

IMPACT OF GEOLOGY AND GEOPHYSICS ON THE CHANNEL IMPROVEMENT PROJECT OF NEW YORK HARBOR

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The US Army Corps of Engineers, together with the Port Authority of New York and New Jersey (PANYNJ), is conducting a substantial program of improvements to New York Harbor system to accommodate deep draft container and tanker vessels. Over 55 linear km of navigation channels, berths and anchorage areas will be deepened, entailing the removal of an estimated 35 million m³ of sediment and rock.

Geological materials to be removed include Holocene estuarine silts, Pleistocene tills, channel fills, and varved lake sediments, sandstones and shales of the Newark Group, diabase of the Palisades sill, serpentinite, and metamorphic rocks of the Manhattan Prong. The wide range of physical properties of these materials and their extensive spatial variation at small scales introduce complexity and uncertainty in planning and bidding as well as dredging operations. Further complications arise from the presence of utility cables, tunnels, pipelines and other underwater structures dating back many decades.

Geological mapping and interpretation based on high-resolution geophysical and hydrographic surveys and careful treatment of sediment and core borings has proven effective in reducing both costs and uncertainty associated with the project. Sonar imaging, chirp sonar, shallow seismic, and geomagnetics are used to map and image the surface and subsurface. All geophysical measurements are calibrated with measurements on core borings. All measurements are located with DGPS. These techniques have been useful in the following:

1. identifying and accurately locating potential subsurface obstructions to dredging
2. physical characterization, subsurface mapping and volumetric estimation of geologic units involved in the dredging
3. mapping the thickness and extent of sediments requiring special handling in dredged material disposal
4. planning the rerouting of pipelines and utilities