Mayor of the City of New York, I wish to reiterate the City's commitment to these development plans and reaffirm the capability of the City to complete these projects within the planning horizon of the USACE study.

Thank you in advance for your consideration of this material. If you have any questions or require further information, please feel free to contact Michael Carey, First Executive Vice President and General Counsel of EDC at (212) 312-3557.

Sincerely,

Randy L. Levine
Deputy Mayor

cc: C. Millard
M. Carey
S. Kaye

Enclosures(3)
g:\agenn\histcov3

TO: Peter Blum, P.E.
ACOE, New York District

June 9, 1998

This is in response to your request for project information from the members of the NY and NJ Infrastructure Work Group concerning the Harbor Navigation Feasibility Study.

Attached is a table indicating status of New York State Department of Transportation's studies and projects that are on the New York Metropolitan Transportation Council's (NYMTC) Transportation Improvement Plan (TIP) for the years1998-2002.

Because the Department's planning horizon is limited to 20 years, there are no projects scheduled at ACOE's 50 year planning horizon. The projects listed on the attached table are within ACOE's 2002-2004 planning horizon.

The selected projects from the TIP were chosen of the following basis of:

- Over $30 million in estimate construction cost
- On Highways and Bridges that permit trucks
- Highways and Bridges that serve the Port of New York and New Jersey

Project Construction Commitment

All of the projects and studies, listed on the attached table, are on the TIP, which means there is funding commitment.

The first four projects are in the study phase. The next steps to construction for these projects are environment assessment , design, and construction.

The remaining projects are in various stages of design, as noted on the attached table. The next step is the construction phase. The estimated dates given in the last column of the attached table.

FROM: Andy Mohr
NYSDOT, MO

NORTH JERSEY TRANSPORTATION PLANNING AUTHORITY, INC.

One Newark Center, 17th floor, Newark, NJ 07102
(973) 639-8400; fax (973) 639-1953

Hon. Paul Souerland, Chairman
Joel S. Weiner, Executive Director

June 26, 1998

Mr. Thomas Shea
Planning Division
U.S. Army Corps of Engineers, New York District
Jacob K. Javits Federal Building
26 Federal Plaza
New York, NY 10278-0900

Dear Tom:

Enclosed is a copy of list of transportation projects in the northern New Jersey region that facilitate movement to port and nearby intermodal facilities. We have forwarded them to the U.S. Army Corps of Engineers to be included in the "without project" conditions in their channel deepening study.

I believe that intermodal facilities and nearby warehouse areas must be included in the calculations by the USACE because they form part of the overall port infrastructure. The list was picked for key transportation routes on an approximate 10-12 mile radius from port facilities, which is the distance that encompasses most of the key intermodal and warehouse facilities.

If you have any questions or need any additional information about the projects that we sent to the Corps, please call.

With best regards,

John Hummer
973-639-8424

THE CITY OF NEW YORK
OFFICE OF THE MAYOR
NEW YORK, N.Y. 10007

RANDY L. LEVINE
DEPUTY MAYOR FOR ECONOMIC DEVELOPMENT,
PLANNING AND ADMINISTRATION

June 28, 1999

Colonel William H. Pearce
District Engineer
U.S. Army Corps of Engineers
Jacob K. Javits Federal Building
26 Federal Plaza
New York, NY 10278-0099

Re: Harbor Navigation Study

Dear Colonel Pearce:

I am writing as a follow-up to my correspondence of November 1998, which is attached. Since then, the New York City Economic Development Corporation (EDC) has completed the *Strategic Plan for the Redevelopment of the Port New York*. This plan is a "blueprint" outlining maritime terminal facility investments to be phased-in over the next 20 years. We believe this plan demonstrates that the City can provide a valuable service by handling a portion of the estimated 15.3 million 20-foot containers that are projected to pass through the port by 2040. Enclosed for your information are copies of the Executive Briefing and Project Summary detailing the recommendations of the plan. These materials were forwarded to New York District staff in February 1999 and used to inform the Harbor Navigation Study.

In previous letters from EDC staff and me to New York District staff, we have outlined recent City efforts to improve maritime freight handling in the Port of New York/New Jersey. Aside from the port redevelopment strategy, EDC is also conducting a federally funded Major Investment Study (MIS) on Cross Harbor Freight Movement. Together, the improvements identified in the MIS and the port plan will guide the City's further investment in New York's railfreight and marine transportation networks. Over the past six years, the City has made substantial investments in its goods movement transportation system (see attached list).

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In summary, the City has been and will continue to be committed to maritime and related freight transportation improvements. We are hopeful that the Corps of Engineers will recognize these efforts by recommending optimum shipping channel depths to New York City's port facilities.

If you have any questions, please feel free to call Michael G. Carey, President of the New York City Economic Development Corporation, at (212) 312-3557.

Sincerely,

Randy L. Levine

cc: (Without attachments)

Charles A. Gargano
Kevin S. Corbett
Robert E. Boyle
Christopher O. Ward
Lillian C. Borrone
Michael G. Carey
Seth O. Kaye

Marine Terminal Improvements

The State of New Jersey is committed to the continued development of the Port Jersey Channel Complex including the Military Ocean Terminal in Bayonne. In furtherance of this development, the State of New Jersey participated in the Local Reuse Authority which designated minimum acreage for maritime purposes at the Military Ocean Terminal. Additionally, in 1995 the Department of Transportation conducted the necessary preliminary engineering studies to develop road and rail access to the Military Ocean Terminal which would couple it with existing facilities on the Port Jersey Peninsula. The State of New Jersey also provided a share of the funding to the Local Reuse Authority for the various studies conducted in developing its plan. The State has worked with the City of Jersey City and Bayonne and others in the development of nearby intermodal/transportation facilities; and has convinced the New Jersey Department of Transportation to extend Container Portway to the Port Jersey Complex. The State anticipates that this project will developed by a probable combination of public and private agencies with the first stages of development completed by the year 2004.

Finally, it should be noted that, in this response, the State of New Jersey has only addressed those facilities which do not fall under the exclusive jurisdiction of the Port Authority of New York and New Jersey. There are considerable landside and waterside improvements which are expected to exist or be developed during the planning period in the absence of the Harbor Navigation Study which are being undertaken by the Port of New York and New Jersey. It includes facilities at Port Newark, Elizabethport, and Howland Hook including new container facilities, highways, arterial roadways, railroads and off-port intermodal terminals, reactivation of the Staten Island Railroad between Howland Hook and New Jersey, improvements to cross-harbor freight transport, reconfiguration of existing container terminals, expansion of terminals, development of new waterfront structures, relocation of existing facilities, and the acquisition and development of additional acreage. New Jersey supports each of those New Jersey projects identified by the response submitted by the Port Authority of New York and New Jersey.

Should you have any questions regarding this information, or require further information, please contact the undersigned at 609-984-6694.

Sincerely,

Frank M. McDonough
Executive Director

FMM/ct
cc: Kevin Corbett
William Ellis
Tom Shea

STATE OF NEW JERSEY
DEPARTMENT OF TRANSPORTATION
1035 PARKWAY AVENUE
CN 601
TRENTON, N.J. 08625-0601
609-530-3536

CHRISTINE TODD WHITMAN
GOVERNOR

JOHN J. HALEY, JR.
COMMISSIONER

July 15, 1998

Mr. Frank Santomauro, PE
Chief Planning Division
U.S. Army Corps of Engineers, New York District
Jacob K. Javits Federal Building
26 Federal Plaza
New York, NY 10278 -0900

Dear Mr. Santomauro:

Attached is the New Jersey Department of Transportation's (NJDOT's) list of North Jersey regional projects that satisfy the "Without Project" criteria of public investments that substantially respond to freight activity generated by or destined to Port of New York and New Jersey (Port) facilities. The NJDOT list highlights "Portway" (described below) and critical port service facility access elements of our State rail program. It does not repeat -- but hereby incorporates by reference -- the extensive number of projects contained in the landside access focused Transportation Improvement Program (TIP) list provided by the North Jersey Transportation Planning Authority. NJDOT also concurs with NJTPA's excellent summary of the value and importance of completion these projects to the regional economy.

Portway is the logical landside extension of the State's strong organizational and financial commitment to help meet the dredging depths needed to sustain the Port as the preeminent hub for maritime activity in the North Atlantic range -- and the nation's "Great Port" on the East Coast. For this reason, it is featured prominently in Governor Whitman's recently released policy and program action statement: New Jersey First -- A Transportation Vision for the 21st Century. (Enclosed) Portway will provide both new and improved linkages between Port facilities and the region's major intermodal rail, trucking and distribution nodes creating new transportation efficiencies and related economic development opportunities. Among other things, it will relieve congestion on the local highway distribution system through addition of new truck dedicated rights of way as well as create new or expanded drayage related connections to the New Jersey Turnpike and Route 1&9. Approximately $200 million in projects related to Portway are already in active development by NJDOT. These include major projects for improvement on Doremeus Avenue (and Bridge), Newark and at and around Charlotte Circle in Jersey City. In total development of Phase One of Portway will result in approximately $500 million in combined public - private investment and provide a platform for further equivalent landside investments in port/ intermodal systems.

In sum, there is strong local and State based support for projects that strengthen New Jersey's landside intermodal systems. This investment is predicated on the immediate need to reduce congestion and secure future Port accessibility and efficiency. This planned investment does not assume 50 foot channel access as a planning certainty. It supports having sufficient infrastructure in place so that future build out to meet load center demand instigated by 50 foot channels can be attained with incremental additions to a strong landside systems core.

Sincerely,

Pippa del. Woods

Pippa Woods
Assistant Commissioner

Attachments

New York City
Economic Development
Corporation

MEMORANDUM

To: Peter Blum, U.S. Army Corps of Engineers

From: Andrew Genn AG

Subject: Proposed "Without Project Conditions"

Date: July 16, 1998

The purpose of this memo is to memorialize the New York City Economic Development Corporation's (EDC) understanding of the "without project" conditions for port areas in Brooklyn as agreed to at the Infrastructure Group workshop held on July 15, 1998. Attachment 1 summarizes the terminal design concepts and associated infrastructure projects that would be developed irrespective of channel deepening. Attachments 2 and 3 show the development footprints at Red Hook and Sunset Park under "without project" conditions. To assist the Corps in its planning efforts, EDC will provide the Army Corps with development costs and throughput estimates for these terminals in the early fall.

You have also asked for "project implementation histories" to document the local sponsor's efforts to enhance port development and freight movement. Below is a preliminary statement on the City's efforts to date.

Project Histories

You have asked that project sponsors provide "project implementation histories" to demonstrate the sponsoring agency's ability to complete port-related development projects. Below are some projects that EDC has sponsored in recent years.

- Reopening of the Howland Hook Marine Terminal;
- Improvement at the Red Hook Container Terminal, including the City-financed resiting of a container crane from South Brooklyn Marine Terminal;
- Purchase and pending reactivation of the Staten Island Railroad and Arlington rail yard;
- Reactivating the 65th Street Yards through construction of new float bridges;
- Successful petitioning of the Surface Transportation Board in its review of CSX and Norfolk Southern's purchase of Conrail to included trackage rights for a

competitor railroad on the Hudson River Line and participation of CSX in the Cross Freight Movement MIS;

- Initiating the Intermodal Goods Movement and Hub Port Feasibility studies in 1997 that led to the current port strategic plan and the Cross Harbor MIS, a $4 million, federally-sponsored initiative; and
- *Development of the Cocoa Port at the South Brooklyn Marine Terminal.*

In funding these projects, EDC typically draws from several funding sources in financing projects, including general City funds, the City's Industrial Development Agency (IDA), and non-city funds (e.g., ISTEA and now TEA-21). The success in implementing these projects demonstrate the City's commitment and financial ability in supporting freight and port development projects. You will receive a more detailed statement shortly.

If you have any questions, please call me at (212) 312-3783.

cc: Kevin Corbett
Frank McDonough
Tom Shea
Bill Ellis

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

July 20, 1999

REPLY TO
ATTENTION OF

Planning Division
Flood Control & Navigation Section

Ms. Therese Langer
Rutgers Environmental Law Clinic
School of Law-Newark
15 Washington Street, Rm. 334
Newark, NJ 07102-3192

Dear Ms. Langer:

Thank you for your inquiry concerning the New York and New Jersey Harbor Navigation Study. Enclosed are copies of the *Without-Project Condition Report* and the *Preliminary Scoping Document*.

It should be clearly noted and understood that the *Without-Project Conditions Report* must be taken as a snapshot of the various plans as they had evolved up to the date of publication. Because of all the changes in the thinking of the various sponsors and the results of the formulation work performed since that time, the District considers the report to be outdated and obsolete. The District will describe how it used the information in the *Without-Project Conditions Report* in the *Draft Feasibility Report*, a copy of which will be provided to you when it is released to the public. The District currently expects to release the *Draft Feasibility Report* and *Draft Environmental Impact Statement* to the public in September 1999.

Should you have any questions concerning these documents, please contact Mr. Thomas J. Shea, III, Project Planner, Flood Control & Navigation Section at (212) 264-5570.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

Roselle Henn, Chief
Environmental Assessment Section
Department of the Army
New York District, Corps of Engineers
Jacob K. Javitz Federal Building
New York, New York 10278-0900

Dear Ms. Henn:

The Environmental Protection Agency (EPA), as a cooperating agency in the preparation of the environmental impact statement (EIS) for the NY/NJ Harbor Navigation Study (Study), has reviewed the draft Without-Project Conditions Report (W/OPCs Report). The W/OPCs Report was prepared for eventual inclusion in the EIS for the proposed project. Based on our review, we offer the following comments.

EPA is concerned with assumptions made in the W/OPCs Report regarding the nature and extent of future port facility development projected to occur regardless of whether the Port's channels are deepened to 50 feet. The expansions envisioned in the Report are, at this point, only proposed. The proposed port expansions will themselves result in significant environmental impacts. Of particular concern is the significant amount of fill (500-800acres) that is required in the Harbor to realize port facility expansions envisioned in the W/OPCs Report. In light of the highly controversial nature of such fill activities, and the fact that these actions have not gone through the required regulatory processes, we believe it is inappropriate to use these projections as a baseline.

According to the definition of scope as found in 40 CFR 1508.25 (a)(1), actions are connected if they: "(ii) Cannot or will not proceed unless other actions are taken previously or simultaneously." Based on discussions at recent project meetings, it has become apparent that the Corps will not proceed with deepening channels to 50 feet until such time as infrastructure and port facility improvements warrant it. Further, the channels proposed for deepening will have a direct and immediate impact on the nature, timing, and degree of future port facility expansions. As indicated in both the January 7, 1999 Infrastructure Workgroup (IWG) Meeting and the January 29, 1999 NY/NJ Port Authority (PA) Master Plan Briefing hosted by the PA, port developers will likely invest in infrastructure changes differently depending on whether a 50 foot channel to their facility would occur sometime in the future or not. Both the presentation by the IWG and the PA showed that port facilities would be expanded in a different sequence under 45 foot and 50 foot depths. This information indicates channel depth will play a role in determining when and which port facilities are expanded. Consequently, 50 foot channel deepening and port facility expansions are clearly connected; the port facility expansions must be evaluated within the scope of this EIS.

EPA believes the scope of the comprehensive EIS should include water access (through channel deepening), cargo handling (through port facility expansion), Port Information Network Systems (PINS), cargo inland transportation (through the Port Inland Distribution Network [PIDN]), and increases in overall port efficiency. As a consequence of the expanded scope for this project, we believe that additional elements should be included in the comprehensive EIS as follows:

- The comprehensive EIS should evaluate a no-action alternative that does not include port facility or infrastructure expansions as these expansions would now be part of the project scope. In a related matter, at several project meetings, the Corps and it's contractors have mentioned that if port development does not occur (no action), regional goods will need to be supplied via inland transportation. Accordingly, a detailed analysis of the environmental impacts (e.g., air quality) should be considered with this alternative. Particular attention should be given to the fact that the distribution network would, to a large extent, originate outside the local NY/NJ Harbor Complex and, therefore, cause a different set of potential impacts from the port development alternatives.

- Each alternative analyzed in the comprehensive EIS should consider the full range of the National Environmental Policy Act requirements as criteria for determining the preferred alternative for each option including potential social, cultural, and ecological impacts, as well as economic impacts. In this regard, the comprehensive analysis should consider:

  - Possible alternatives for avoiding and minimizing fill under Section 404 of the Clean Water Act. This needs to be fully discussed for each proposed fill location, such as (but not limited to) the purchase of surrounding upland areas, the removal of uplands, or the relocation of upland structures to accommodate port expansion.

  - Both regional and local air impacts pursuant to the Clean Air Act. This needs to be fully evaluated including appropriate modeling for carbon monoxide, nitrogen oxides, volatile organic compounds, and particulates.

  - Environmental Justice concerns for minority and low income populations pursuant to Executive Order 12898. This needs to be considered for locations that would be impacted by port and infrastructure development.

In addition to the general comments we have outlined above, we have provided an enclosure which outlines our specific comments and concerns with the W/OPCs Report.

EPA is aware of the time constraints associated with the release of the draft EIS and Feasibility Study later this year. As a result, we would like to offer our assistance as a cooperating agency in helping you understand our concerns, in generating additional ideas to meet specific time critical needs you may have, and by continuing to review reports prior to their public release. As always, we look forward to working with you throughout this project.

Thank you for the opportunity to comment. Should you have any questions concerning this letter, please contact me or Grace Musumeci at (212) 637-3504 and (212) 637-3738 respectively.

Sincerely yours,

Robert W. Hargrove, Chief
Strategic Planning and Multi-Media Programs Branch

Enclosure

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

MAY 27 1999

Colonel William H. Pearce
District Engineer
Department of the Army
U.S. Corps of Engineers
Jacob K. Javits Federal Building
26 Federal Plaza
New York, New York 10278-0099

Dear Colonel Pearce:

This letter is intended to reiterate the position that the Environmental Protection Agency (EPA) expressed at the April 1, 1999 Senior Executive Review Group (SERG) Meeting regarding the NY/NJ Harbor Navigation Study, and to suggest we hold a follow up meeting.

Even in light of further discussions at the staff level, EPA still believes that the proposed channel deepenings and the projected port facility development projects are inextricably linked (i.e., connected actions). As stated in our April 7, 1999 comment letter on the project, channels will not be deepened to accommodate the fleet if there are no port facilities to accommodate it. By the same token, the port facilities will not expand in the same manner to accommodate the fleet if there is not a commitment to deepen the channels. Additionally, while it may be possible to evaluate the environmental impacts to the Harbor of channel deepening without considering the future configuration of port facilities, it would be virtually impossible for decision makers to pick which channels to deepen without knowing which port facilities would be expanded to accommodate the deeper draft vessels. Without analyzing alternatives of port development and the associated impacts, a reasonably foreseeable build out scenario can not be determined. Consequently, port development and channel deepening activities rely on each other, and therefore port facility development must be analyzed in the Harbor Navigation environmental impact statement (EIS).

We believe that our position is supported by the language authorizing the Harbor Navigation Study in the Water Resources Development Act of 1996, as well as the May 1998 Preliminary Scoping Document released for the project. Moreover, the National Environmental Policy Act (NEPA) mandates that EISs examine the cumulative impacts of the project, including past, present, and reasonably foreseeable future actions. It is our understanding that the EIS contains a section on cumulative impacts; but based on the information presented to date, we are concerned that it will not adequately analyze the impacts associated with port facility development. If the EIS does not adequately evaluate future port facility expansions, it would be inadequate.

During the April 1, 1999 meeting, we agreed to collectively prepare a comprehensive study that includes the modernization of the Harbor's port facilities. The study would include: channel deepening, transportation infrastructure improvements, and port facility expansions. Because the U.S. Army Corps of Engineers, the Port Authority of NY/NJ (PA), and the states are currently examining many of the elements outlined above, we believe that these agencies should take the lead on the study. However, EPA as a cooperating agency in the preparation of the EIS for the Harbor Navigation Study, would be willing to devote the appropriate time and resources necessary to assist in the preparation of the analysis. Additionally, conducting this study will not preclude ongoing studies (Newark Bay Sub-Channel Placement Cells, the DMMP, etc.) from continuing as necessary. In fact, information obtained through these studies could be useful in the formulation of this comprehensive EIS.

With the above in mind, as well as the time critical nature of the study, I suggest we discuss the Harbor Navigation study at the June 16 Partnership meeting. We need to discuss how the need for a comprehensive study and the December due date can be accommodated. Should you have any questions concerning this matter, please contact me at (212) 637-5000.

Sincerely,

/S/ William J. Muszynski

William J. Muszynski, P.E.
Deputy Regional Administrator

cc: Tom Wakeman
Port Authority of New York and New Jersey

Dr. Raimo Liias
U.S. Corps of Engineers

Correspondence with Advisory Groups

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November 28, 1997

Thomas J. Shea, III
Study Manager, Flood Control & Navigation Section
Department of the Army
New York District, Corps of Engineers
New York, NY 10278-0090

Re: Citizen Advisory Group, New York and New Jersey Harbor Navigation Study

Dear Mr. Shea:

I am disappointed that we did not receive the full *New York and New Jersey Harbor Navigation Study Feasibility Study* in a timely enough manner to read, analyze and comment on it. I am additionally disappointed that we did not receive the *Project Study Plan Executive Summary* until two days before the Citizen Advisory Group meeting, and would not have been aware that it existed except through a chance meeting at the Dredging Conference last Tuesday. We also continue to be disappointed that there is an arbitrary division between the Citizen Advisory Group and the Business group.

As I quickly read the summary, it became apparent that few or none of our comments from the February 14, 1997 Advisory meeting were incorporated. I saw no mention of other regional transportation initiatives or plans. What happened to discussion about the Brooklyn to New Jersey or Staten Island Rail Tunnel, or the Cross Harbor Railroad? Where is there mention of the Port Authority's Port planning initiative. Where is mention of the MOTBY conversion?

Why would the Army attempt to assume to make market decisions about shipments, transshipments, alternative freight carrying methods, when the market will make those decisions? If a decision is made, not to deepen channels, and cargo goes elsewhere, the market area for consideration just gets larger. It may cost more, but it is offset by other benefits..

There are too many assumptions made, which attempt to say that any diversion from the Army's course of deeper and deeper channels will have catastrophic national consequences. One assumption is that "If container handling facilities of the Port are accessible only by relatively inefficiently sized vessels, the profit motive will guide shipping lines to seek out alternative loading and routing practices." *So, what.* If containers are routed elsewhere, there is status quo for the national economy, neutral affect. In fact under certain circumstances: more rail line construction, and capital investment in rail cars and locomotives, may result in a net increase in economic activity and jobs nationally and regionally, offsetting a possible loss locally.

The report goes on to say, "The decision as to whether or not an investment should be made to improve a given navigation channel depends on a comparison of the economic cost of the channel improvements with the economic cost of not improving the channel. In this case, an important part of the economic cost of not improving the channel would come in the form of the economic cost of cargo diversion and

transshipment." Again the assumption is made that this region is isolated economically from the rest of the north eastern United States, the rest of the nation and the world.

What if -- Port Newark and Elizabeth became container barge hub port for the entire North East, and larger ships called only on Bayonne, and Brooklyn. Jobs would be created in Tunnel building, or tug and barge construction, barge and tug crews, rail car and locomotive construction, train crews, engineers, architects, investment professionals, (and will result in more sustainable development resulting in cleaner air, less crowded roads, and busier waterways and rails).. Hundreds of thousands of new jobs could be created. Why look at the change in the port as a negative. Why not increase the scope of the port so that smaller ports in New Haven or Providence become part of a barge, ship, rail network?

I would suggest that your distribute the entire plan to the Citizen Advisory Group members, and then have another meeting in two months. It is important that if the Corps does not have the authority or the vision to be able to see how this opportunity to really plan, could improve the region's transportation infrastructure while protecting the quality of life and the environment of the region, then they should find others who can.

Sincerely,

Andrew J. Willner
Baykeeper

cc. Col. Gary Thomas

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO ATTENTION OF
Planning Division
Flood Control & Navigation Section

January 8, 1998

Dear Interested Party:

I want to thank you for your participation in the Business & Labor Advisory Group Meeting on November 21, 1997. Attached is a summary of the discussions held at the meeting, a copy of the slides used during the presentation and the sign in sheet of those who attended the meeting.

During the meeting, we asked for your concerns, your vision for the future of the Port and any other information that may be useful in completing this study. We would like you to provide this information by February 13, 1998. The following month (March 1998) we will provide you with a consolidated bibliography of the information received. In April 1998, we will follow up the bibliography with a document showing the issues identified and how we plan to address them in the study.

There will also be follow-on meetings later in the study. The first of these will be in the summer of 1998 when the District completes assembling the various alternatives for further analysis. This meeting will be followed by a presentation of our preliminary evaluation of the alternatives in the winter of 1998. The following summer we will also invite you to a presentation of our recommendations, which will be held prior to the submission of any report.

Again, thank you for your participation, I look forward to continue working with you on this important study. If you have any further questions or concerns, please contact Tom Shea, Study Manager, Flood Control & Navigation Section, 212-264-1060, e-mail thomas.shea@usace.army.mil.

Sincerely,

John Sassi, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO ATTENTION OF
Planning Division
Flood Control & Navigation Section

January 8, 1998

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Sincerely,

John Sassi, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

Planning Division

May 4, 1998

Dear Citizens Advisory & Business and Labor Advisory Group Members:

As described in the enclosed Public Notice, the Army Corps of Engineers New York District has scheduled a series of public scoping meetings for the Environmental Impact Statement to be prepared for the New York/New Jersey Harbor Navigation Feasibility Study. We hope that members of the Citizens Advisory Group and the Business and Labor Advisory Group will be able to attend one or more of these sessions.

In addition we invite both groups to attend a joint meeting on 8 June 1998 at 3 PM in Conference Room D, 27th Floor, 290 Broadway, New York, NY.

The joint meeting was suggested by Advisory Group Members following our previous meetings. The purpose of the joint meeting will be to brief both groups on the results of the scoping meetings and the issues raised, to provide information on the status of our ongoing studies, and to provide an additional opportunity for input to the Scope of the EIS and the Feasibility Study. Your comments will be used to help define the Scope of the EIS and to assist in the design of work to be conducted in the next phases of the feasibility study.

In addition, the Port Authority of New York and New Jersey and the New York City Economic Development Corporation will provide an update on their respective studies. Likewise, your comments will be used to further refine the work of these two agencies.

We hope you will be able to attend. If you have any questions please call Mr. Thomas Shea, Study manager at 212-264-5570.

Sincerely,

Frank Santomauro

Frank Santomauro, P.E.
Chief, Planning Division

Enclosure

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June 4, 1998

Thomas J. Shea, III
Study Manager, Flood Control & Navigation Section
Department of the Army
New York District, Corps of Engineers
New York, NY 10278-0090

Re: Scope of Work for the New York and New Jersey Harbor Navigation Study

Dear Mr. Shea:

Since we have not heard from you regarding our letter to you of November 28, 1997, we are resubmitting that letter to you as part of our testimony for the Scope of work. Many of the questions we asked, and statements we made nearly eight months ago, are still pertinent.

We intend to continue to review the Scope of work, and participate in the EIS process, however we continue to have serious reservations about the – project purpose, the project scope, the benefits implied, the environmental consequences, and the citizen participation process of the Navigation Study.

It seems to us that events are unfolding around the Corps, and you have elected not to consider the consequences of developing your plan outside of the context of: regional transportation plans, the cross bay railroad tunnel, the cross harbor "rail barge" proposals, plans by New York and New Jersey, and the environmental consequences of attempting to create a deep water port in a shallow estuary.

We intend to submit more extensive written comments on the Scope of Work. We also look forward to your answers to the questions raised in our November 18, 1997 letter, and meeting with you and Col. Pearce on this and other issues germane to the Corps mandate. Thank you.

Sincerely,

Andrew J. Willner
Baykeeper

Enclosure

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

June 23, 1998

Planning Division
Flood Control & Navigation Section

Dear Interested Party:

I want to thank you for your participation in the Business & Labor and Citizens Advisory Groups Meeting on June 8, 1998. Attached is a summary of the discussions held at the meeting and the sign in sheet of those who attended the meeting.

Again, thank you for your participation. I look forward to continue working with you on this important study. If you have any further questions or concerns, please contact Mr. Thomas J. Shea, III, Study Manager, Flood Control & Navigation Section, 212-264-5570, Fax 212-264-6040, e-mail thomas.shea@usace.army.mil.

Sincerely,

Frank Santomauro

Frank Santomauro, P.E.
Chief, Planning Division

Enclosures

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

June 29, 1998

Planning Division
Flood Control & Navigation Section

Dear Interested Party:

As discussed at the recent advisory group meetings, one of the first tasks undertaken as part of the New York & New Jersey Harbor Navigation Study, is the preparation of a bibliography of recent literature concerning the Harbor's biological resources. A report based on a review of the biological information will help to determine the need for additional research or data collection.

Enclosed for your use and review is a copy of the bibliography prepared for this study. Please review the report and if you are aware of any reports or documents that are not listed and will help to evaluate the biological resources of the Harbor, please provide them to my point of contact below.

The District is also preparing a second bibliography concerning the Economics of the Harbor. The report will also be provided for your review when completed.

Should have any concerns or further input, please contact Mr. Thomas J. Shea, III, Study Manager, Flood Control & Navigation Section, (212) 264-5570.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

January 27, 1999

Planning Division
Flood Control & Navigation Section

Dear Interested Party,

I would like to invite you to a session of the Business and Labor and the Citizens Advisory Groups on February 16, 1999 at 2:00 p.m. in Conference Room D, 27th Floor, 290 Broadway, Manhattan, N.Y.

The purpose of the meeting will be to update the two groups with the status of this important study and provide an open forum for the members to discuss issues related to it.

I hope you will be able to attend. If you have any questions, please call Mr. Thomas J. Shea, Project Planner at (212) 264-5570 or thomas.shea@usace.army.mil.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

June 30, 1998

Planning Division
Flood Control & Navigation Section

Andrew J. Willner
Baykeeper
American Littoral Society
Building 18, Sandy Hook
Highlands, NJ 07732

Dear Mr. Willner:

Thank you for your letters of November 28, 1997 and June 4, 1998, concerning the New York & New Jersey Harbor Navigation Study. I appreciate you expressing your concerns regarding the study.

First, I would like to state that the District has not yet developed any plans or recommendations for any improvements in the Harbor as a result of this study. The analysis and Fact Sheet required by §905(b) of the Water Resources Development Act of 1986 completed last April, which you received, only identified that there are likely to be sufficient benefits to cover the costs of some type of improvement in the Harbor. The Executive Summary of the Project Study Plan (PSP), which was provided to you, outlines the investigations and scopes of studies needed to identify and recommend Harbor improvements. Neither document makes any project recommendations, nor does any other document yet produced by the Corps of Engineers.

The integration of various regional transportation plans is of concern to both of us. During the development of the PSP for this study, we dealt with many questions as to how this issue ought to be handled. In coordination with our study partners, we have recognized that many of the studies/initiatives that you mention were the responsibility of the sponsors or others, and that the results of those efforts must be integrated into our study as the "existing conditions" and "future without-project conditions". As a result, we have formed a work group composed of various federal, state and local transportation planning and execution agencies whose sole purpose is to ensure that this study includes their input. The result of this integration will be an interim report entitled "Without-Project Conditions". When completed, it will be sent to both advisory groups for comment. This will occur prior to its inclusion in the final report.

From the beginning of this study, our partners and we have felt that the two advisory groups should convene separately so that both groups could speak freely. A member of the Business and Labor Group echoed this view at the November 1997 meeting, who felt that anything said at a joint meeting would be used to initiate legal action against them. In order to overcome these concerns, we have decided to conduct

two phases of meetings. The first phase is a separate session with the Business & Labor Group to accommodate their concerns regarding the uses made of their remarks. The second phase is a joint session of both groups, as you and others have requested. This was the format that we followed this past May and June and will continue to follow, subject to the desires of our study partners.

I feel that this exchange of letters is serving as an impediment to dealing effectively with matters of our mutual concern. Therefore, I would like to renew my invitation to you to meet with my staff and I to discuss these matters in greater detail. Please contact Mr. Thomas J. Shea, III, Study Manager, Flood Control & Navigation Section at (212) 264-5570 to arrange the meeting.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

CF:
Mr. Kevin Corbett, Empire State Development Corporation
Mr. Frank McDonough, Esq., New Jersey Maritime Resources
Mr. Thomas Wakeman, The Port Authority of New York and New Jersey
Ms. Shirley Jaffe, New York City Economic Development Corporation

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

July 27, 1999

Planning Division
Flood Control & Navigation Section

Dear Interested Party:

I would like to invite you to a NY & NJ Harbor Navigation Study Advisory Group Meeting on August 10, 1999, beginning at 9:30 a.m. in Room 3604, 36st Floor, 26 Federal Plaza, New York, NY.

Since the advisory group last met, the District has accomplished a significant amount of work, which has culminated in its identification of a tentative recommended plan. On July 8, 1999, the District conducted its Alternative Formulation Briefing (AFB) to Headquarters, US Army Corps of Engineers, the North Atlantic Division, the study partners, and the regional resource agencies. The purpose of the AFB was to identify the tentative recommended plan and resolve any policy issues that may have arisen as to the method by which that recommendation was arrived. This early identification of the recommended plan and the resolution of policy issues will then allow the District to release the draft feasibility report and draft environmental impact statement to the public concurrently with its detailed policy review in Washington. The principal result of the AFB is that the District will be able to release the draft reports in September, as scheduled.

The conduct of the briefing was based on the AFB Technical Memorandum, which is enclosed for your information. The purpose of the meeting in August will be to review the document with you and answer any questions that you may have concerning the tentative recommended plan and future activities.

I look forward to your continued participation in the Advisory Group. If you have any questions, please contact Mr. Thomas J. Shea, III, Project Planner, Flood Control & Navigation Section, (212) 264-5570, e-mail: thomas.shea@usace.army.mil.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

Enclosure

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

REPLY TO
ATTENTION OF

March 12, 1999

Planning Division
Flood Control & Navigation Section

Dear Interested Party:

I want to thank you for your participation in the joint Business & Labor and Citizens Advisory Groups Meeting on February 16, 1999 for the New York and New Jersey Harbor Navigation Study. Attached is a summary of the discussions held at the meeting, a copy of the briefing and the attendance sign-in sheet of those who attended the meeting.

Again, thank you for your participation. I look forward to continue working with you on this important study. If you have any further questions or concerns, please contact Mr. Thomas J. Shea, III, Project Planner, Flood Control & Navigation Section, 212-264-5570, Fax 212-264-6040, e-mail thomas.shea@usace.army.mil.

Sincerely,

Frank Santomauro

Frank Santomauro, P.E.
Chief, Planning Division

Enclosures

Correspondence on Fish & Wildlife Coordination Act Report

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278–0090

29 January, 1999

REPLY TO
ATTENTION OF

Planning Division
Environmental Assessment Section

Mr. Clifford Day, Supervisor
US Fish & Wildlife Service
927 Main Street, Bldg. D-1
Pleasantville, NJ 08232
Attn: John Staples

Dear Mr. Day:

The US Army Corps of Engineers, New York District (District) was pleased to meet with Mr. John Staples, Mr. Tom McDowell and Mr. Bob Russell of your staff on December 2, 1998 to discuss our comments on your August, 1998 Planning Aid Report (PAR) for the proposed New York & New Jersey Harbor Navigation Study. We transmit these comments and request a response letter as pre-coordinated with Mr. Staples (enclosed). Your response will be useful, in conjunction with the PAR, in the development of our draft Scope of Work for the preparation of the Fish and Wildlife Coordination Act Report for this project.

We note with pleasure, the attendance of Mr. McDowell at the last two Environmental Workgroup Meetings for the New York & New Jersey Harbor Navigation Study and look forward to his continued involvement. We are also interested in the potential integration of present and future field studies and monitoring for the harbor area into a comprehensive environmental program as part of the Harbor Navigation study. We look forward to further discussions on this subject with your office.

If you have any questions, please contact Ms. Judith Rugg, Project Biologist, at (212) 264-0212.

Sincerely,

Frank Santomauro

Frank Santomauro, P.E.
Chief, Planning Division

Enclosure

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
927 North Main Street (Bldg. D1)
Pleasantville, New Jersey 08232

RECEIVED 4/26/99

FP-99/007

April 21, 1999

Frank Santomauro, P.E.
Chief, Planning Division
New York District
U.S. Army Corps of Engineers
26 Federal Plaza
New York, New York 10278-0090

Dear Mr. Santomauro:

This responds to the U.S. Army Corps of Engineers' (Corps) January 29, 1999 letter, which provided comments on the U.S. Fish and Wildlife Service's (Service) Planning Aid Report (PAR), dated August 1998, for the proposed New York and New Jersey Harbor Navigation Study (HNS). We apologize for the delay in responding to the Corps letter.

AUTHORITY

The following comments provide technical assistance only and do not constitute comments by the Service as afforded by the Fish and Wildlife Coordination Act (48 Stat. 401; 16 U.S.C. 661 *et seq.*) nor do they preclude comment on any forthcoming environmental documents pursuant to the National Environmental Policy Act of 1969 as amended (83 Stat. 852; 42 U.S.C. 4321 *et seq.*) (NEPA).

SERVICE COMMENTS

The Corps stated that the Red Hook Channel has been eliminated from further consideration for the proposed project. We will incorporate this change into our upcoming Fish and Wildlife Coordination Act report for the HNS.

We also note the Corps concurrence with the majority of the Service's 13 recommendations to minimize impacts of the proposed project to the high-quality fish and wildlife habitats within the New York / New Jersey Harbor Estuary.

The Service's PAR recommended, that the Corps determine the reason for high concentrations of fish in channels versus shoals and determine key concentration areas for commercially and recreationally important fisheries. It is known that channels within Raritan Bay yield more fish per unit sampling effort using an 8.5-meter otter trawl. However, it is not known what the response of fish would be to deepening and widening existing channels. It would not be safe to conclude from existing data that there would be an increase in the number of fish using channels if the channels were widened. The Corps responded to this recommendation by stating that sampling to determine fish species composition, density, and population structure throughout the study area is currently being performed. Additionally, the Corps stated that it was beyond the scope of the current study to determine reasons behind fish distribution within the study area.

While determining the reasons for fish concentrating in channel areas may be difficult, such information would allow the Corps to more accurately predict any adverse impacts of channel alterations. Unfortunately, it appears that the schedule for the proposed project will not allow for a thorough examination of this issue prior to completion of the Environmental Impact Statement. Therefore, the Service recommends that the Corps design a sampling plan to determine the impacts of channel deepening and widening on fish populations within the study area. Such a study would presumably include sampling fish abundance and composition in channel and adjacent shoal areas prior to and after channel alterations. The Service recommends designing the study in cooperation with appropriate state and federal natural resource agencies.

The Service recommended in the PAR that the Corps evaluate the impacts of expansion of land-based port facilities on fish and wildlife resources. The Corps responded that indirect impacts anticipated from implementating a comprehensive navigation improvement plan would be analyzed. Unfortunately, the Corps concludes in its November 1998 report entitled "New York and New Jersey Harbor Navigation Study; Without-Project Condition Report" that filling over 700 acres of open water and wetlands for port facility expansion will be considered the without-project, future condition. Therefore, it is unclear what indirect impacts the Corps would evaluate as part of the HNS. To fully evaluate environmental effects consistent with Section 1502.16 of the Council on Environmental Quality's NEPA regulations, impacts to fish and wildlife resources associated with large fills proposed for land-based port facility expansions must be evaluated as potential indirect impacts for the HNS.

The Service recommended in the PAR that the Corps conduct 11 studies to determine the effect of dredging with respect to contaminants and disturbance on a range of receptors including: peregrine falcon (*Falco peregrinus*); black-crowned night-heron (*Nycticorax nycticorax*); snowy egret (*Egretta sacra*); double-crested cormorant (*Phalacrocorax auritus*); greater scaup (*Aythya marila*); and, sentinel bivalves. We note that the Corps is funding the first study that was recommended to determine the prey base of peregrine falcons within the study area. We concur with the Corps that the results of this ongoing study will determine the need for two additional studies regarding the peregrine falcon.

Since the issues related to the additional Service-recommended studies are complex, we feel it would be best to discuss the merits of these studies on a conference call or in a meeting. We understand the Corps is concerned about the usefulness of some of the studies and the tight time frames involved in completing an Environmental Impact Statement for the HNS. However, we feel that studies to document the effects of the proposed project on fish and wildlife resources are warranted, especially with regard to contaminants.

The Service looks forward to continued work with the New York District on the HNS. Should you have any questions regarding these comments, please contact me or have your staff contact Thomas McDowell or John Staples of my staff at (609) 646-9310.

Sincerely,

for Clifford G. Day
Supervisor

NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

REPLY TO
ATTENTION OF

July 19, 1999

Planning Division
Environmental Assessment Section

Mr. Clifford G. Day, Supervisor
U.S. Department of the Interior
Fish and Wildlife Service
New Jersey Field Office
927 North Main Street, Building D-1
Pleasantville, New Jersey 08232

Dear Mr. Day:

Thank you for the comments contained in your April 21, 1999 letter to Planning Division concerning the New York District's (District) response to the Planning Aid Report prepared by the Fish and Wildlife Service (Service) for the New York and New Jersey Harbor Navigation Study. We acknowledge that these comments are for technical assistance alone and do not preclude Service comment upon the Fish and Wildlife Coordination Act (48 Stat. 401; 16 U.S.C. 661 et seq.)(FWCA) report that the Service is preparing for this study or any other forth-coming environmental documentation related to this study. Nonetheless, the following may clarify and address concerns raised in your April 21, 1999 letter before the preparation of the FWCA report.

The Service expressed concerns about the adequacy of the sampling plan design to assess recreationally and commercially important fish specie abundance, population composition and distribution throughout the channels and adjacent areas of the proposed project. Sampling of the study area is currently underway. The study's environmental impact statement will use this information in its analysis. The data will also be used to develop a pre-construction monitoring program. I have enclosed the sampling program and preliminary data results for your review. I have also submitted this information to other resource agencies participating in this study. The total scope for the pre-construction and potential post-construction monitoring efforts will be coordinated with your office as the EIS progresses.

The Service also expressed concern regarding some 700 acres of fill projected as the "Without-Project" future condition. As potential effects are evaluated by comparing with- to without-project conditions, the Service feels that the indirect effects of fill have not been properly addressed. There have been several developments that are relevant to this issue:

- With respect to terminal areas, the *Without-Project Conditions Report* reflected the views of the future held by the various non-federal entities involved as they had evolved up to the date of publication. Because of all the changes in the thinking by the District and the results of the formulation work performed since that time, the District considers the report outdated and obsolete.

- There are no fills in the Without-Project Condition now, and the District does not expect that to change.

- There are no fills in the With-Project Condition now, and the District does not expect that to change.

- No fills are required in order for the operators of the present container terminals at Port Newark/Elizabeth Port Authority Marine Terminal, Global Terminal, and Howland Hook Marine Terminal to benefit from deeper channels up to fifty feet in depth. No fills will be required in order for the operators of the future container terminals at MOTBY and South Brooklyn to benefit from deeper channels up to fifty feet in depth.

- It is important to distinguish between effects caused by channel deepening and effects caused by efforts on the parts of terminal operators to capture more business, beyond that which they will be able to capture in the Without-Project conditions. The environmental effects caused by channel deepening will be described and analyzed in the EIS for the New York and New Jersey Harbors Study. The environmental effects caused by efforts on the parts of terminal operators to capture more business, should those efforts occur, will be described and analyzed in a separate EIS being prepared by the non-federal entities.

- The scope of the EIS being prepared by the non-federal entities is to include actions to be taken that require one or more federal permits and, as cumulative impacts, actions to be taken that increase the amount of land area in the Port devoted to the handling of containers. All anticipated increases in the amount of land area in the Port devoted to the handling of containers, whether accomplished by acquisition of existing land or by fill, will be described and analyzed in the EIS being prepared by the non-federal entities.

The Service also commented on the characterization of sediments. Due to the time constraint imposed on the study, chemical and physical testing of the dredged material has not taken place. Sub-surface data collected during previous navigation improvement projects and maintenance dredging of navigation channels located within the project area will be used to characterize, to the extent feasible, sediments below the currently authorized project depth. The physical characterization of project sediments will be used to identify potential disposal options. The District will perform all required sediment testing, in accordance with current regulation, before construction of any recommended project.

Should you need additional information concerning project formulation, please contact Mr. Thomas Shea at (212) 264-5570. For information on biological sampling, contact Ms. Jenine Gallo of my Environmental Analysis Branch at (212) 264-0209.

Sincerely,

Frank Santomauro, P.E.
Chief, Planning Division

Enclosures

Public Notice
&
Responses

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, N.Y. 10278-0090

DEC 18 1997

REPLY TO ATTENTION OF

District Engineer

NEW YORK AND NEW JERSEY HARBOR, NY & NJ
FEASIBILITY LEVEL NAVIGATION STUDY

This announces the initiation of a cost shared feasibility level study for determining whether navigation improvements in the Port of New York and New Jersey are justified for Federal participation. The study is being conducted in partnership between the State of New York, (Empire State Development Corporation), the State of New Jersey (Department of Commerce and Economic Development), and The Port Authority of New York and New Jersey and the New York District, US Army Corps of Engineers. The study is authorized by Section 435 of the Water Resources Development Act of 1996 (WRDA).

Planning studies of water resource problems are conducted in two phases by the US Army Corps of Engineers in its Civil Works role. The first phase is the reconnaissance study, accomplished entirely at Federal expense. The second phase is the feasibility study, which is cost shared equally between the Federal government and a non-Federal sponsor(s).

The Section 905b, WRDA 86 Analysis Fact Sheet was completed in April 1997. The purpose of this analysis is always three-fold. The first is to determine whether the Federal Government should continue in further studies of the water resource problems. The second is to determine the scope, duration and cost of any further studies. The third is to identify a non-Federal sponsor willing to cost-share the studies. The analysis found that there should be sufficient economic benefits to justify deepening selected channels within the Port to 50 feet or more below mean low water and identified the non-Federal sponsors mentioned above for the feasibility study.

The feasibility phase will study, in more detail, the engineering, economic and environmental evaluations to identify the optimum channel depths to meet the existing and future needs of the Port of New York and New Jersey, with an emphasis on container and crude petroleum. At its completion, a "Feasibility Report" containing a recommendation for construction, if justified and supported by a non-Federal sponsor will be released. The report, including the necessary environmental documentation, would be submitted to the United States Congress for project authorization.

The Port of New York and New Jersey is the largest port on the East Coast, providing more than 166,000 port-related jobs, $20 billion in economic activity, and serving more than 17 million consumers in the states of New York and New Jersey. Through its intermodal links, the Port provides second day access to another 80 million consumers in the northeast and mid-western states. In 1995, the Port received and shipped more than 44.8 million long tons of waterborne general cargo to all parts of the United States and throughout the world and received petroleum and related products from ports on the Atlantic and Gulf Coasts, the Caribbean, Africa and the Persian Gulf.

The Corps' New York District requests any pertinent information about the project area from any Federal, state, or local agencies, and the private sector. In particular, we request information on the type, amount, and location of waterborne commerce and ships calling on the Port and any projections of future commerce and size of ships. This information will be used to

define the status of the Port, forecast the benefits of channel improvements, and determine potential Federal involvement in providing deeper, wider and/or realigned channels. The Corps also welcomes any assistance and suggestions concerning the conduct of this study.

Interested parties should send all comments and information to the address at the top of page 1, attention Thomas J. Shea, III, Study Manager, Flood Control & Navigation Section, call him at (212) 264-1060 or email: thomas.shea@usace.army.mil.

Gary Thomas
Colonel, Corps of Engineers
District Engineer

A. P. MOLLER INC.

MAERSK INC.

MAERSK

February 10, 1998

Mr. Thomas J. Shea, III
Study Manager
Flood Control and Navigation Section
U.S. Army Corps of Engineers
Jacob K. Javits Federal Building
New York, New York 10278-0090

Dear Mr. Shea:

Maersk Inc. serves as the exclusive North and Central American agent for Maersk Line, the world's largest ocean container carrier. Maersk Line has served the port of New York for many years, and hopes to continue and expand upon that long time relationship.

Presently, Maersk Line vessels deployed to Port Newark consist of our "M" class ships. They carry in excess of 4,000 intermodal containers and require a depth of 40 + 3 feet while underway and 40 + 2 feet alongside the berth.

Our principals have expressed an interest in deploying the newer, "K" class containerships in trades that serve the east coast, however, as such vessels require a depth of 48 + 4 feet while underway and 48 + 3 feet at dockside, prevailing conditions at the port of New York, however, at this time make it impossible to pursue such plans. We are reasonably confident that "K" class ship calls at the port of New York could well become a reality, at such time when required conditions for port access and berthing could be secured.

Sincerely,
Maersk Inc.

Jorgen Steving
Director, Operations

JST/pln

Giralda Farms, Madison Avenue, P.O. Box 880, Madison, NJ 07940-0880, USA
Telephone: 973-514-5000. Telex: MCI 6733476. Fax: 973-514-5410.
Internet: http://www.maerskline.com

UNIVERSAL MARITIME SERVICE CORP

February 11, 1998

Mr. Thomas J. Shea, III
Study Manager
Flood Control & Navigation Section
U.S. Army Corps of Engineers
Jacob K. Javits Federal Building
New York, New York 10278-0090

Dear Mr. Shea:

Universal Maritime Service Corporation (Universal) is a major stevedore/marine terminal operator doing business at Port Newark, New Jersey. We operate berths 51, 53, 55, 57 and 59, with backland (container storage area) of some 160 acres. We service 15 ocean container carries, servicing all major world trade routes.

In the aggregate, Universal handles in excess of 375,000 container gate movements and 275,000 container ship moves annually while servicing over 400 vessels. Our projections envision substantial growth in the trade lanes serviced by virtually each of our clients. Accordingly, we estimate that container volumes will substantially increase each year for the next five years. We have invested substantially in order to accommodate our present and future volume demands.

In terms of predicting future ship size, we know that two of our clients, Maersk Line and P&O/Nedlloyd, currently have several container ships deployed that have the capacity to carry in excess of 6,000 containers each. Presently, the largest of such vessels requires 48 + 4 feet of water depth when fully laden and underway. Both of those clients have concluded that a port of New York service utilizing their larger vessels is economically impractical due, of course, to depth limitations.

The balance of our clientele, we understand, are presently weighing the merits of building newer and larger vessels. We suspect that prevailing industry and market conditions will induce them to opt for larger vessels, as well. Universal certainly hopes that the port of New York is in a position to accommodate such vessels. We know that other ports on the seaboard will be.

Sincerely,

R.L. Signorino

Ronald L. Signorino
Director Regulatory Affairs

RLS/jms

231 Tyler Street, Port Newark, N.J. 07114
Telephone: 201-465-1000. Telecopier: 201-465-5806.

GLOBAL
TERMINAL & CONTAINER SERVICES, INC.

VIA FAX & MAIL

February 11, 1998

Department of the Army
New York District, Corps of Engineers
Jacob K. Javits Federal Building
New York, NY 10278-0090

Attn: Thomas J. Shea III
Study Manager, Flood Control & Navigation Section

Dear Mr. Shea:

I understand that the Corps is in the process of collecting information about a "Feasibility Phase" of deepening the New York and New Jersey Harbor to 50 feet or more.

In the past, Global Terminal has supplied various information in support of deepening the channels in this Port. I believe the following most updated information is helpful to the study.

1. Several months ago, Global Terminal had started discussing with major railroads to bring container rail services to the terminal. The plan is to construct another rail track along side the current one to make an on-dock rail. We have held various meeting with representatives from the New Jersey Department of Transportation (DOT), New Jersey Department of Commerce and Economic Development (DCED), officials from Jersey City, a local rail company and the North Jersey Transportation Planning Authority. We have received very strong support from them regarding this plan.

2. New Jersey state government, particularly the DOT and DCED, are working on a Portway Project. This is a public-private partnership project which gears to provide smooth freight transportation between the different container terminals and rail ramps in New Jersey. The Port Jersey Peninsula is a part of this entire network. Construction should begin in 1999. Furthermore, the New Jersey Turnpike Hudson Extension between exits 14 and 14A (Bayonne) has three lanes in each direction. However, currently only two lanes are used with the shoulder reserved for emergencies. It seems this is the only bridge in the Port area not fully utilizing its capacity.

   This means that roadways supporting the long term expansion of the Port Jersey Peninsula will be available within the next several years. A short-term solution is also ready as soon as the Turnpike Authority decides to use the shoulder of the Turnpike Hudson Extension.

302 PORT JERSEY BOULEVARD, P.O. BOX 273, JERSEY CITY, N.J. 07303
(201) 451-5200 • 800 648-9744 • FAX (201) 451-5088

3. Military Ocean Terminal in Bayonne (MOTBY), will be available soon for development into a container terminal. Four months ago, the Bay Reuse Commission for MOTBY voted for a proposal to make a part of the base a container terminal. More space could be assigned to this container terminal should the demand be there and the benefits justify, according to the chairman of the Commission.

   Nearby areas around the Port Jersey Channel could also be developed into container terminals as the demands increase.

4. To prepare itself for the transportation needs of the 21st century, Global Terminal plans to replace all of its existing cranes with post-panamax cranes in the immediate future.

   These cranes could be in use early next year.

In summary, infrastructure and economic development in the Port Jersey area are already planned to meet future requirements of the New York/New Jersey Harbor. As soon as the Port Jersey Channel is dredged to 41 feet this year, we expect development in the area to move even faster.

In view of the need to become more cost competitive, the NYSA and the ILA jointly announced to cut assessments, some of them by as much as 50%, effective January 1, 1998. This is a continuation of efforts to reduce costs in doing business in this Port. It was indicated that more efforts will be extended in this direction.

The Port of New York/New Jersey has been the most important gateway in north America for international trade with countries in Europe. There are numerous indications and projections that the economic development in Europe will take big leaps in the next two years, following the strong foundation established in 1996 & 1997. It will not be surprising that 6000 - TEU vessels, which require a minimum of 45-feet of water, will be deployed within the next several years to service this trade lane.

We, the federal/state/municipal governments and private sectors, need to strengthen our partnership to work together to make the New York/New Jersey Port ready for this trade growth and to create more new jobs for this area.

Please let me know if you should need further information.

Very truly yours,

C. M. Chen
President & CEO

CMC/pg
cc: Col. Gary Thomas
K. Mak

John J. Angelone
President
Local 1588

International Longshoremen's Association
AFL-CIO

Executive Board
Gene G'Sell
Joe Pelliccia
Nick Romano
Harry Lupo

Business Agent
William C. Hurley

Environmental Rep.
Tom Rackley

Administrator
Denise M. Bohn

550 KENNEDY BOULEVARD • BAYONNE, NEW JERSEY 07002 • PHONE (201) 437-3452 • FAX: (201) 436-7487

February 16, 1998

Thomas J. Shea, III
Study Manager
Department of the Army - Corps
Jacob K. Javits Federal Building
New York, NY 10278-0090

Dear Mr. Shea:

On June 17, 1997, Governor Christine Todd Whitman filed with the Secretary of State my commission to the Dredging Project Facilitation Task Force (DPFTF). On August 1, 1997, Jeffrey T. Michaels, Chairman DPFTF appointed me to a sub-committee preparing guidelines and procedures for bona fide requests for approval of specific projects to be funded by the Bond Act.

The mission of the DPFTF is to assist appropriate State agencies and the Legislature in establishing proprieties for the dredging project in accordance with the economic benefit to the State and the relative potential to bring about economic growth through enhanced maritime commerce.

So much for background; in late October 1993 in a special environmental issue from the Port Authority, Ms. Lillian C. Borrone, Port Director, wrote "Today" (1993) "the modern container ship that calls on the Port of New York and New Jersey typically have drafts of up to 40 feet and sometimes may exceed 40 feet". She went on to say, "However to assure we remain competitive, we will be assessing whether or not this region will require a 45-foot channel in the next century". This was only a little over four years ago and now the technological and competitive nature of our Port demands a depth of at least 50 feet.

The Army Corps of Engineers Feasibility Study must consider time, economics, and the environment. Absent of politics, the quickest, most economical, and environmentally safe place to dredge to depths of 50 or 55 or 60 or possibly 65 feet without hitting bedrock is the Port Jersey Channel.

The Base Re-Use Committee in Bayonne, on October 30, 1997, voted the re-use of the Military Ocean Terminal to include a deep sea container port (125 to 200 acres or possibly more) in its mixed use, and Global Terminals which mirrors the Military Ocean Terminal is also eagerly awaiting to be the first to receive the mega ships in our great Port.

This is at a cost billions of dollars less than Port Newark, Port Elizabeth, or Howland Hook due to the need of extensive blasting of bedrock in the Kill Van Kull and the Arthur Kill. Port Jersey is environmentally correct with a time element and cost at a fraction of any other feasible project.

I have enclosed ten newsletters that are read by thousands of people each month. The President's Message in each newsletter deals with the Port, dredging, and maritime commerce.

Thank you for the opportunity to respond.

Sincerely yours,

John J. Angelone
President

New Jersey
ALLIANCE for ACTION INC.

PHILIP K. BEACHEM
President
ERICA D. FERRY
Vice President

P.O. Box 6438 · Raritan Plaza II · Edison, New Jersey 08818-6438
(732) 225-1180 · FAX (732) 225-4694

ELLIS S. VIESER
President-Emeritus

February 25, 1998

Mr. Thomas Shea, III
Study Manager - Flood Control & Navigation Section
Department of the Army
New York District, Corps of Engineers
Jacob K. Javits Federal Building
New York, New York 10278-0900

Dear Mr. Shea:

The New Jersey Alliance for Action applauds the announcement of a Feasibility Study to determine optimum channel depths in the Port of New York and New Jersey.

It is clear that the Port of New York and New Jersey must be deepened to meet the demands of the shipping industry. The larger ships already experience difficulties in sailing into the port, and the newer ships will only be bigger. If the Port of New York and New Jersey is not deepened, ships will move on to other ports, such as Halifax, Nova Scotia, which has an average channel depth of over 60 feet.

The New Jersey Alliance for Action was created in 1974 to promote infrastructure development. Since then we have been closely involved with dredging/port development, transportation improvements, waste management telecommunications, etc.

I reiterate that the channels must be deepened to meet the needs of the Port of New York and New Jersey. The 166,000 employees in port related jobs, our $20 billion economy and the 17 million consumers in the New York and New Jersey area are counting on it.

Please call me if you have any questions at, (732) 225-1180.

Sincerely,

Philip K. Beachem

Philip K. Beachem
President

PKB:pg

cc: Colonel Gary Thomas, District Engineer, Corps of Engineers
Ellis S. Vieser, President-Emeritus
Erica D. Ferry, Assistant Vice President
Gerald T. Keenan, Assistant Vice President

WATERFRONT COMMISSION OF NEW YORK HARBOR
42 BROADWAY
NEW YORK, N. Y. 10004-1640
(212) 742-9280
FAX (212) 480-0587

JAMES H. WALLWORK
MICHAEL C. AXELROD
COMMISSIONERS

CARMINE A. CARDONE
EXECUTIVE DIRECTOR

March 13, 1998

Mr. Thomas J. Shea, III
Study Manager
Flood Control & Navigation Section
U.S. Army Corps of Engineers
Jacob K. Javits Federal Building
New York, New York 10278-0090

Dear Mr. Shea:

Thank you for the opportunity to comment on the New York and New Jersey Harbor, NY & NJ Feasibility Level Navigation Study. As an active stakeholder in the Port, we support this comprehensive study of the navigation needs at the Port of New York and New Jersey that will address the improvements required to provide economically efficient and environmentally sound navigation to meet current and future requirements.

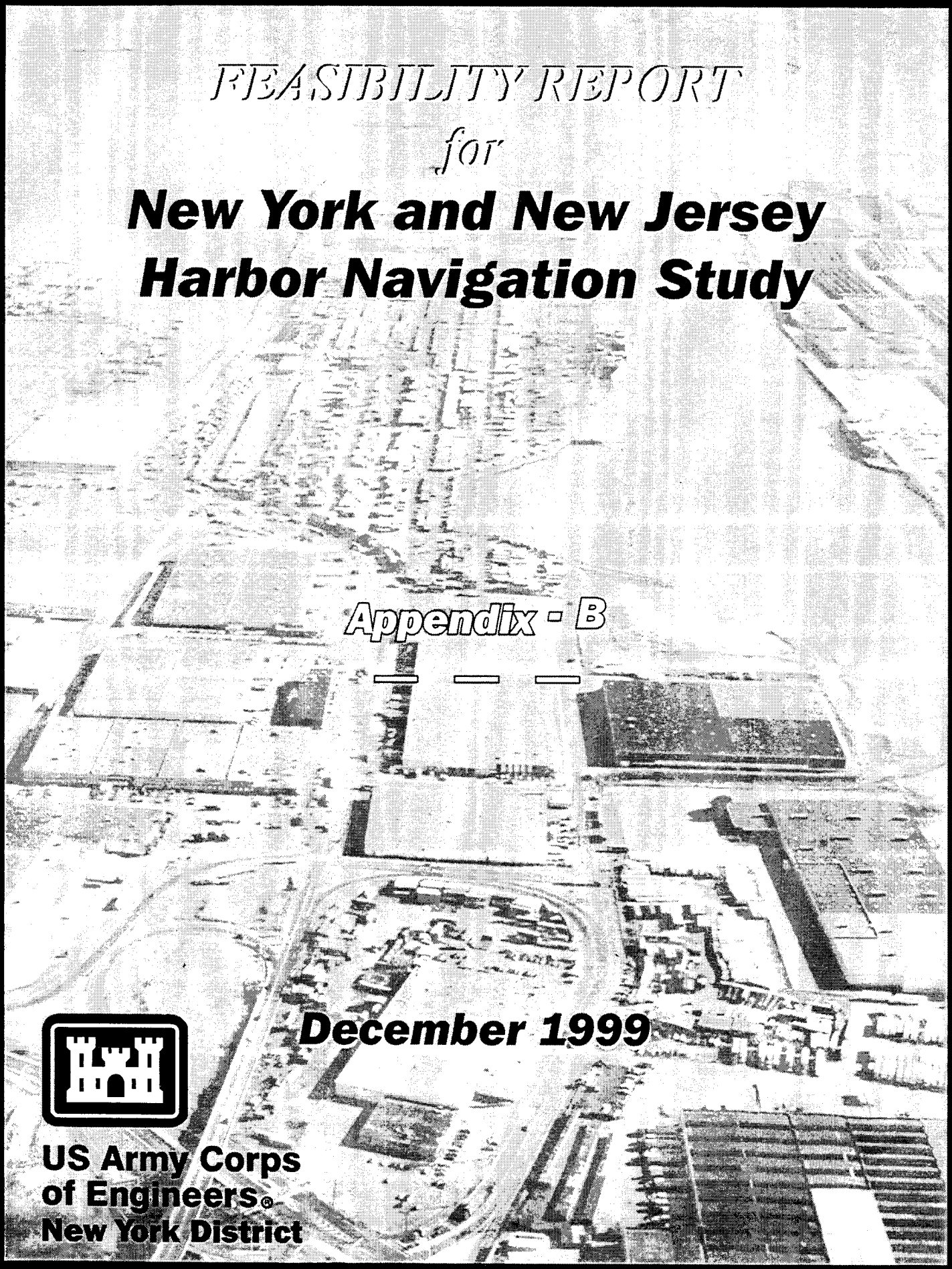
The Waterfront Commission of New York Harbor is a bi-state agency, an instrumentality of the States of New York and New Jersey, authorized by the Congress of the United States. The agency is vested with licensing, regulatory, investigatory and law enforcement powers in the Port of New York-New Jersey. The Commission licenses and registers some 6,000 persons working on the waterfront as longshoremen, checkers, pier superintendents, pier guards, hiring agents and telecommunications system controllers. We also license 75 stevedoring companies that perform services involving or incidental to the movement of waterborne freight, and employ these licensees and registrants. The Commission has the responsibility to regularize the waterfront labor force by balancing the number of eligible dockworkers with the demand for their services.

As dredging the harbor became more difficult over the past few years, we have seen cargo destined for this region shift to other ports. This has not only lessened work opportunities for our registrants and licensees, but has also had an unfavorable impact on other businesses and employees who rely on the Port for their existence. If the Port of New York and New Jersey is to compete successfully for cargo with other ports, and sustain the economy of the region, it will be necessary to plan to provide the appropriate channels depths for the larger vessels now in production. We fully support this project as necessary to the prosperity of the Port and the region.

Please keep us informed on the progress of the feasibility study. If the Commission can provide any information useful to this effort, do not hesitate to call.

Very truly yours,

Carmine A. Cardone
Executive Director



FEASIBILITY REPORT

for

New York and New Jersey Harbor Navigation Study

Appendix - B

December 1999

US Army Corps of Engineers®
New York District

(Not Used)