DMMIWG

Memo: DMMIWG
From: Jim Tripp and Tom Wakeman, co-Chairs
Date: June 28, 2002

The next meeting of the DMMIWG is scheduled for Wednesday, July 10, 2002, Hudson River Foundation, 40 West 20th Street, 9th floor, Manhattan, starting at 9:30a.m. Subsequent meetings will take place on August 7, September 4 and October 2, 2002.

The agenda for the July 10 meeting will include:

1. **Howland Hook and the Arlington Marsh.** Andrew Genn, EDC. What are current EDC plans vis-à-vis the future of the Howland Hook terminal? Does it encompass any expansion that would have an impact on the Arlington Marsh? How would this be affected by the depth of the channel to Howland Hook? Should this Marsh be considered as a potential fill site for port operations or should the Marsh be permanently protected?
2. **Arthur Kill ecosystem restoration initiatives.** Tom Wakeman and Len Houston. At the last meeting, we heard presentations both about the historic and future likely impact of boat traffic and channel deepening on the Arthur Kill ecosystem, historic changes in that ecosystem in recent decades and opportunities for an AK restoration initiative. What should such an initiative look like? Who will be in charge and who will do what?
3. **Windows.** Tom Wakeman et al. At the DMMIWG meeting in May, we had a series of presentations on Windows and the need for a systematic process for providing scientific information about restrictions on dredging to protect essential fish habitat on all channels in the Harbor. How are we doing in terms of moving this process ahead? Who is doing what?
4. **Hackensack Meadowlands.** The Corps has released its Meadowlands Mills EIS. What are the basic findings of the EIS? What are its recommendations? What is the status of alternatives to filling wetlands in the Empire Tract? How are any findings or recommendations in the EIS consistent with HEP CMMP provisions regarding protection and restoration of ecological resources in the Harbor?
5. **Freight rail.** Alice Cheng/Andrew Genn of EDC. What is the status of EDC proposed freight rail improvements? The use of the Port Authority's $50 million for freight rail investments in New York and New Jersey? The freight rail tunnel EIS?
6. **HARS/RMWG.** Ron Borsellino or Doug Pabst, EPA. EPA has released the Interim Consensus Report of the HARS Scientific Peer Review, Phase 1: Human Health Evaluation, dated June 20, 2002. What is the next step for this part of the Evaluation? What about the ecological evaluation?
7. **CPIP.** Update. Rick Gimello.

At the meeting on June 12, we discussed the following:

1. Arthur Kill wave wash and erosion study. Wakeman introduced the presentation. This is a follow-up to the February presentation concerning the potential impact of Arthur Kill deepening on erosion south of Howland Hook. Angelo Trotto added that the PA retained Moffet & Nichols to conduct a study, to collect additional data and the review their erosion and wave wash model.

Santiago Alfageme of M & N, a coastal engineer, discussed the results of the study, including: 1. Study objectives. 2. The AK 41/40 foot project. 3. The environmental assessment. 4. Development of vessel-generated waves. 5. Wake measurements. 6. Wake modeling and assessing of project-induced changes. 7. Historical marsh changes. 8. Summary of preliminary findings.

Objective, project and assessment. The purpose of the study is to review the impact of ship -generated waves under existing and future conditions on wetlands in the northern reach of the AK. The existing depth of the navigation channel is 35 feet. The project depth is 41 feet to Howland Hook and 40 feet for a distance of approximately 1 mile south. A focus is on Old Place Creek where you can see mud flats and marsh. The Corps' assessment identifies bank loss at Old Place Creek.

Vessel-generated waves and measurements. Ship waves are initially generated due to water drawdown. As a ship proceeds, it creates a return current, offset by water depression the length of the ship, about ½ foot. The transition from depression to an undisturbed water level creates a front wave. A similar wave is generated off of the stern, the back wave. Drawdown creates a long solitary wave the length of the ship. It is not easily observed in the field. It does not break at the shoreline; it is more like a quick tide pulse.

Secondary waves are created by inertial forces. There are two sets of such waves. Transverse waves are perpendicular to the sailing line; diverging waves are at an angle. These waves intersect. They are short, behave like normal waves and break at the shoreline. A picture of such wakes approaching the shoreline shows them peaking up and then breaking. To measure these waves generated by tug boats and ships in the current 35 foot navigation channel, we installed wave gauges at Bridge Creek and Old Place Creek that the City Parks Department has restored. They were installed as close to mean low water as possible. The gauges are capable of a 0.5 second sampling frequency. A filter removes tidal oscillations. We used the resulting time series to identify relatively short 2 to 3 second diverging waves associated with tugs. We measured a total of 59 drawdown incidences and 151 secondary waves between December 12 and 18, 2001. A graph shows statistics for drawdown and secondary waves. A video from December 15 shows a drawdown and secondary waves. After the tug passed, the bigger secondary waves are shown breaking along the shore. A slide shows return current. The highest secondary waves were measured as 33 centimeters or about one foot, after a tug passed moving at 10 knots.

The relative sheer stress of drawdown, return flow and secondary waves in terms of ability to erode are 5 to 1 to 32. In other words, secondary waves have six times the ability of drawdown to erode. In terms of findings, the maximum wave height was 33 centimeters. Secondary waves propagate and break similarly to normal waves. Tugs transit the channel more frequently than larger vessels.

Modeling. Ship wake modeling shows the source of waves, propagation and shoaling/breaking characteristics. The equation to predict secondary waves comes from PIANC (1987). It is directly proportional to the 4^{th} power of the vessel speed and inversely proportional to water depth. We use the constant equal to 1.0. We can plot speed vs. wave height. See Fig. 8 p. 11 and plot wave height as a function of channel depth. Increasing the depth of the navigation channel from 35 to 41 feet reduces the wave height 9%. The wave height is measured at MLW. The speeds of vessels are relative to the water current. Speeds are determined by a range finder. The formula does not take configuration of the channel into account.

We need to look at how waves propagate towards the shore. Fig. 11 p. 14. The black line shows MLW. Waves change as they tough bottom. Ship wake modeling for future conditions is similar to that for pre-project conditions. Fig. 19 p. 23 shows a tug wake approaching the intertidal shelf with the wave peaking up and then breaking. Fig. 20 showing the breakline represents the existing profile; the red line represents the new channel slope. The new shelf or channel edge moves 20 meters closer to the marsh shoreline. With the expanded channel there are only 5 meters from the slope of the channel to the seaward edge of the marsh. The wave height increases 7%. This increase is due to the closer proximity of the edge of the channel to the marsh. This is 5 meters vs. 30 meters current distance from the edge of the channel to the marsh.

Historic changes. The natural depth of the AK was 15 to 20 feet. The channel was deepened to 30 feet in the 1930's, then 35 feet in the 1960's. The railroad bridge was built in the 1890's. The Goethals Bridge was built in 1928. We have inspected maps from 1639 and 1776, an 1844 USGS map showing depths of 17, and 19-20 feet, a 1907 NYC map that shows an earlier railroad bridge; a 1917 Doc map where a huge area on the east side encompassing Howland Hook is shown as wetlands; a 1924 map that shows that dredging had started with wide casting filling wetlands; a 1924 Fairchild aerial photo that depicts fill; a 1931 DOC map that shows 30 foot depths; a 1940 DOC map that depicts an area north and south of the Goethals Bridge as marsh. This shows Gulfport, later GATEX to the south of Old Place Creek. An 1947 USGS quad sheet depicts this area around Old Place Creek as marsh. A 1966 DOC map shows a 35 foot channel with the shoreline looking the same. A 1975 NOAA map shows Howland Hook as built, as does a 1986 NOAA mpa.

From 1974 to date we have more detailed aerial maps. We have 10 good enough aerial maps between 1974 and 2002. However, between 1979 and 1990 we have no good aerial photos. The average erosion rate is 20 feet from 1974 to 1990. Since 1990 there has been no net change in the shoreline. A big oil spill occurred in

January 1990 when a ship hit a pipeline on the NJ side of the AK close to Old Place Creek.

Seebode pointed out that there is no plan to deepen the AK channel south of Howland Hook below 40 feet. A question was asked: what happens to the location of the edge of the channel in the AK when it goes to 50 feet at the Elizabeth reach? Seebode responded that the Corps' report shows a loss of wetlands in this reach. A suggestion is that a 3:1 slope is conservative since a lot of edge of the channel is hard.

Figure 25A shows historic marsh vegetation changes. Between 1974 and 2002 there is some gain in vegetation despite a loss in shoreline MLW. The NYC Parks Department did restoration work in 1992-96. Parks installed wave breakers which were later removed. The vegetation line remains at a similar location. Fig.25B shows historic marsh change further north of the OPC marsh. Historic changes in MLW are shown as a white line for the 1974-2002 period, and as a yellow line 1990-2002. In terms of correlation between changes in MLW and changes in vegetation, there is some increase in marsh despite MLW line loss. This is due in part to the NYC Parks restoration. There is no correlation between change in shelf width and vegetation where the shelf is the distance from the marsh edge to MLW. Any negative correlation is due to the fact that some of the areas were restored by NYC Parks.

Preliminary findings. The maximum secondary wave height was 33 centimeters, caused by tugs. Larger vessels generate smaller waves with longer drawdown. A deeper channel would result in a decrease in generated wave height in the order of 9%. A reduction in the intertidal shelf width results in slightly increased wave breaking energy at the edge of the marsh in the order of 7%. With a 9% decrease in wave height and a 7% increase in shoreline energy, the net effect is minus 2%. The project will result in a decrease in the number of ship calls with fewer tankers and therefore fewer tugs. This will reduce total wake energy.

The MHW line retreated 10 meters (33 feet) and a maximum of 20 meters in the 1974-90 period. The changes from 1990 to 2002 have been insignificant. The vegetation cover at OPC has been largely stable since 1974, partly due to the NYC Parks restoration efforts. Historic shoreline changes do not show correlation between the intertidal shelf width and changes in marsh vegetation extent. These findings confirm the reasonableness of the Corps EIS approach that monitoring is appropriate with erosion control if the erosion rate is found to increase due to the project.

Hank Smeal asked why a deeper channel would cause the secondary wave height to decrease since these waves do not come close to the channel bottoms at 35 vs. 40 feet. Alfageme responded that at the generation point the depth does not make a difference. In a deeper channel there is less of a disturbance. All formulations take depth into account at the point of propagation. Wakeman added that, if we keep tugs at speeds below 10 knots, we would have smaller waves along the shoreline. Houston pointed out that the Corps looked at wave wake and both wake erosion rates and channel cutting into the shelf. We have a good handle on impacts, and they are mitigatable.

Summers indicated that NYC Parks helped to stabilize the shoreline. Why can't the Corps do its mitigation along the AK shorelines? What would it take to get the Corps to rethink its mitigation plan? Houston responded that we would have to persuade the resource agencies that the mitigation plan was irrational. Seebode commented that a large portion of this channel presently exists below 35 feet. The volume of material to be removed south of Howland Hook is relatively small. This material is contaminated with hydrocarbons etc. We are interested at looking at KVK rock for beneficial use. That offer stands open. We stand ready to participate in a study to do restoration. We do not believe that this project will have a significant impact. DEC pointed out that DEC is doing an AK shoreline study; it is not interested in blindly placing material along the shoreline. Summers stated that the shallow shoreline is becoming so narrow. Tripp added that the larger impact is the deepening and widening of the channel. In terms of conducting an AK restoration study, Andrew Genn stated that the leadership would have to come from Parks and DEP.

2. AK protection and restoration. Presentation by Al Appleton with Jennifer Cox who is in charge of the RPA restoration project. The USFWS has designated the AK as a significant water habitat. It is prime area for wetlands and streambank restoration. It is a premier heron habitat and a very significant fish habitat.

The first map shows the original estuary. There are five remaining primary habitats – the Bronx River, Jamaica Bay, Raritan Bay, the Hackensack Meadowlands and the Arthur Kill. There are 2500 acres of habitat along the Arthur Kill in terms of wetlands, buffers and some upland. On Staten Island, 750 acres are protected; 1750 acres are unprotected. There is more habitat on the NJ side along the AK tributaries. The AK has big blocks of habitat particularly on the NY side with many tributaries – 16 of them still exist. With the exception of Captain Creek, they all still exist. This adds to overall ecological viability. Most of the industrial uses along the AK are in decline, except for the Port. Other intensive uses, e.g., housing, are moving in. But some of these former industrial areas could be de-developed. There are many different habitat types. This is the northern limit of many plant species. The bird population is huge. The public use potential is huge.

Current restoration efforts are underway. The Corps has a 21-acre mitigation area for compensate for loss of littoral habitat. NYC Parks and DEC have restoration projects. Baykeeper and the Riverkeeper are pursuing riverbank restoration. The Corps has identified seven sites as part of its restoration feasibility study. The HEP Habitat Work Group has identified over 20 sites, including sites along the Rahway River. Peter Blanchard has identified 23 sites, 14 of which have heightened restoration potential.

We have been talking about going from site specific to ecosystem level restoration. The tributaries have significant potential. The map is the restoration-shed of the AK.

The AK needs shoreline protection. The littoral zone is very precious. Tributary restoration is central to AK restoration. Removal of blocks to flows, fish ladders, more connections between wetlands and tributaries, storm water management control, removal of fill from filled wetlands, i.e., Bridge Creek etc. We need to look at de-fragmenting some of these areas. We need to buy some of those old industrial sites and restore them, using the PA's $60 million as a local match for federal dollars.

3. Jamaica Bay. Presentation by Denise Reed, PhD, geomorphologist, New Orleans University and participant on the Jamaica Bay Blue Ribbon Panel of the NPS. The goal of restoration should be centered on ecosystem funcgtions. There are extensive marsh islands in the middle of JB with two kinds of problems. The island edges are retreating, and the inside of the islands is falling apart like Swiss cheese. There are dredged channels, huge borrow holes, JFK fill, a stabilized Rockaway Inlet and Rockaway Beach is developed. Before we stabilized the inlet, it migrated. When it was further east, it created a floodplain delta. As it migrated it built up other islands. The marsh islands were built by this sand and then maintained by silts. But now we have dredged channels, a stabilized inlet and deep holes. Marshes have to accrete to keep above sealevel. The silts that should build up the islands now go to the holes.

There is wastewater and landfills. Thus we have nutrients entering JB. Also the circulation is not good enough to cope with all of the nutrients. The nutrients are producing a lot of alva-slimy green material. It smothers vegetation. There are huge mounds of mussels. They grow in huge bunches on banks. For many islands wetlands are not doing well, impacted by alva. Nutrients are stimulating mussels that are plugging island drainage channels so that water sits there. What has changed is the dredged and nutrient inputs. Ice is not the problem. It is other stresses. We have more deep water close to the edge of the islands. What to do? We should use unconfined fills to nourish the middle of the islands. Also place baffles to moderate wave attack. Fill the holes. Improve circulation.