Lower Passaic River, Newark Bay and NY/NJ Harbor:
Dredged Material Management

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Passaic River Coalition

Improving water quality isn’t just our goal,
it’s your future.
Lower Passaic River and Newark Bay, the Diamond Alkali Superfund Site

- The Diamond Alkali Superfund Site has been on the Superfund National Priorities List since 1984.
- Ella Filippone, Executive Administrator of the Passaic River Coalition (PRC), and Anne Kruger, Ph.D., Senior Scientist for the PRC since 1992, have been actively monitoring the technical aspects of this case since its inception, and have been involved in public participation through community involvement groups, such as the CAG.
- We hope that by working together actions will finally be taken to really start cleaning up this Superfund Site.
Lower Passaic River, Newark Bay and NY/NJ Harbor

The Lower Passaic River and Newark Bay are critical parts of the NY/NJ Harbor Estuary, a hub of economic activity in America, because these waters provide so many ecological benefits, including shipping access to the world.
Harbor Benefits

Early on European Settlers realized the importance of the Passaic River. The location of Newark made it ideal as a center of trade and commerce because of its easy access to the Harbor.

Sketch of the waterfront circa 1920

Engraving of Newark 1844
Passaic River and Newark Bay Benefits

Many industries and businesses were developed along the Passaic River and Newark Bay because these waters provide access to shipping and many other benefits.

Industry at the Great Falls mid 19th Century

In 1791 Alexander Hamilton realized the power of the waters of the Passaic River going over the Great Falls and founded the Society for Establishing Useful Manufactures at the start of the Industrial Revolution.
Dredging Problems in Lower Passaic River

But shipping needs the navigation channels to be dredged. The river was also a place to dump stuff, including PCBs and dioxin. Because there’s been no place to dispose of the dredged material, most of the Lower Passaic River has not been dredged since the 1940s.
Dredging Problems in Newark Bay
Economy threatened because of difficulties in dredging contaminated sediments in Newark Bay!
Dredging Problems in Harbor
NY/NJ Harbor Deepening Navigation Projects
Dredged Material Management (DMM) Problems in Harbor

Until 1997:
All Harbor DMM at “Mud Dump Site” in ocean

1997 to 2012:
Only clean DMM at Historic Area Remediation Site (HARS) in ocean
Contaminated DMM in CDFs in Newark Bay

After 2012:
Contaminated DMM ???
Fish Problems in the Newark Bay Complex
Dead crabs lie atop contaminated sediments.
Health Problems from Fishing in Lower Passaic River and Newark Bay Complex

People are eating crabs and other fish containing toxic levels of dioxin!

Although fishing for crabs and other fish has been prohibited since 1984, almost half of the anglers interviewed by NJDEP staff in 2002 reported eating blue claw crabs from the Newark Bay Complex.
Legacy Pollutants (PCBs and Dioxin) in Lower Passaic River, Newark Bay and NY/NJ Harbor

History of Legacy Pollutants --

All these problems are caused primarily by the contamination of sediments with persistent toxic compounds, PCBs and dioxin (polychlorinated hydrocarbons).

1929 to 1979: PCBs were designed to be non-flammable and chemically stable up to ~2,000°F. PCBs were manufactured for many uses from 1929 until they were banned in 1979 because of their toxicity, but they continue to persist today, adhering to sediment particles in the water, because microbes and other biota can’t change them chemically. They are taken up by plants and eaten by animals on which they have harmful effects.

1960s: The dioxin, 2,3,7,8-TCDD (a polychlorinated hydrocarbon), was a contaminant in Agent Orange, which was manufactured at the Diamond Alkali plant at 80 Lister Avenue in Newark in the 1960s and used in VietNam to defoliate plants. Dioxin is about the most toxic substance known to man.

1984 to 20??: Ban on eating shellfish and fish from Lower Passaic River.

1984 to 20??: DO NOT CATCH! DO NOT EAT! “Blue Claw Crab Alert” in the Newark Bay Region.

2011 to 20??: Today, more than a third of a century after they were last manufactured, these legacy pollutants persist in sediments in the Lower Passaic River, Newark Bay Region, and NY/NJ Harbor.
Sediment Contamination: PCBs

PCBs (polychlorinated biphenyls) are persistent organic compounds that are toxic to benthic organisms and fish as well as people. The maximum level of total PCBs that would be considered acceptable in non-residential soils and river sediments is 14 parts per billion of soil (ng/g). In the Lower Passaic River sediments, PCB levels were over 12,000 ng/g in the 1960s and as high as 2,800 ng/g in the 1990s.
Sediment Contamination: PCBs in Newark Bay

Even though the manufacture of PCBs was banned in 1979, their presence in Newark Bay continues to grow. In some sediment samples taken from Newark Bay in 2005 and 2007 levels of PCBs exceeded 4,800 ng/g (red).
Sediment Contamination: PCBs in NY/NJ Harbor
Dioxin is about the most toxic substance known to man. The maximum level of this dioxin (2,3,7,8-TCDD) that is considered acceptable in river sediments is ~1 pg/g (parts per trillion). The highest concentration shown here is >600 pg/g at river mile 3, near the Diamond Alkali site. Very high levels, ~800,000 pg/g, were found in sediments deposited in the sixties when Agent Orange was manufactured and dioxin was washed into the Passaic River.
2,3,7,8-TCDD: 1963 and 1995 Concentrations

- 1963 Concentration
- 1963 (Bopp et al.)
- 1995 Concentration
- 1985 (Bopp et al.)

Newark Bay (approximate river mile)

River Mile

Dundee Dam (RM 17.5)
Sediment Contamination: Dioxin in Newark Bay

In 2005 and 2007 sediments that became contaminated with dioxin in the 1960s at the Diamond Alkali site and were washed into Newark Bay still had levels over 666 pg/g (red).
Lower Passaic River, Newark Bay and NY/NJ Harbor
The Challenge

- Are we willing to move these pollutants, PCBs and dioxin, from one place to another within the NY/NJ Harbor area?
- Within the USA?
- Can the CAG envision a process that will permanently remove most of the harmful impacts of PCBs and dioxin from the NY/NJ Harbor area?
- Can we as a society destroy pollutants that are considered indestructible?
- What kind of legacy do we want to leave for future generations?
Lower Passaic River, Newark Bay and NY/NJ Harbor
Actions for Dredging and DMM

U.S. Army Corps of Engineers:

- “The Port of New York and New Jersey must be dredged to maintain navigation and commerce estimated to generate about $20 billion annually in direct and indirect benefits.”

- Need a Dredged Material Management (DMM) Plan that gives “special emphasis to beneficial uses of the material needing to be dredged to maintain efficient waterborne transportation into and out of the Port.”

We propose these actions:

Action 1. Dredge Legacy Pollutants (PCBs and Dioxin) from Lower Passaic River

Action 2. Move Dredged Sediments from Water to Land

Action 3. Decontaminate Dredged Sediments for Beneficial Uses
Action 1, Dredge Legacy Pollutants (PCBs and Dioxin) from Lower Passaic River!
Help to Restore Fishable Waters!

Benefits

😊 Reduce illness and medical costs for people eating seafood.
😊 Improve health and diversity of the biota in the waters and sediments of the Lower Passaic River, Newark Bay and all of the NY/NJ Harbor reducing future clean-up costs.
😊 Help to restore healthy habitats for fish improving “opportunities for recreation, tourism, and fisheries – industries valued at over $20 billion per year that depend on a clean Harbor Estuary.”
Action 1, Dredge Legacy Pollutants (PCBs and Dioxin) from Lower Passaic River

Benefits

😊 Restoration of navigation channels in the Lower Passaic River. “The Federal interest in navigation derives from the Commerce Clause of the Constitution.” Since the 1940s the Federal Government has neglected its duty to keep the authorized navigation channels in the Lower Passaic River clear of contaminated sediments.

😊 Reduction in migration of legacy pollutants into Newark Bay and NY/NJ Harbor.
Action 2, Move Dredged Sediments from Water to Land! **Do not use CADs or CDFs!**

**Benefits**

😊 Reduction in flooding.

😊 No maintenance costs.
Action 3, Decontaminate Dredged Sediments with Legacy Pollutants for Beneficial Uses

Do not use Non-Decontaminating Treatment for Dredged Material Management (DMM)

😊 Wetlands Restoration: PCBs and dioxin will persist and cause harm because they were chemically created to resist the chemical changing forces of nature.

😊 Landfill: Legacy pollutants can migrate into environments surrounding a landfill and cause harm.

😊 Biological Treatment (STPs): Dioxin and PCBs are indigestible and may be toxic to the microorganisms used to treat sewage, and they will persist in sediments treated by biological methods.

😊 Sediment Washing: The chemicals used to clean some sediments will not wash off or change these legacy pollutants.

😊 Incineration: Incinerator temperatures of 1,400°F to 1,800°F are not hot enough to destroy PCBs and dioxin by oxidation.
Action 3, Decontaminate Dredged Sediments with Legacy Pollutants for Beneficial Uses!  
Do not use “Off-site” Disposal!

Costs of “Off-site” Disposal

😊 The few facilities (7) that have permits to provide thermal treatment for wastes with PCBs are located in western states (TX, LA, OK, UT).
😊 Shipping costs to western facilities are high.
😊 High costs for greenhouse gas emissions during shipping.
😊 None of the PCB waste facilities will immobilize heavy metals.
😊 Dumping anywhere in the U.S. or Canada will lead to high ecologic/economic costs.

Costs of “Off-site” Disposal

Benefits of “Local Decon”

😊 Development of a “Local Decon” facility will provide DMM for future dredging projects.
😊 “The Port of New York and New Jersey is the largest port on the East Coast, providing more than 230,000 direct and indirect jobs in port related activities.”
😊 Clean sediments throughout the harbor can save at least $25,000,000 per year in costs of maintaining the harbor’s water transportation infrastructure.
Action 3, Decontaminate Dredged Sediments with Legacy Pollutants for Beneficial Uses by Thermal-Chemical Treatment!

Benefits

- Permanent destruction of Legacy Sediment Contaminants, PCBs and Dioxin, at temperatures of ~2,500°F.
- Immobilization of heavy metals.
- Beneficial use of contaminated sediments dredged from the Lower Passaic River, Newark Bay, NY/NJ Harbor, and eastern USA.

Thermal-Chemical Treatment:
The thermal-chemical technology uses a rotary kiln that is fueled by natural gas to melt multi-contaminated sediments. The process is similar to what happens in an active volcano. In a rotary kiln operating at ~2,500°F the organic contaminants are disassociated or destroyed, and the non-volatile heavy metals are encapsulated into the siliceous matrix that forms from the sediments to produce a product which can be used as a 30-40% replacement for Portland cement in concrete, a beneficial use.
Action 3, Decontaminate Dredged Sediments with Legacy Pollutants for Beneficial Uses by Thermal-Chemical Treatment!

Evaluation of Thermo-Chemical Treatment for DMM

This technology for remediating contaminated sediments was conceived at the Gas Technology Institute (GTI) in 1994, and developed from bench-scale to pilot-scale in 1994 to 2005. EPA and the Brookhaven National Laboratory have worked with GTI on this project since 1995. In 2000 the NJ Department of Transportation, Office of Maritime Resources, selected this technology “to be evaluated for its applicability to the treatment of sediment dredged from navigational channels.”

As in the development of most new technologies, problems were encountered in the demonstration-scale testing of the Cement-Lock® technology in Bayonne in 2006 and 2007. In our judgment these problems are being well addressed in the current phase of planning for a treatment facility.

After considering the options available for the management of materials that should be dredged from the Lower Passaic River, Newark Bay, NY/NJ Harbor and elsewhere we find that the thermo-chemical treatment option being proposed by the Volcano Partners is both ecologically and economically sensible and sustainable.
Thermal-Chemical (Cement-Lock®) Treatment

Air Pollution Control

😊 Heat recovery for steam generation and electric power production

😊 NO\textsubscript{x} control by selective non-catalytic reduction

😊 Acid gas (SO\textsubscript{x} and HCl) capture by lime injection

😊 Spent lime and particulate capture in bag house fabric filters

😊 Mercury control by powdered activated carbon injection

😊 Spent activated carbon capture in bag house fabric filters
Benefits of Thermal-Chemical Treatment for Dredged Material Management (DMM)

- Elimination of reliance on CADs or CDFs
- Reduction in reliance on landfills
- Beneficial uses (cement, energy)
- No long-term liability
- Minimal waste
- Permanent removal of some of the legacy pollutants, PCBs and dioxin, and other contaminants from the environment of the Lower Passaic River, Newark Bay and NY/NJ Harbor
Lower Passaic River, Newark Bay and NY/NJ Harbor
Working towards making these Waters Navigable and Fishable !!!

We hope that the actions we’re recommending will stimulate discussion among involved parties so that mutually acceptable ways will be found to fund these actions as soon as possible. We hope that you and your community will work with us to encourage the implementation of the Superfund projects so that in the future the millions of people living and working in the area, as well as visitors from around the world, can enjoy the ecologic and economic benefits of a healthy river and harbor. This effort is critical for restoring economic prosperity to this region!

Questions or comments?
Working for a Better Future for the Lower Passaic River and Newark Bay

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