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Recommendations to U.S. Environmental Protection Agency, National Remedy Review Board (NRRB), Regarding the Lower Passaic River Restoration Project (LPRRP)

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Recommended Actions

The time has come to take definitive action to begin the cleanup of the Lower Passaic River. Countless studies, models, and discussions have reviewed the seriousness of the contamination. Our effort in this report is to show the need to take action now and to provide recommendations for a successful program.

The sediments in the Lower Passaic River are very highly contaminated with PCBs and ***dioxins***. These chemicals are among the most toxic substances known to man and are a major public health concern. Since being founded in 1969, the Passaic River Coalition (PRC) has been actively involved in efforts to clean up the Passaic River, historically considered one of the most polluted rivers in the United States. The Superfund program was established in 1980 to address abandoned hazardous waste sites under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).[1] "This law was enacted in the wake of the discovery of toxic waste dumps such as Love Canal and Times Beach in the 1970s."[2] At both these sites ***dioxin*** contamination was the principal problem. The Diamond Alkali Superfund Site has been on the Superfund National Priorities List since 1984. This Superfund Site includes the Lower Passaic River, which is definitely an "abandoned hazardous waste site" that needs to be cleaned up soon!

Representatives of the PRC have been active public participants in this Superfund case, Harbor Estuary programs, and other efforts to reinvigorate life in and besides the waters of the Lower Passaic River and the New York – New Jersey Harbor Region, shown in Figure 1.[3] We have been providing Technical Assistance regarding the Lower Passaic River Restoration Project (LPRRP) to the local communities since 2006.[4] In our 2008 comments to the NRRB regarding

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1 U.S. Environmental Protection Agency. 2012. Web-site: www.epa.gov/superfund/about
2 *Ibid.*
3 Tierra Solutions, Inc. 2008. Phase I and Phase II Field and Data Report, Newark Bay Study Area Remedial Investigation. Phase I and Phase II Sediment Investigation Field and Data Report, Figure 1-1.
4 U.S. Environmental Protection Agency, Region 2, Technical Assistance Grant (TAG), Diamond Alkali Site, Agreement No. 1-97298303.

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the LPRRP "Early Action" proposals we documented some of the many studies which concluded that PCBs and ***dioxins*** are the contaminants of greatest concern.[5] The New York Academy of Sciences Harbor Consortium had studied five contaminants (Mercury, Cadmium, PCBs, Dioxins, and PAHs) in the NY/NJ Harbor for ten years. The Consortium reported that "dioxins were selected for study … because of their impacts on fish and shellfish in the NY/NJ Harbor Watershed, their relatively high toxicity even at low concentrations, their ubiquity in sediments in the Harbor …, and, thus, their potential impact on the economy of the region, especially the Port of NY & NJ."[6] The Consortium's recommendations include the following statement:

> Cleanup of PCB-contaminated sites – particularly along the Passaic River – as well as the dioxin-contaminated Diamond Alkali Superfund site and its effects on the nearby Harbor, remains a (if not the) major priority. The Consortium has urged all litigating parties to focus their efforts on achieving early and effective action.

Given the chemical nature of PCBs and ***dioxins***, the most effective actions to take in the LPRRP would be –

- **Precision Hydraulic Dredging** for "substantial" removal of the sediments that are contaminated with PCBs and ***dioxins*** and other legacy COPCs and COPECs in the lower 17 miles of the Passaic River starting at Dundee Dam, and not refilling the river with "backfill".
- **Local Decontamination and Beneficial Use** of dredged materials by dewatering, and then decontaminating the dredged materials by destroying the PCBs and ***dioxins*** using thermal-chemical treatment (Cement-Lock®) to produce a cement admixture (Ecomelt®) at site(s) within the Diamond Alkali Superfund Site.

Our recommendations will --

- **Improve water quality;**
- **Lead to more fishable waters;**
- **Restore navigability;**
- **Encourage revitalization of the waterfront;**
- **Reduce flooding.**

These actions would --

- Protect Human Health and the Environment
- Comply with Applicable or Relevant and Appropriate Requirements (ARARs)
- Have long-term effectiveness and permanence
- Reduce the toxicity, mobility, and volume of contaminated sediments through treatment resulting in a beneficial use
- Be implementable
- Be cost-effective

The evidence leading to these conclusions is discussed herein.

The alternative actions to be proposed in the "Remedial Investigation and Focused Feasibility Study" (RI/FFS) for the "Lower 8 Miles of the Lower Passaic River" would not be nearly as effective at achieving the objectives listed above as the actions we propose. By taking the actions we propose, a new paradigm for environmental remediation can be demonstrated using cutting-edge technology. For decades the standard operating procedures for cleaning up sediments

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[5] Passaic River Coalition. September 2008. Comments to U.S. Environmental Protection Agency, National Remedy Review Board (NRRB), Re Lower Passaic River Restoration Project Early Action Proposals.

[6] New York Academy of Sciences Harbor Consortium. January 2008. "Safe Harbor: Bringing People and Sciences Together to Improve the New York/New Jersey Harbor. Pages 46-47.

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contaminated with PCBs, ***dioxins***, and other toxic solid substances which aren't soluble in water has been to transport them to a landfill, dump them in another water body, or do nothing. But now we have an alternative. Today the appropriate technology for managing these sediments, Cement-Lock®, is available and a group (Volcano Partners LLC) is ready to develop facilities for full scale operations. This process has been endorsed by the National Advisory Council for Environmental Policy and Technology (NACEPT) and was specifically recommended for managing dredged materials from the Lower Passaic River.[7] This new process will destroy the ***dioxins*** and PCBs, eliminating any future liability. Holistic, morally responsible, and long-term solutions for the river's contamination are now attainable and can be cost-effective.

The interconnected issues revolving around the Passaic River can make planning and funding for the LPRRP difficult:

> A major impediment to a sustainable approach to restoration of contaminated sediment impacted waterways, particularly in urban environments, is the fragmented, non-integrated nature of various regulatory processes and agency programs which often overlap and have competing objectives. Remediation, economic development, port maintenance, source control, and habitat restoration are typically assessed, planned, and managed separately.[8]

The Lower Passaic River has not been dredged since the 1950s, likely because of management issues associated with the disposal of the dredged material, which has become very expensive due to contamination and is outside the role of the United State Army Corps of Engineers (USACE). As a result, recreational, ecological, and economic benefits provided by the river have been lost. "Also, the river and bay have been filling up with more sediment, and flooding is worsening, and it will get even more hazardous in coming years as sea level rises due to global warming."[9] Clearly the actions taken to restore the river will affect a wide range of stakeholders, all of whom have the capability of system-wide effects on the river's region.

In order to avoid interagency conflict and properly address all of the issues we face, particularly contamination, navigation, flooding, and habitat restoration, an effective solution must integrate the goals and responsibilities of all stakeholders through a Regional Sediment Management (RSM) Plan. This Plan is already in place under the New York - New Jersey Harbor & Estuary Program, which includes the Lower Passaic River.[10] "Rather than a localized issue, sediment management in the Harbor Estuary is a regional issue that can only be successfully implemented as a joint effort between federal, state, and local entities and the public."[11] The foundation of this RSM Plan should be implemented for the remediation of the Lower Passaic River. In doing so, a cost sharing strategy drawing upon funding from many parties will encourage participation by all stakeholders, address a full spectrum of significant issues through a single multi-faceted action

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[7] National Advisory Council for Environmental Policy and Technology. February 2012. Letter to USEPA Administrator Lisa P. Jackson, Re Technologies for Environmental Justice Communities and Other Valuable Populations.

[8] Stern, E.A. and E. Peck. 2012. Integrated Approaches to Sustainable Sediment Management – The Paradox of Having it All. Keynote Presentation at NORDROCS 2012, Olso, Norway.

[9] National Advisory Council for Environmental Policy and Technology. February 2012. Letter to USEPA Administrator Lisa P. Jackson, Re Technologies for Environmental Justice Communities and Other Valuable Populations.

[10] New York – New Jersey Harbor Estuary Program. October 2008. Regional Sediment Management Plan.

[11] *Ibid.* Executive Summary, Page ii.

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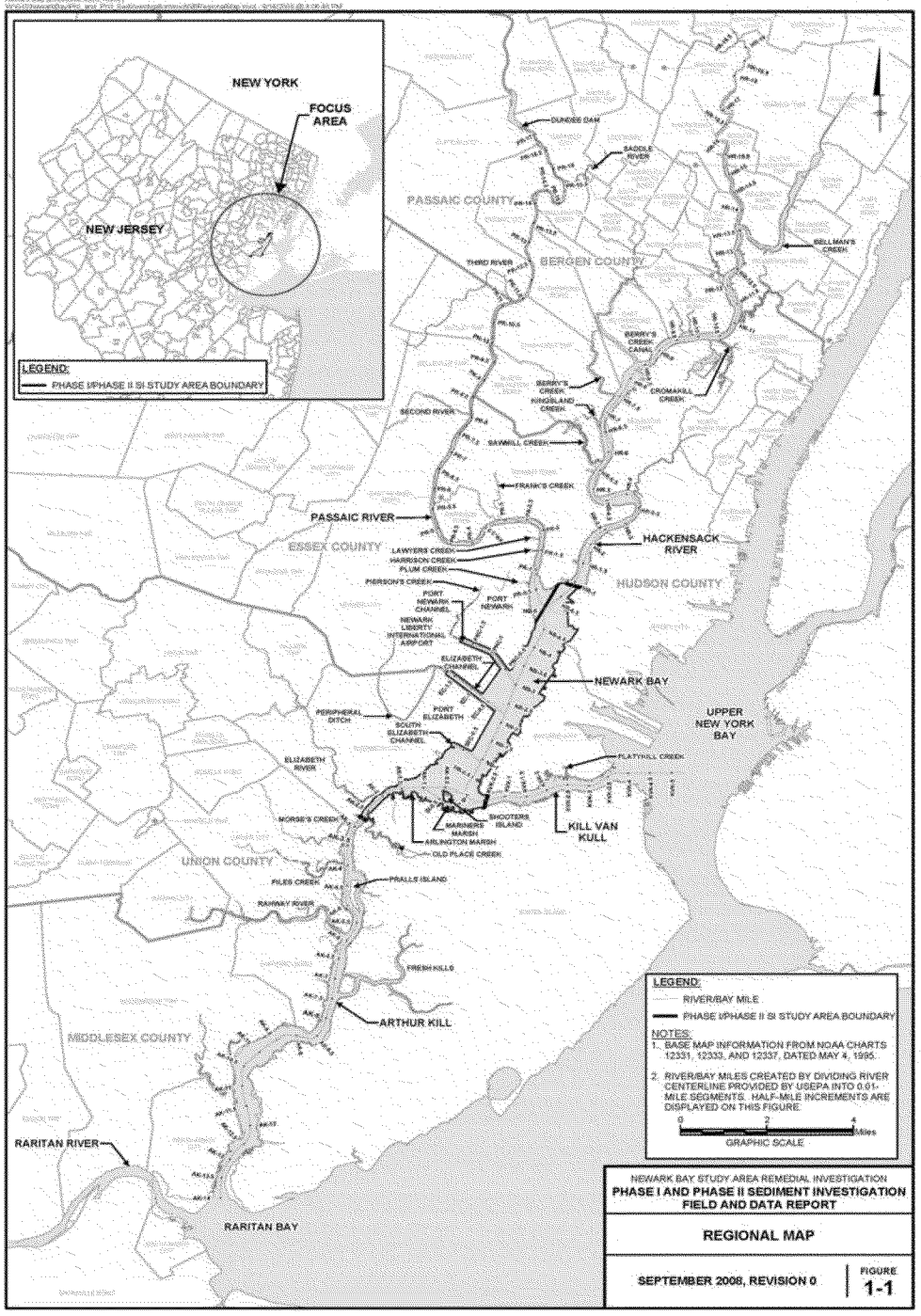
plan, and build the foundation for a long-term sustainable solution that significantly reduces the need for future projects.

Figure 1 – NY/NJ Harbor Region[12]



[12] Tierra Solutions, Inc. 2008. Phase I and Phase II Field and Data Report, Newark Bay Study Area Remedial Investigation. Phase I and Phase II Sediment Investigation Field and Data Report, Figure 1-1.

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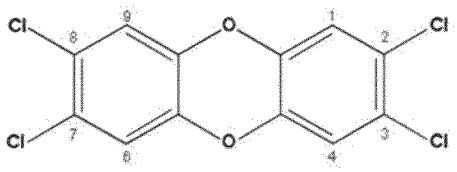
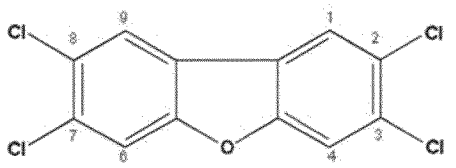
Dioxin Contaminated Sediments: A Major Public Health Concern

The World Health Organization has declared that exposure to ***dioxins*** and dioxin-like substances is a major public health concern.[13] ***Dioxins***, as described by the U.S. Environmental Protection Agency (USEPA), are 30 polychlorinated organic compounds with similar chemical structures and similar modes of toxic action. They include CDDs (chlorinated dibenzo-*p*-dioxins), CDFs (chlorinated dibenzofurans), and certain PCBs (polychlorinated biphenyls).[14] Their chemical structures are depicted in Figure 2. The most toxic ***dioxin*** is 2,3,7,8-TCDD (2,3,7,8-tetrachlorodibenzo-*p*-dioxin).

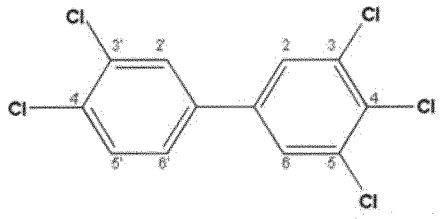
Figure 2 -- Chemical Structures of *Dioxins*



2,3,7,8-Tetrachlorodibenzo-p-dioxin



2,3,7,8-Tetrachlorodibenzofuran



3,3',4,4',5-Pentachlorobiphenyl (PCB126)

Dioxins are potent animal toxicants which can alter the fundamental growth and development of cells.[15] Toxic effects of human exposure to ***dioxins*** can include developmental and neurodevelopmental effects on fetuses and children, and changes in thyroid and steroid hormones and reproductive function.[16] Children are the population most at risk. ***Dioxins*** are also "likely human carcinogens".[17] Human exposure occurs mainly through consumption of meat, dairy products, fish and shellfish food containing contaminated animal fats.[18] Nowhere in the world is one more likely to find such food than by fishing and consuming the fish caught in the Lower Passaic River and Newark Bay.

Dioxins persist in natural environments 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, and as they go up the food chain they accumulate in fatty tissues and become more and more toxic.

Other ***dioxins***, CDDs and CDFs have never been manufactured deliberately, but are by-products of industrial processes. They include the manufacture of plastics made from polyvinyl chloride (PVC), some herbicides and pesticides that contain chlorine, chlorine bleaching of paper pulp, and smelting. The ***dioxin***, 2,3,7,8-TCDD, was a by-product in the manufacture of Agent Orange, which was made at the Diamond Alkali plant at 80 Lister Avenue in Newark in the 1960s and used in Vietnam to defoliate plants. This ***dioxin*** is

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[13] World Health Organization, Public Health and Environment. 2010. Preventing Disease through Healthy Environments, Exposure to Dioxins and Dioxin-like Substances: A Major Public Health Concern. WHO Document Production Services, Geneva, Switzerland.

[14] U.S. Environmental Protection Agency, Office of Research and Development. 2001. Dioxin: Summary of the Dioxin Reassessment Science.

[15] *Ibid.*

[16] WHO, 2010.

[17] U.S. Environmental Protection Agency, Office of Research and Development. 2001. Dioxin: Summary of the Dioxin Reassessment Science.

[18] WHO, 2010.

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about the most toxic substance known to man. The incineration of municipal and medical wastes at low to moderate temperatures (1,400°F to 1,800°F) and backyard trash burning can create ***dioxins*** (CDDs and CDFs), which are emitted to the air or in ash and then can contaminate soil and aquatic sediments.[19] ***Dioxins*** can also be generated by natural events, such as volcanic eruptions and forest fires.[20]

Dioxins are definitely POPs (Persistent Organic Pollutants). Today, over a third of a century since PCBs were last manufactured, the New Jersey Department of Environmental Protection (NJDEP) is still advising people not to eat fish and shellfish from the Lower Passaic River.[21] Catching and eating crabs from the Newark Bay Region has been banned since 1984. According to a NJDEP study, the estimated lifetime excess risk of cancer from consumption of crabs from the Newark Bay Complex ranges from a low of 0.5% to a high of >100%.[22] In 2011 the NJDEP launched another public awareness campaign regarding its "Blue Claw Crab Alert" in the Newark Bay Region (see Figure 3.[23]) But some people in the Newark Bay Region are still going crabbing and fishing. The impacts that ***dioxin*** pollution has had on the health of people in the Newark Bay Region and beyond over many past decades may never be known, but ways to reduce the health risks from ***dioxins*** in the future are known. Action should be undertaken as soon as possible!

The "Risk Based Remedial Goal" for the ***dioxin*** 2,3,7,8-TCDD in river sediments has been 0.3 parts per trillion (ppt).[24] Near the Diamond Alkali site in the Lower Passaic River sediments, ***dioxin*** levels were as high as 5,300,000 ppt.[25] In 2005 and 2007 sediments that had become contaminated with dioxin produced in the 1960s at the Diamond Alkali site and were washed into Newark Bay still had levels over 666 ppt.[26]

PCBs are man-made substances that were specifically designed to be non-flammable and chemically stable under very hot conditions so they could replace mineral oils that burn, be used for their lubricating and electrical insulating capacities, and in many other ways. PCBs were manufactured for many uses from 1927 until they were banned in 1979 because of their toxicity. They were released into the environment from many sources, and continue to be released from sources such as the disposal of large-scale electrical equipment and waste.[27]

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[19] WHO, 2010.

[20] *Ibid.*

[21] New Jersey Department of Environmental Protection, Office of Science. 2011. Fish Advisories. <www.state.nj.us/dep/dsr/fishadvisories/ >

[22] New Jersey Department of Environmental Protection, Division of Science, Research and Technology. 2002. Estimate of Cancer Risk to Consumers of Crabs Caught in the Area of the Diamond Alkali Site and other Areas of the Newark Bay Complex from 2,3,7,8-TCDD and 2,3,7,8-TCDD Equivalents.

[23] New Jersey Department of Environmental Protection, Office of Science. 2011. Blue Claw Crab Alert, Newark Bay Region: DO NOT CATCH! DO NOT EAT!

[24] Malcolm Pirnie, Inc. 2007. Lower Passaic River Restoration Project, Draft Source Control Early Action Focused Feasibility Study. Prepared for US Environmental Protection Agency, US Army Corps of Engineers, New Jersey Department of Transportation. June 2007. (FFS). , Sections 2.4.1 & 2.4.2, pages 2-11 to 2-14, Tables 2-3 and 2-4.

[25] U.S. Environmental Protection Agency. 2012. Lower Eight Miles of the Lower Passaic River Remedial Investigation and Focused Feasibility Study Summary for Community Advisory Group. Alice Yeh, Project Manager.

[26] Tierra Solutions, Inc. 2008. Phase I and Phase II Field and Data Report, Newark Bay Study Area Remedial Investigation. Phase I and Phase II Sediment Investigation Field and Data Report, Figure 4-13.

[27] WHO, 2010.

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The "Risk Based Remedial Goal" for total PCBs in non-residential soils and river sediments has been 14 parts per billion (ppb).[28] In the Lower Passaic River sediments, PCB levels as high as 130,000 ppb have been found.[29] In many sediment samples taken from Newark Bay in 2005 and 2007 levels of PCBs exceeded 4,810 ppb.

Levels of PCBs in the surficial sediments of NY/NJ Harbor are shown in Figure 4. Only the areas with the darker blue dots have sediments containing levels of PCBs that might be considered tolerable.

Figure 3 – Blue Claw Crab Alert, Newark Bay Region

[28] Malcolm Pirnie, Inc. 2007. FFS, Sections 2.4.1 & 2.4.2, pages 2-11 to 2-14, Tables 2-3 and 2-4.

[29] U.S. Environmental Protection Agency. 2012. Lower Eight Miles of the Lower Passaic River Remedial Investigation and Focused Feasibility Study Summary for Community Advisory Group. Alice Yeh, Project Manager.

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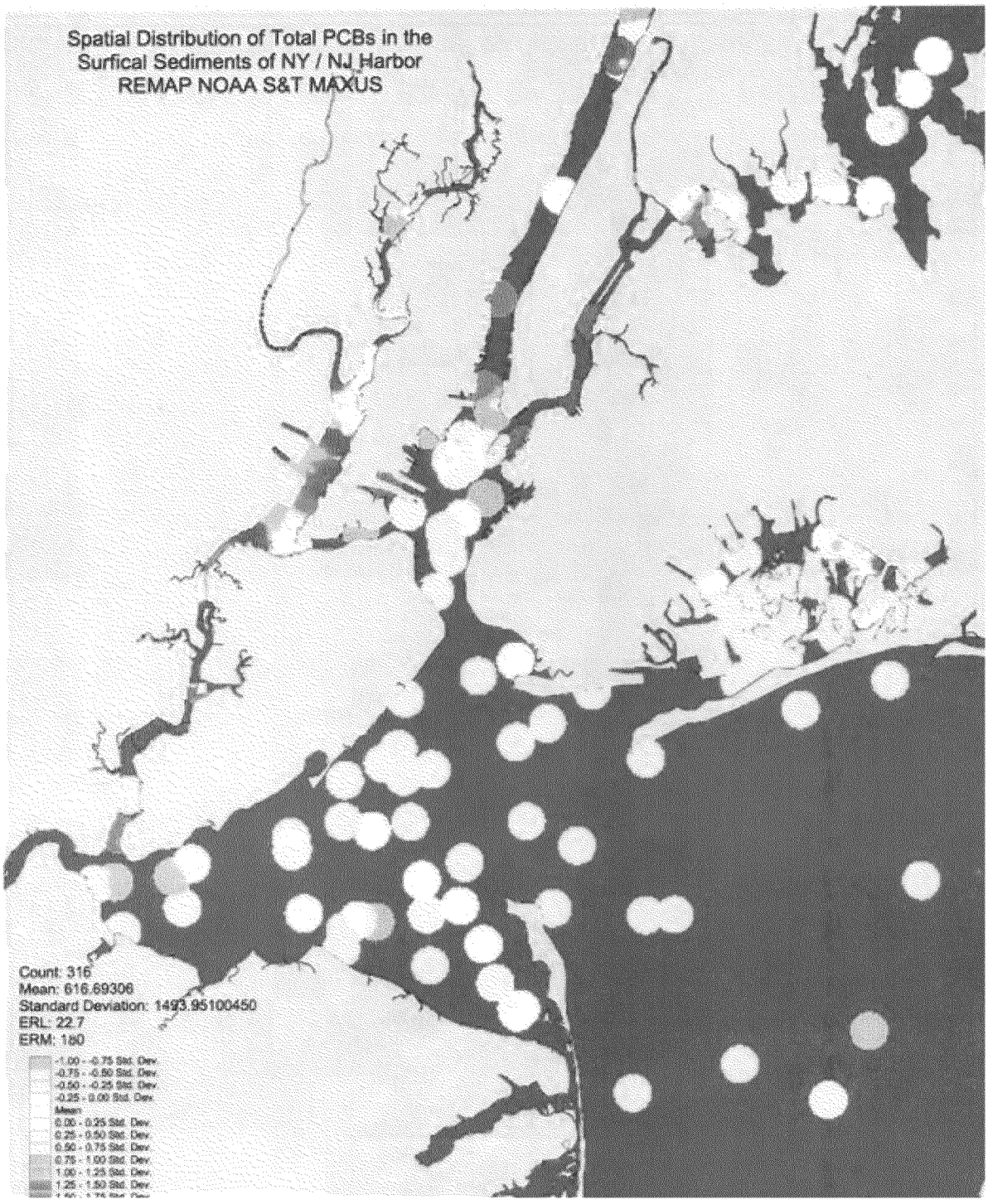
Figure 4 –Total PCBs in the Surficial Sediments of NY/NJ Harbor[30]



[30] Passaic River Coalition. April 2012. Lower Passaic River, Newark Bay and NY/NJ Harbor: Dredged Material Management (DMM) of *Dioxin* Contaminated Sediments.

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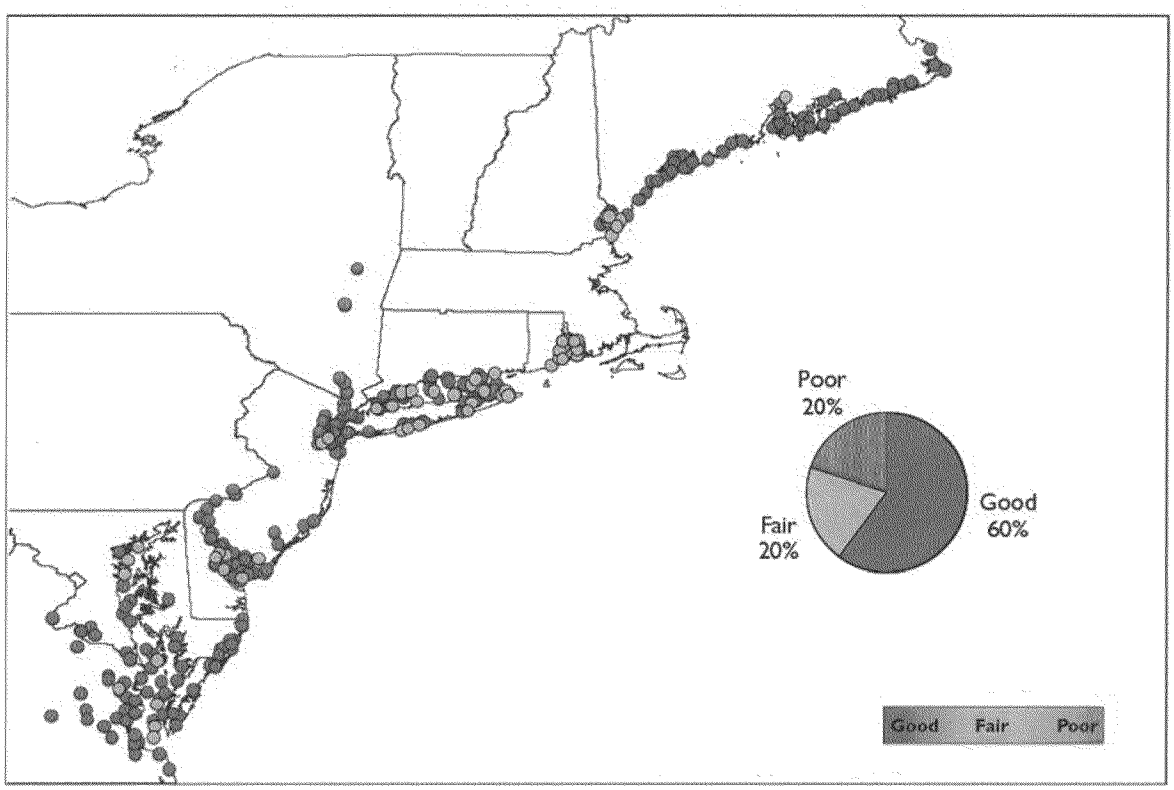
Figure 5 – Fish Tissue Contaminants Index Data for Northeast Coastal Waters[31]



The USEPA has developed a Fish Tissue Contaminants Index based on data from concentrations of chemical contaminants found in composites of whole-body fish, lobster and fish fillet samples.[32] Sites in Northeast Coastal Waters where fish were sampled prior to 2007 are shown in Figure 5. A "Poor" rating indicates that the health of the fish is poor and that the fish are probably not safe to eat. "Elevated concentrations of PCBs were responsible for the impaired ratings for a large majority of the sites."[33]

The removal of sediments highly contaminated with ***dioxins***, including PCBs, from the waters of the Newark Bay region and throughout the NY/NJ Harbor will gradually help these waters to become "fishable" again, but only if the removal of ***dioxins*** is sustainable. ***Dioxins*** persist today as legacies of the past. Because of their abilities to harm many types of biota, and to resist chemical changes even under incineration temperatures, it is vital to reduce this legacy of environmental harm. The carbon, hydrogen and chlorine atoms in these compounds should be split apart to form more benevolent compounds, such as carbon dioxide, water, and hydrogen chloride. The technology to do this is available today.

[31] U.S. Environmental Protection Agency, Office of Research and Development/Office of Water. April 2012. National Coastal Condition Report IV, Northeast Coast Coastal Condition, page 3-11.
[32] *Ibid.* Page 3-10.
[33] *Ibid.* Page 3-10.

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Remediation Requirements and Objectives

The remedial action alternatives in question are assessed based on their compliance with regulatory requirements and evaluation criteria. Applicable requirements and criteria are listed below.

CERCLA - Section 9621. Cleanup Standards:

Section 9621(b) "General Rules" establishes several broad guidelines that need to be taken into consideration:

- "Remedial actions in which treatment which permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants is a principal element, are to be preferred over remedial actions not involving such treatment."
- "The offsite transport and disposal of hazardous substances or contaminated materials without such treatment should be the least favored alternative remedial action where practicable treatment technologies are available."
- "The President shall conduct an assessment of permanent solutions and alternative treatment technologies or resource recovery technologies that, in whole or in part, will result in a permanent and significant decrease in the toxicity, mobility, or volume of the hazardous substance, pollutant, or contaminant. In making such an assessment, the President shall specifically address the long-term effectiveness of various alternatives."
- "In assessing alternative remedial actions, the President shall, at a minimum, take into account:
  - (A) the long-term uncertainties associated with land disposal;
  - (B) the goals, objectives, and requirements of the Solid Waste Disposal Act [42 U.S.C. 6901 et seq.];
  - (C) the persistence, toxicity, mobility, and propensity to bioaccumulate of such hazardous substances and their constituents;
  - (D) short- and long-term potential for adverse health effects from human exposure;
  - (E) long-term maintenance costs;
  - (F) the potential for future remedial action costs if the alternative remedial action in question were to fail; and
  - (G) the potential threat to human health and the environment associated with excavation, transportation, and redisposal, or containment."
- "The President shall select a remedial action that is protective of human health and the environment, that is cost effective, and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies that maximum extent practicable."

Clean Water Act:

One of the primary directives of the USEPA is to enforce the Clean Water Act. Applicable and noteworthy sections of the Clean Water Act include:

- Section 116(a), which refers to the Hudson River PCB Reclamation Demonstration Project. Here, dredged sediments were treated "as required" then buried in secure, monitored landfills. This demonstration project was done to determine "the feasibility of indefinite storage in secure landfills of toxic substances." It then states: "No pollutants removed pursuant to this paragraph shall be placed in any landfill unless the Administrator first determines that disposal of the pollutants in such landfill would provide a higher standard of protection of the public health, safety, and welfare than disposal of such pollutants by any other method including, but not limited to, incineration or a chemical destruction process." This restriction

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applies to the Lower Passaic River; therefore landfills should only be used for the disposal of sediments if there are no other better methods for protecting human health.

- Section 302(a): "Whenever, in the judgment of the Administrator or as identified under section 304(l), discharges of pollutants from a point source or group of point sources, with the application of effluent limitations required under the section 301(b)(2) of this Act, would interfere with the attainment or maintenance of that water quality in a specific portion of the navigable water which shall assure protection of public health, public water supplies, agricultural and industrial uses, and the protection and propagation of the balanced population of shellfish, fish and wildlife, and allow recreational activities in and on the water, effluent limitations (including alternative effluent control strategies) for such point source or sources shall be established which can reasonably be expected to contribute to the attainment or maintenance of such water quality."

Remedial Action Objectives:

The EPA has established three Remedial Action Objectives (RAOs):

1. Reduce cancer risks and non-cancer health hazards for people eating fish and shellfish by reducing the concentrations of contaminants of potential concern (COPCs) in the sediments of the FFS Study Area.
2. Reduce the risks to ecological receptors by reducing the concentration of contaminants of potential ecological concern (COPECs) in the sediments of the FFS Study Area.
3. Reduce the migration of COPC- and COPEC-contaminated river sediments from the FFS Study Area to upstream portions of the Lower Passaic River and to Newark Bay and the New York-New Jersey Harbor Estuary.

Evaluation Criteria set forth in the National Contingency Plan:

The criteria used to evaluate remedial alternatives in the FFS are as follows:

- Threshold Criteria – All active alternatives must first meet threshold criteria in order to be considered a viable solution
  - Overall protection of human health and the environment
  - Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
- Balancing Criteria – Balancing criteria are used to compare the viability and effectiveness of active alternatives under consideration
  - Long-term effectiveness and permanence
  - Reduction in toxicity, mobility, and volume through treatment
  - Short-term effectiveness
  - Implementability
  - Cost
- Modifying Criteria – Modifying criteria are generally considered after an active alternative has been selected based on other criteria, however the selected alternative may be modified to meet these criteria
  - State Acceptance
  - Community Acceptance

Only the actions which we recommend would be as effective at meeting the objectives of these regulations and requirements for the reasons discussed hereinafter.

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Lower 8 Miles of the Lower Passaic River, Focused Feasibility Study (FFS) Detailed Analysis of Alternative Actions Proposed

No Action:

As noted in the 2007 FFS, "Active remediation of the Area of Focus followed by monitored natural recovery will achieve any threshold for 2,3,7,8-TCDD, which is responsible for about 65 percent of the risk, 40 years faster than it would be achieved by the No Action alternative."[34] The No Action alternative will not reduce the risks to human health and the environment in a reasonable amount of time, will increase the risks from flooding, and will decrease navigability due to increased sediment build up in the Lower Passaic River. Because of climate change, it is predicted that the ocean could rise by as much as two feet by the end of the century and the frequency and severity of flooding events will increase.[35] These effects would have significant impacts on the areas flooded along the Lower Passaic River, Newark Bay, and the New York-New Jersey Harbor Estuary. Effects of the recent Hurricane Sandy are now being assessed and will demonstrate the severity of the "no action" alternative.

Focused Capping with Dredging:

Only 840,000 yd^3 of sediment would be dredged under this alternative, which is designed to address areas with the highest net flux of contaminants. It is best to ensure that unacceptable levels of contaminants are not capped in place. Sediments would be dredged "to a depth of 2.5 feet so that an engineered cap can be placed over those portions dredged without causing additional flooding."[36] Confirmation sampling would be performed to document the capture of the contaminant mass. Even though these measures are designed to cap contamination without contributing to additional flooding, it is likely that flooding would continue to worsen under this alternative. "Armoring along the channel bed increases bed friction and, consequently, may increase water depths during floods."[37] Friction caused by the engineered armor cap, combined with rising sea levels and an increased frequency of major flooding events due to climate change, will exacerbate an existing flooding issue.[38] This alternative does not involve reconstructing the navigational channel, either. In fact, by applying shallow caps over highly contaminated sediment, this action would ensure future dredging for navigational purposes will never happen, permanently restricting usage of the river. Furthermore, USEPA has determined that focused capping with dredging is not adequately protective of human health and the environment, a threshold criterion of the National Contingency Plan. As a result, this alternative is no longer being evaluated for consideration.

Capping with Dredging for Flooding and Navigation:

Under this alternative, 4.9 million yd^3 of contaminated sediment would be removed from the river, enabling the use of an engineered cap or backfill where appropriate, while also mitigating flooding and restoring the navigational channel from Newark Bay up to RM2.2.[39] First, RM0 –

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[34] Malcolm Pirnie, Inc. 2007. FFS, Section 5.2.1, page 5-16.

[35] Union of Concerned Scientists. 2007. Confronting Climate Change in the U.S. Northeast – New Jersey.

[36] U.S. Environmental Protection Agency. 2012. Lower Eight Miles of the Lower Passaic River Remedial Investigation and Focused Feasibility Study Summary for Community Advisory Group. Alice Yeh, Project Manager.

[37] Malcolm Pirnie, Inc. 2007. FFS, Section 3.3.4.1, page 3-9.

[38] Union of Concerned Scientists. 2007. Confronting Climate Change in the U.S. Northeast – New Jersey.

[39] U.S. Environmental Protection Agency. 2012. Lower Eight Miles of the Lower Passaic River Remedial Investigation and Focused Feasibility Study Summary for Community Advisory Group. Alice Yeh, Project Manager.

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RM2.2 would be dredged and capped, followed by RM8.3 – RM2.2, then finally the Kearny Point mudflats.

Long-term Effectiveness and Permanence: An engineered cap is only a physical barrier between the contaminated sediment and the active environment. If a section of the cap were to fail or erode over time, high concentrations of toxins would be immediately bioavailable. This threat will not dissipate over time, as most of the COPCs and COPECs, especially the ***dioxins***, PCBs and heavy metals, do not break down biologically and will persist. The permanence of this solution, therefore, is completely reliant upon the monitoring and maintenance of the engineered cap ***in perpetuity*** – a costly, long term investment with undesirable risk. Ensuring the maintenance of a cap can be a burden on any river, but the tidal action of the Lower Passaic River raises additional concerns. River flow reverses when the tide rises, driving a salt wedge upstream an average of 4 miles each tidal cycle.[40] This dynamic flow will apply powerful and unpredictable forces upon the cap. As recently as 2007, it was reported that "The effects of wind/wave action on cap stability have not been evaluated."[41]

Additionally, the Passaic River Valley is subject to severe flooding which has increased in frequency in recent years.[42] The high flow rates created by these storms will also apply considerable force to the cap. Armored caps are also known to increase bed friction[43], which should increase the rate of the caps erosion during periods of high flow as well. All of these factors create concerning levels of uncertainty related to the long-term effectiveness and permanence of the cap.

While this alternative does propose removing 4.9 million yd^3 of contaminated sediment, roughly 6.1 million yd^3 would remain in the river. The shallowest sediment in the Lower Passaic River has the lowest concentrations of COPCs and COPECs, with concentrations increasing with depth. Therefore, the sediment that remains after dredging, which would then be located directly below the cap, has higher concentrations of contaminants than the removed material. If any issues would compromise the engineered cap, these highly toxic sediments would become bioavailable, and distributed widely throughout the environment due to tidal flows.

As stated in CERCLA, "Remedial actions using permanent solutions… that, in whole or in part, will result in a permanent and significant decrease in toxicity, mobility or volume of a hazardous substance are preferred." Partial dredging with capping does not permanently or significantly decrease the toxicity or volume of contaminated sediment; it acts as a temporary restriction of the contaminants' mobility. "Capping does not satisfy the CERCLA Statutory Preferences for treatment."[44] A far more protective and permanent solution would be to remove the contaminated sediments entirely over time. If, as an interim, capping is to be used, USEPA must provide a timeline for when their sites will be treated and where the capping is permanent.

Environmental Implications: Addressing RM2.2 – RM0, then RM8.3 – RM2.2, then the Kearny mudflats is a fundamentally flawed approach to remediating the Lower Passaic River. Instead of working downstream, efforts should begin upstream and shift downstream in a systematic approach. The severely contaminated Diamond Alkali Site has been the focal point of the river's

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[40] *Ibid.*
[41] Malcolm Pirnie, Inc. 2007. FFS, Section 4.3.1.4, page 4-16.
[42] Union of Concerned Scientists. 2007. Confronting Climate Change in the U.S. Northeast – New Jersey.
[43] Malcolm Pirnie, Inc. 2007. FFS, Section 3.3.4.1, page 3-9.
[44] Malcolm Pirnie, Inc. 2007. FFS, Section 5.1.2.2, page 5-9.

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restoration, resulting in a concentrated focus on the lower 8 miles. Now that the Diamond Alkali Site has been addressed, efforts should focus on restoring the entire lower 17 miles systemically. It would be a fundamental error to view this river as a collection of individual sites which can be addressed using a piecemeal approach.

When individual sites are dredged via a piecemeal approach, they must be refilled with backfill to level the river bottom. This backfill would create an artificial substrate which is harmful to ecological redevelopment. Backfill is convenient for piecemeal remediation, but it is unnecessary if dredging is done systematically from RM17 – RM0. The general downstream flow of the river will transport re-suspended materials to areas not yet dredged. By beginning as far upstream as possible, the likelihood that residual contamination will be removed during future dredging is maximized, resulting in greater total capture of COPCs and COPECs. In addition, eliminating backfill will result in a deeper river channel and cost savings. Concentrations of COPCs and COPECs in the sediments exposed by deep dredging are likely to be very low or negligible because their depth extends below the reach of legacy contamination. Backfilling with two feet of sand is therefore unnecessary and will only expedite the refilling of the navigational channel.

If this river is to be truly cleaned up and returned to a more natural state, then the abiotic materials biological communities will develop upon is a crucial consideration. Capping will require at least 6 inches of sand in all locations, with between twelve and eighteen inches of gravel or stone to armor the cap in many areas. These materials will create an artificial environment which can hinder ecological development.

The ultimate goal of these remedial efforts should be to establish a healthy, fishable river. In order to do so, we must not look solely at the fish, but at the entire ecosystem upon which they rely. Considering the vast extent of the current remedial effort, this is likely our only chance to properly facilitate the restoration of a healthy ecosystem.

The LPRRP Restoration Goals[45] are:

- To create, enhance, and restore habitat.
- To enhance plant and animal communities.
- To improve water quality and sediment quality.
- To support human use of the river.

To have a chance at achieving these goals, sand caps cannot become the dominant substrate – it must primarily be the native fine sediment to which these biological communities are adapted. However, capping could be integrated with habitat restoration to create a mosaic landscape. The future make-up of the river's bottom, the intertidal zones, and the surrounding landscape are the critical consideration for restoration. Biological communities have adapted to fine sediment, and they are dependent upon it. For instance, beds of eelgrass create habitat for fish, benthic organisms, and other wildlife. The eelgrass needs sediment for nutrient uptake and as an anchor for their root structures. Another keystone species, the oyster, requires a hard substrate for colonization and the formation of oyster reefs. Armored, stone caps could serve this purpose. Rocky shores engineered for bank stabilization would also provide the necessary substrate for oyster reefs. Facilitating the return of these two keystone species should be a primary consideration during restoration.

[45] http://www.ourpassaic.org/Restoration.aspx

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Navigable Channel: A navigation channel is authorized for the Lower Passaic River from RM0 to RM15.4, originally dredged and constructed near the end of the 19th century.[46] The last significant river-wide dredging happened in the 1940s, but RM0 to RM2 was dredged last in 1983. Since that time, large amounts of sediment have been deposited in the Lower Passaic River and navigation has been restricted. This remediation alternative would create a 300-foot wide navigational channel from RM0 – RM2.2, but it would not restore the navigational channel for the remaining 13.2 miles of river. Conversely, the engineered capping upstream from RM2.2 would prevent any channel maintenance from ever occurring and the navigational channel could never return, limiting a vast array of future uses for the river.

"According to *Land Use in the CERCLA Remedy Selection Process* (USEPA 1995), remedial alternatives developed during the RI/FFS should reflect reasonably anticipated future land use(s)."[47] Constructing a navigational channel in the Lower Passaic River played a crucial part in the economic development of this region in the past. Considering this history, re-establishing the navigational channel could play an integral part in modern redevelopment and restoration of the riverside municipalities as well. Access for larger ships, as well as smaller recreational craft, to the shores of the Lower Passaic River should be an anticipated future use of the land and the river. Several municipalities have already stated their desire for depths that will at least allow recreational boating and water taxis.[48]

The economic impact of permanently ending the authorized navigational channel upstream of RM2.2 is significant and immeasurable. "The State of New Jersey has reaffirmed its need for the river's navigational infrastructure, as its communities develop plans for use of a restored river in its future."[49] This should be addressed as part of the river's remediation and restoration, not forbidden. Remedial actions enacted upon the Lower Passaic River should be facilitating economic redevelopment. Instead, under this alternative, monitoring the cap will cost millions of dollars.

Finally, while ships are directed to follow navigational channels, it is not uncommon for them to veer slightly off course. The rocky surface of armored caps can damage the hulls of ships if a ship were to strike a cap.[50] This can also destroy the protective nature of the cap, instantly re-exposing the environment to contaminants.

Flooding: This alternative calls for dredging to at least 10 feet below mean low water (MLW) across a width of 200 feet from RM2.3 to RM8.1. From RM8.1 to RM 8.3, the width would be 150 feet. This dredge depth is not meant to mitigate the effects of regional flooding; instead it "includes dredging of enough fine-grained sediment (4.3 million yd^3) to ensure that an engineered cap can be placed without causing additional flooding."[51] Essentially, it is dredging just enough to install an engineered cap and, according to the USEPA's modeling, mitigate the

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[46] U.S. Environmental Protection Agency. 2012. Lower Eight Miles of the Lower Passaic River Remedial Investigation and Focused Feasibility Study Summary for Community Advisory Group. Alice Yeh, Project Manager.
[47] Malcolm Pirnie, Inc. 2007. FFS, Section 4.1.3, page 4-2.
[48] Malcolm Pirnie, Inc. 2007. FFS, Appendix F, pages 5-8.
[49] Malcolm Pirnie, Inc. 2007. FFS, Executive Summary: Description of the River, page iii.
[50] Malcolm Pirnie, Inc. 2007. FFS, Section 3.3.4.1, page 3-9.
[51] U.S. Environmental Protection Agency. 2012. Lower Eight Miles of the Lower Passaic River Remedial Investigation and Focused Feasibility Study Summary for Community Advisory Group. Alice Yeh, Project Manager.

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effects the cap has on flooding. In view of recent events from Hurricane Sandy, a more protective alternative must be designed. Climate change is predicted to raise sea levels by as much as two feet by the end of the century and increase the frequency of major flooding events.[52] Engineered capping may not increase flooding today, but negligence of future conditions will cause us to miss our only opportunity to mitigate the effects of future flooding.

Implementability: In the 2007 FFS, it was stated that "the coring data…show a high degree of local spatial heterogeneity, indicating that localized areas of relatively higher concentrations typically described as 'hot spots' may not exist. Instead, 'hot zones' of the river seem to exist on a scale of more than a mile or more, nearly bank to bank (i.e., the width of the navigational channel plus historical berth areas) in lateral extent." Capping is most effective when there are localized "hot spots" of contamination – distinct areas of significantly elevated contamination. However, the tidal action of the Passaic River has created large areas of uniformity which the quote above describes as "hot zones." Given this spatial distribution, a determination must be made regarding the treatment of these surface areas. It is not wise to cap entire "hot zones" from bank-to-bank for stretches of the river over a mile long. Furthermore, capping on the banks of the river will affect the intertidal zone, a sensitive part of the ecology of the river's system. Covering such large areas of the river is a costly, massive habitat altering reconstruction. The fiscal and ecological costs appear to discourage this course of action as a permanent solution.

Deep Dredging with Backfill in Lower 8 Miles:

Deep Dredging would remove contaminated sediment from the lower 8 miles of the Passaic River, a total volume of 9.6 million yd^3. Dredging would begin upstream at RM8.3 and move downstream until reaching RM0. The resulting channel dimensions would be:

- RM8.3 – 8.1: 10 feet over a 150 foot width
- RM8.1 – 7.1: 16 feet over a 200 foot width
- RM7.1 – 4.6: 16 feet over a 300 foot width
- RM4.6 – 2.6: 23 feet over a 300 foot width
- RM2.6 – 0.0: 33 feet over a 300 foot width

The dredge depth from RM8.3 – 0 is three feet deeper than the target channel depth to account for historical dredging accuracy and over-dredging.[53]

Long-term Effectiveness and Permanence: Removing all of the contaminated sediments is one way to ensure a high degree of long-term effectiveness and permanence. Similar to the FFS Proposal "Capping with Dredging for Flooding and Navigation", however, it does not address contamination from RM17 to RM8. Contaminated sediments in this upstream region will migrate downstream, re-contaminating portions of the Lower 8 miles.

Environmental Implications: Deep Dredging removes the largest possible volume of contaminated sediment, which can make environmental restoration difficult. Restoring natural hydrology and creating lost habitats are important considerations, both of which require some sediment to remain along shores. Specifically, the NY/NJ Harbor Estuary Program's Target Ecosystem Characteristics include shorelines and shallows as a goal.[54] Deep Dredging is a

[52] Union of Concerned Scientists. 2007. Confronting Climate Change in the U.S. Northeast – New Jersey.
[53] Union of Concerned Scientists. 2007. Confronting Climate Change in the U.S. Northeast – New Jersey.
[54] Bain, M., J. Lodge, D.J. Suszkowski, D. Botkin, R. Diaz, k. Farley, J.S. Levinton, F. Steimle and P. Wilber. 2007. Target Ecosystem Characteristics for the Hudson Raritan Estuary: Technical Guidance for Developing a

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widespread and disruptive action, counterbalancing the benefits of completely removing contaminants.

Flooding: Deep dredging will mitigate regional flooding better than any other alternative. Removing 9.6 million yd^3 of contaminated sediment increases space in the river for flood waters' additional volume. This increase in volume enhances the river's ability to move large amounts of water downstream during periods of high flow. Addressing flooding will also alleviate some concerns during the economic redevelopment of the region. Similar to addressing the navigational channel, mitigating the effects of flooding while addressing historic contamination is a cost effective way of solving regional issues. However, the Passaic River Coalition is concerned substantial habitat restoration would be very difficult after such extensive dredging.

Lower Passaic River Restoration Project
Preferred Action -- Precision Hydraulic Dredging

Precision Hydraulic Dredging for "substantial" removal of the sediments that are contaminated with PCBs and ***dioxins*** and other legacy COPCs and COPECs in the lower 17 miles of the Passaic River starting at Dundee Dam, and not refilling the river with backfill is recommended.

Long-term Effectiveness and Permanence: Precision Hydraulic Dredging for substantial removal of contaminated sediments has a similar long-term effectiveness and permanence of removing all contaminated sediments under the FFS Proposal "Deep Dredging with Backfill in Lower 8 Miles." However, our preferred action includes removing contaminated sediments from RM17 to RM8 as well. Once removed from the river, the toxic contaminants attached to these sediments can no longer be moved upstream or into Newark Bay and the New York/New Jersey Harbor Estuary. This alternative would maximize the reduction in risks to human health and the environment by ensuring COPCs and COPECs are permanently no longer bioavailable, thus allowing institutional controls like NJDEP's fish and shellfish consumption advisories to be lifted within a reasonable timeframe.

Environmental Implications: Our preferred alternative is appropriate because A) we feel it is very important to permanently remove contaminants from the river so they cannot ever become bioavailable again, and B) this remedial action best satisfies the objectives of all the stakeholders involved, concurrent with the goals of a RSM Plan. However, the Passaic River Coalition recognizes that, in an effort to restore habitats which have disappeared, it is best for sediment to remain in some areas. It is critical that an appropriate balance between removing contaminants and creating new habitats is reached.

The need to create and restore habitat in the Lower Passaic River has been extensively described in documents created for the NY/NJ Harbor & Estuary Program. These efforts should be incorporated into the evaluations by the USEPA and the NRRB. Specifically, suggestions from "Target Ecosystem Characteristics for the Hudson Raritan Estuary" and the "Hudson-Raritan Estuary Comprehensive Restoration Plan" should be implemented.

Comprehensive Ecosystem Restoration Plan. A report to the Port Authority of NY/NJ. Hudson River Foundation, New York, NY. 106 pp.

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The Target Ecosystem Characteristics (TECs) were developed by a team of estuarine scientists for the NY/NJ Port Authority under the NY/NJ Harbor Estuary Program.[55] They identified eleven total characteristics:

1. Oysters and Oyster Reefs
2. Eelgrass Beds
3. Coastal Wetlands
4. Shorelines and Shallows
5. Habitat for Fish, Crabs, and Lobsters
6. Enclosed and Confined Waters
7. Reduction in Toxic Contaminants in Hudson Raritan Estuary Sediments
8. Tributary Connections
9. Waterbirds
10. Maritime Forests
11. Public Access

While these recommendations span the entire estuary, many of these goals can be addressed on the LPRRP. In fact, the USACE has already identified 35 habitat restoration opportunities on the Lower Passaic River and the applicable TECs that can be incorporated into each opportunity.[56] While we consider all of these TECs as critical efforts, the Passaic River Coalition is particularly concerned about the restoration of oyster reefs and eelgrass beds. Both keystone species have almost entirely disappeared from the Passaic River and the Hudson-Raritan Harbor & Estuary, but the critical habitats necessary for ecosystem restoration can be reestablished.

Oyster reefs were once very common in this estuary. In the late 1880s, oysters were New York's most profitable fishery, providing jobs for thousands and food to many more. They also create complex habitat promoting a healthy and biodiverse river, protect shorelines from erosion by absorbing wave energy, provide a spawning habitat for fish, and filter large amounts of water resulting in increased water clarity.[57] Oysters require a hard surface located in the top 5 meters of water for colonization. For these purposes, capping contaminated sediments with an armored (gravel) cap could provide an appropriate substrate if this approach were included in the design. The New York and New Jersey Baykeeper has been successfully engaging in oyster re-colonization activities for the past 7 years within the estuary, giving hope that efforts can be successful on the Lower Passaic River as well.[58]

By clarifying the water, oyster reefs will improve conditions for the return of eelgrass. Like oyster reefs, beds of eelgrass were once a prominent keystone species of our estuary, but they

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[55] Bain, M., J. Lodge, D.J. Suszkowski, D. Botkin, R. Diaz, k. Farley, J.S. Levinton, F. Steimle and P. Wilber. 2007. Target Ecosystem Characteristics for the Hudson Raritan Estuary: Technical Guidance for Developing a Comprehensive Ecosystem Restoration Plan. A report to the Port Authority of NY/NJ. Hudson River Foundation, New York, NY. 106 pp.

[56] Hudson-Raritan Estuary Comprehensive Restoration Plan. March 2009. Draft Volume 1: Lower Passaic River Restoration Planning: Summary of Restoration Opportunities.

[57] *Ibid.*

[58] Bain, M., J. Lodge, D.J. Suszkowski, D. Botkin, R. Diaz, k. Farley, J.S. Levinton, F. Steimle and P. Wilber. 2007. Target Ecosystem Characteristics for the Hudson Raritan Estuary: Technical Guidance for Developing a Comprehensive Ecosystem Restoration Plan. A report to the Port Authority of NY/NJ. Hudson River Foundation, New York, NY. 106 pp.

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have severely declined due to increased water turbidity and habitat degradation.[59] When the eelgrass beds were lost, significant changes in the river's biological and physical processes likely took place. It serves as a food source for birds, a nursery for fish and shellfish, reduces erosion by trapping sediments and stabilizing coastal zones, and increases biodiversity.[60] Bringing eelgrass back to the Lower Passaic River will have a lasting positive effect contributing to the return of a more natural river system.

Navigational Channel: Our recommended action includes re-establishing the entire authorized navigational channel. The use of this channel could play a substantial role in the economic redevelopment of the region, which would otherwise be limited by all other alternatives. Restoration of the authorized navigational channel by the USACE while simultaneously addressing the legacy of contamination throughout the river is a cost effective opportunity to reduce future inquiries.

Flooding: Similar to "Deep Dredging with Backfill in the Lower 8 Miles", our preferred alternative would remove a substantial volume of contaminated material. This would increase the river's ability to move flood waters downstream quickly.

Lower Passaic River Restoration Project
Dredged Material Management (DMM) Alternatives

In 1984 the "Diamond Alkali" site, which includes the property at 80 Lister Avenue in Newark as well as the contaminated Lower Passaic River, was declared a Superfund Site. The Diamond Alkali Superfund Site project became part of the LPRRP in 2000 and studies were extended into Newark Bay.[61] In the LPRRP Draft Focused Feasibility Study (FFS) of 2007, "sediments in the lower eight miles of the river were identified as a major source of contamination to the 17-mile" tidal portion of the river and to Newark Bay.[62] According to the USACE, one of the goals of the LPRRP is to provide a plan that will result in "a significant cost savings to the navigational dredging program related to dredged material management in the NY/NJ Harbor."[63] Thus, the "Phase 1 Removal Action" project, which removed about 40,000 yd^3 of the sediments most highly contaminated with ***dioxins*** from an area of the Lower Passaic River directly next to the land side of the Diamond Alkali site, and the "Lower 8 Miles of the Lower Passaic River" project are NY/NJ Harbor dredging projects. The NY/NJ Harbor Region is depicted in Figure 1.[64] Navigation channels that need to be dredged are shown in Figure 6.[65] The dredged material management (DMM) plans for these projects will greatly influence future DMM in Newark Bay, the harbor and far beyond. DMM alternatives that are being considered for the "Lower 8 Miles

[59] New York – New Jersey Harbor & Estuary Program. 2012. The State of the Estuary 2012: Environmental Health and Trends of the New York – New Jersey Harbor Estuary.

[60] *Ibid.*

[61] U.S. Army Corps of Engineers, New York District; U.S. Environmental Protection Agency, Region II; New Jersey Department of Transportation, Office of Maritime Resources. April 2003. Project Management Plan, Lower Passaic River, New Jersey, Investigation and Feasibility Study for Remediation and Ecosystem Restoration.

[62] Malcom Pirnie, Inc. 2007. FFS, Executive Summary, page i.

[63] U.S. Army Corps of Engineers, New York District. 2011. Lower Passaic River Restoration Project, NJ. Lisa Baron, Chief, Harbor Programs Branch. Web-site: www.nan.usace.army.mil.

[64] Tierra Solutions, Inc. 2008. Phase I and Phase II Field and Data Report, Newark Bay Study Area Remedial Investigation. Phase I and Phase II Sediment Investigation Field and Data Report, Figure 1-1.

[65] *Ibid.* Figure 4-13.

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Figure 6 – Navigation Channels in Lower Passaic River, Newark Bay Area

of the Lower Passaic River" project are evaluated here for use with sediments contaminated with PCBs, ***dioxins*** and other pollutants.

CAD (Confined Aquatic Disposal):

It has been proposed that up to 9.6 million yd^3 of the contaminated sediments to be dredged from the "Lower 8 Miles" stretch of the Passaic River be placed in deep holes dug into the clean clay in Newark Bay between the shipping channel and the City of Bayonne, as shown in Figure 7. The estimated cost of this DMM Option is about $0.8 billion, and is about $1.6 billion less than that for "Decontamination/Beneficial Use".[66] The Corps has described CAD or CDF (Confined Disposal Facility) cells in Newark Bay as "an affordable and environmentally safe method … to dispose of contaminated dredged materials".[67] But given the chemical nature of these sediments to be dredged, which are highly contaminated with POPs, especially ***dioxins***, PCBs and heavy metals, putting them into a CAD is just moving them down river into the bay. This DMM Option would not make these sediments environmentally safer, and it would be costly. The Corps describes CAD cells as "potential contingency options" for DMM of harbor dredging.[68] USEPA Region 2 had previously ruled out a CAD as a DDM alternative in the 2007 Draft FFS. They cited potential difficultly controlling effluent, precisely placing materials in the CAD unit, sediment re-suspension, and the permanent nature of this questionable alternative. In addition, CADs are typically used for navigational projects where severe amounts of contamination are <u>not</u> a consideration. They are also viewed harshly by the regulatory and environmental communities, including local community representatives and environmental organizations.[69] The Passaic River Coalition concurs with USEPA's findings relating to a CAD. In addition, we are concerned that a created CAD would significantly destroy the current benthic community in the bay.

If using CAD cells for these highly contaminated sediments is still considered a viable option, then the following concerns must be addressed: Given the likelihood of the release of ***dioxins*** and other contaminants from a CAD site by a boat straying from the navigational channel or other type of accident, a process must be established ***in perpetuity*** for preventing such accidents and identifying the responsible party. Payment for the long term costs of monitoring and maintaining the CAD cells must be clearly identified. The complications of allowing CADs to be built close to berths 4, 6 and 8 at the Port Newark Marine Terminal and the navigational channels from which contaminated sediments need to be dredged soon should be included in a DMM plan.

Off-site Treatment and Disposal:

In the "Phase 1 Removal Action" project the dewatered contaminated sediments are being shipped by rail to facilities in Oklahoma and Utah. The economic costs of shipping wastes across the country are high, and so are the ecologic costs from greenhouse gas emissions. We do not know what the ecologic costs will be at these "Off-site" disposal facilities at this time because information about them has not been made available. However, past studies lead us to conclude that dumping such contaminated sediments anywhere in the U.S., Canada or elsewhere without appropriate pretreatment of the dredged material will cause high ecologic costs that lead to high

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[66] Malcolm Pirnie, Inc. 2007. FFS, Appendix J, page J-3.

[67] U.S. Army Corps of Engineers, New York District, JoAnne Costagna. 10/19/2012. Port's dredged material management method keeps economy afloat. Web-site: www.nan.usace.army.mil.

[68] U.S. Army Corps of Engineers, New York District. 2011. Dredged Material Management Plan for the Port of New York and New Jersey. Michael Millard, Project Manager. Web-site: www.nan.usace.army.mil.

[69] Malcolm Pirnie, Inc. 2007. FFS, Page 3-20.

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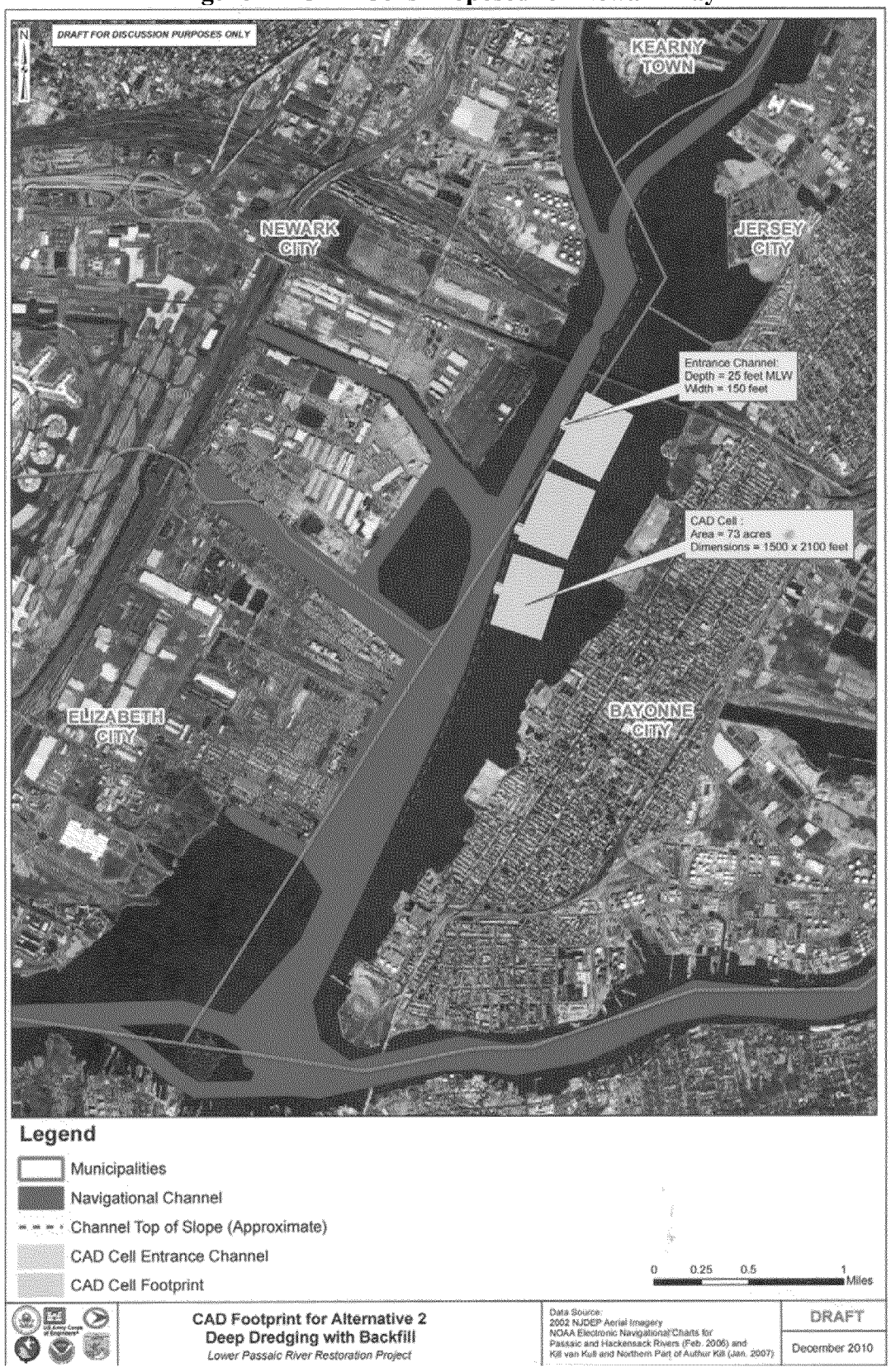
Figure 7 – CAD Cells Proposed for Newark Bay



economic costs. In any case this would not be a "Beneficial Use" of these sediments. In addition to our concerns, CERCLA Section 112(b) identifies the statutory preference that "off-site transport and disposal of hazardous substances or contaminated materials without treatment is considered the least favorable remedial alternative when practicable treatment technologies are available." Overall, we view this alternative as being outdated and morally wrong in light of modern technology which can permanently destroy or decontaminate highly toxic materials.

Sediment Washing:

Sediments dredged from the Lower Passaic River near the Diamond Alkali site in 2005 were used in the BioGenesis[SM] sediment washing demonstration project to "produce high-end topsoil", a beneficial use product.[70] "The BioGenesis[SM] Sediment Decontamination Technology is a physical/chemical process that uses impact forces (cavitation/collision) and chemical forces (oxidation with hydrogen peroxide) to strip contaminants from the surface of sediment particles and suspend them in the water phase where they can be separated from the sediment."[71] The sediments are then mixed with clean organic matter to make manufactured soil. The wash water is piped to the nearest sewage treatment plant. For some sediments dredged from the NY/NJ Harbor Region this treatment may be appropriate, but not for those contaminated with PCBs or ***dioxins***. The "chemical forces" used do not change these compounds. Some of the PCB/***dioxin*** contaminants would be carried attached to very small particles of dirt in the wash water to the sewage treatment plant where they would contaminate the sludge. The ***dioxins*** would also end up in the manufactured soil where they could do harm.

In September 2012 a bench scale test report became available detailing the results of two soil washing vendors' attempts to wash sediment from the RM10.9 hot spot. Both vendors were unable to treat soils to levels remotely acceptable, achieving decontamination efficiencies of 3.75% and 27.2%. Levels of PCB reduction were also reported to be insufficient and the technology will likely not reach pilot-scale testing for Lower Passaic River sediments.

A disposal option under consideration, thermal-chemical manufacturing, produces a byproduct with a beneficial use. Thermally treated materials can be used to produce cement. In light of the failed bench scale sediment washing, the materials which would be used for a beneficial use are no longer available because they cannot be sufficiently decontaminated. Considering the thermal-chemical alternative, which is capable of achieving decontamination efficiencies over 99.99%, sediment washing should not be considered a viable option.

Thermal Oxidation (Incineration):

Incineration is effective at reducing the mass of solid waste because much of the organic matter burns up and goes into the air as carbon dioxide, water and other compounds. Incinerator feedstock must be able to burn under its own calorific value, but the dredged materials from the NY/NJ Harbor will not burn because they are mostly mineral matter which has no calorific value. Incinerators can produce ***dioxins***, and do produce ash which may contain leachable heavy metals. Disposal of the ash poses both ecologic and economic problems. Consequently, thermal destruction by oxidation at temperatures in the range of 1,400°F to 1,800°F should not even be

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[70] Malcolm Pirnie, Inc. 2007. FFS, Pages 3-15 & 3-16. & Appendix H, BioGenesis Sediment Washing Demonstration Project, pages H-15 to H-86.

[71] BioGenesis Washing BGW, LLC. 2009. Demonstration Testing and Full Operation of the BioGenesis[SM] Sediment Decontamination Process, Keasbey, New Jersey. Page ES-11.

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considered as an option for the decontamination of sediments dredged from the Lower Passaic River and Newark Bay.

"Thermal Destruction" and Vitrification:
In the 2007 FFS for the LPRRP various *ex situ* treatment processes to decontaminate the dredged materials were assessed. One of these processes was "thermal destruction" which "uses high temperatures (typically between 1,400°F and 2,200°F) to volatize and combust organic chemicals."[72] What was evaluated in the FFS as a "thermal destruction" process was the thermal-chemical (Cement-Lock®) process, which operates at higher temperatures in the range of 2,400°F to 2,600°F.[73] The FFS describes vitrification as "a process in which higher temperatures (2,500°F to 3,000°F) are used to destroy organic chemicals by melting the contaminated dredged material to form a glass aggregate product".[74] The vitrification technology was to be considered for further evaluation for the LPRRP. The FFS states that "the thermal treatment process options, thermal destruction and vitrification, meet the criteria of permanently treating the sediments while achieving the highest treatment efficiencies."[75] The vitrification process developed by the Minergy Corporation is being used to treat sewage treatment plant wastewater sludge, and pulp and paper plant wastewater solids. It was considered for treatment of the PCB contaminated sediments dredged from the Lower Fox River in Wisconsin, but these dredged materials are going to a landfill instead because this DMM is cheaper. The thermal "destruction" (Cement-Lock®) process was selected for further study in the LPRRP because "it produces a beneficial use product that offsets a significant portion of the treatment costs, and because it has been shown to achieve a high treatment efficiency for Passaic River sediments based on the results of a pilot demonstration project in which 16.5 tons of Passaic River sediment were treated."[76] The 2007 FFS also states that the thermal-chemical (Cement-Lock®) process "is one of the only technologies proven as effective in treating… (***dioxins***, PCBs and PAHs) detected in the sediment" of the lower 8 miles of the Passaic River.[77] Overall, Cement-Lock® is the only DMM alternative that meets the requirements of CERCLA, the Clean Water Act, EPA's RAOs, and the National Contingency Plan's evaluation criteria.

Preferred Dredged Material Management (DMM) Option Thermal-Chemical (Cement-Lock®) Treatment

Development of Thermal-Chemical Technology:
The thermal-chemical (Cement-Lock®) 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 Ecomelt®, which can be used as a 40% replacement for Portland cement in concrete, a beneficial use product. Rotary kilns have been used to produce Portland cement for more than a hundred years. For over 65 years the Gas Technology Institute (GTI) has been a world leader in the research and development of energy technologies using gas. This

[72] Malcolm Pirnie, Inc. 2007. FFS, Page 3-17.
[73] *Ibid.*
[74] *Ibid.*
[75] Malcolm Pirnie, Inc. 2007. FFS, Page 4-8.
[76] *Ibid.*
[77] *Ibid*, Page 3-17.

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technology for remediating contaminated sediments was conceived at GTI in 1994, and developed from bench-scale to pilot-scale in 1994 to 2005. EPA Region 2, the US Department of Energy, and 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."[78]

Pilot-Scale and Demonstration-Scale Testing of Thermal-Chemical Technology:
In 2005 sediments dredged from the Stratus Petroleum site in Newark Bay and then dewatered were used in a pilot test of the Cement-Lock® technology at a demonstration plant in Bayonne, NJ.[79] This test led to equipment modifications that needed to be retested.[80] The retesting occurred in November 2006, but was halted early for several reasons. In December 2006 and May 2007 demonstration-scale tests of longer duration were conducted using more contaminated sediments dredged from the Passaic River near the Diamond Alkali site. The results from these tests show that the Cement-Lock® technology "can achieve high destruction and removal efficiencies for contaminants of concern, specifically ***dioxins*** and furans and PCBs" (treatment efficiency of >99.9%).[81] Some of the Ecomelt® produced was mixed with Portland cement to make high quality concrete paving at Montclair State University. Much was learned from the pilot and demonstration test projects. When the Passaic River Coalition considered the technical problems that occurred during these tests, we concluded that they could be corrected if appropriately addressed as discussed below.

Technologies Involved in the Thermal-Chemical Treatment of Dredged Materials:
Since 2008 the partners in Volcano Partners, LLC, have brought together several different business entities with their own expertise that would cooperate in the development and operation of facilities for the manufacture of a cement extender (Ecomelt®) from contaminated sediments dredged from the NY/NJ Harbor and elsewhere. These entities include Tetra Tech, Foster Wheeler Corporation, ABB, and ADA/NORIT Americas JV. As with most manufacturing businesses, there are at least four different processes that would be involved in the thermal-chemical treatment of dredged materials. Each of these processes involves different technologies. Each process requires different types of operational expertise. The technological modifications and expertise that Volcano Partners suggest be used in each of these four processes are evaluated here.

Front End Materials Handling Process -- Debris Removal, De-watering of Dredged Materials:
In the test runs the dewatered sediments fed into the rotary kiln should have been drier. This problem and other problems encountered with feed handling are correctable. Tetra Tech is helping to design the systems to offload the dredged sediments from barges, to remove debris, and dewater the sediments to 50% solids content, to deliver the dewatered sediments to the treatment factory, and to blend Cement-Lock® technology additives with the sediment to reduce the moisture content to 40% or below.

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[78] Endesco Clean Harbors, LLC, prepared by Michael C. Mensinger, Gas Technology Institute. July 2008. Sediment Decontamination Demonstration Program – Cement-Lock® Technology, Final Report: Phase II Demonstration Tests with Stratus Petroleum and Passaic River Sediments. Submitted to: NJ Department of Transportation, Office of Maritime Resources; US Department of Energy, Brookhaven Science Associates, LLC. Page iii.
[79] *Ibid.*
[80] *Op. cit. #22.* Page iv.
[81] *Op. cit. #22.* Pages 103, vii.

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Manufacturing Process -- Design/Build/Operate Thermal-Chemical Treatment Factory:
The demonstration tests proved that a cement extender (Ecomelt®) can be manufactured from contaminated sediments. In the Passaic River Coalition's judgment the improvements in the design of the system being proposed to correct problems encountered in the demonstration tests make sense. Tetra Tech, Foster Wheeler Corporation (FWC), design engineers in rotary kiln technology, and ABB, an industrial leader in cement plant planning, are helping in planning the design, construction and operation of a Cement-Lock® facility using a rotary kiln thermal-chemical processing technology. In this system dewatered sediments that have been mixed with feed additives (slag modifiers) are fed through a kiln on a double screw feeder conveyor. The heat for processing the sediments comes from burning natural gas with air. The amount of air and oxygen (O_2) used is controlled by a combustion air fan so that the gas, which is mostly methane (CH_4), is used efficiently to form carbon dioxide (CO_2) and water (H_2O), and so that nitrogen oxide (NO_x) formation is minimal. Air contains about 78% nitrogen (N_2) and 21% oxygen (O_2). As the dredged sediments are rolled through a kiln and heated to high temperatures of ~2,500°F most of the sedimentary material is melted into a molten slag, and the organic matter is converted to gases, especially CO_2 and water. The temperatures used are even hot enough to convert PCBs and ***dioxins*** to CO_2, water, hydrogen chloride (HCl), and chlorine gas (Cl_2). The molten slag drops from the kiln and the walls of the secondary combustion chamber into a pool of water where it is quenched and cooled. The slag is then conveyed from the pool to a grinder/pulverizer/blender to become Ecomelt®. The rotary kiln thermal-chemical treatment technology being proposed by FWC has already been used to treat a variety of heterogeneous waste streams, including contaminated soils, sediments, and sludges. In fact, FWC's rotary kiln projects include the Clean Harbors Aragonite facility in Grantsville, Utah, which has been in operation since 1991 and has received an EPA permit for PCB Disposal.[82] The Destruction and Removal Efficiency (DRE) for PCBs at this plant have at times exceeded 99.999999%. However, that facility produces an ash, which can produce leachable heavy metals such as lead and mercury when deposited in a landfill. The Cement-Lock® facility proposed for this area will be a cradle to grave solution and the first plant in the U.S. and Canada to be designed for the treatment of sediments contaminated with both legacy pollutants and heavy metals.

Waste Management Process -- Air Pollution Control and Monitoring:
This thermal-chemical treatment process uses lots of energy by burning natural gas with air to heat the rotary kiln system (Ecomelt® generator). Energy wastage would be minimized by using the superheated flue gases to produce steam to generate electricity, an additional beneficial product, at an estimated rate of 10,000MWh per year.[83] The Volcano Partners, including ADA/NORIT Americas JV, are now proposing to build and operate a Cement-Lock® plant with "state-of-the-art" air pollution controls. This process forms acidic gases, NO_x (nitrogen oxides), SO_x (sulfur oxides), and HCl (hydrogen chloride), which can cause acid rain if released to the air and are known greenhouse gases contributing to climate change.[84] Before being emitted the flue gases would be cooled with direct water injection. NO_x emissions would be reduced by selective non-catalytic reduction, which would convert the NO_x to the nitrogen and oxygen gases that fill the air. Injection of lime into the flue gases would convert SO_x and HCl gases to solid particles, which would then be captured in fabric filter bag houses. Mercury (Hg) becomes a gas in this

[82] U.S. Environmental Protection Agency. 2011. Web-site: www.epa.gov/hazard/tsd/pcbs/pubs/stordisp.htm
[83] Appendix 1 – Robert Fabricant Esq., Volcano Partners LLC. 2012. Cement-Lock 2012: A Proposed Minimum Volume Program AND Integrated, Sustainable Sediment Management.
[84] Union of Concerned Scientists. 2007. Confronting Climate Change in the U.S. Northeast – New Jersey.

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treatment process and must be captured. Absorbing gaseous mercury on impregnated powdered activated solid carbon particles which are caught in filter bags is proposed for mercury removal. Powdered activated carbon would also be used to remove any ***dioxins*** or furans that may be formed in the system. The proposed Cement-Lock® treatment process would not produce any waste water. The solid fine particulates caught in bag houses can be effectively managed and might even be useful. The cleaned, odorless flue gases will be lifted through a gas stack tall enough to allow for proper dispersion into the atmosphere. It is the Passaic River Coalition's judgment that the air pollution control systems proposed by the Volcano Partners are designed to be operated so as to exceed mandated air emissions standards.

Disposition of Manufactured Product -- Beneficial Use of Cement Extender (Ecomelt®):
It has been demonstrated that contaminated sediments, even those from the Lower Passaic River, can be melted to make Ecomelt®, mixed with Portland cement, and then used to make high grade concrete. There are many benefits to be gained from using contaminated sediments to make Ecomelt®. Tests by Accutest Laboratory using the EPA's Toxicity Characteristic Leaching Procedure (TCLP) have proven Ecomelt® is a harmless product which does not leach metals immobilized within its crystalline, glassy-like matrix (see Table 1).[85] The organic contaminants, including PCBs and ***dioxins***, that adhere to the sediments are destroyed in the Cement-Lock® rotary kiln process, which also generates electricity. Although some parts of the processes needed in the manufacture of Ecomelt® are more expensive than those in the manufacture of Portland cement, the values to be gained in cleaning up the contamination should offset these costs. Volcano Partners has also entered a letter of intent with U.S. Concrete, demonstrating that a market does exist for the Ecomelt® product.[86] In any case, the production of this product would certainly be a beneficial use of contaminated sediments.

Table 1: Results of TCLP Tests for Metals on 6 Ecomelt® Samples from Cement-Lock® Demo Plant Campaign with Passaic River Sediment

Metal	TCLP Limit	Ecom-1	Ecom-2	Ecom-3	Ecom-4	Ecom-5	Ecom-6	Average Ecomelt
	mg/L							
As	5	0.5U**	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Ba	100	1U	1U	1U	1U	1U	1U	1U
Cd	1	0.0092	0.005U	0.005U	0.005U	0.005U	0.005U	0.0057
Cr	5	0.01	0.01U	0.01U	0.01U	0.014	0.011	0.0108
Co	--*	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U
Cu	--	0.15	0.025U	0.025	0.025U	0.034	0.026	0.0475
Pb	5	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
Mn	--	0.21	0.071	0.037	0.032	0.037	0.034	0.070
Hg	0.2	0.0002U	0.0002U	0.0002U	0.0002U	0.0002U	0.0002U	0.0002U
Ni	--	0.12	0.04	0.04	0.04	0.04U	0.04	0.0533
Se	1	0.5	0.5	0.5	0.5U	0.5U	0.5U	0.5U
Ag	5	0.01	0.01	0.01	0.01U	0.01	0.01U	0.01U
Zn	--	0.7	0.31	0.16	0.13	0.22	0.17	0.282

* Not a TCLP priority metal.
** U = below the analytical detection limit.

[85] Volcano Partners, LLC. Volcano Partners: Manufacturers of Non-Hazardous Cement and Electricity from Hazardous Materials. On-line Brochure.
[86] Personal communication with Al Hendricks, Volcano Partners, LLC.

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Cement-Lock® Feasibility

Site for Thermal-Chemical Treatment Facility:
Finding an appropriate site for the development of a thermal-chemical treatment facility for DMM of contaminated sediments is critical for implementing these dredging projects. The site must be easily accessible by ship, and there should also be good rail and highway facilities nearby. The site must be large enough to accommodate all the necessary facilities. It would be necessary to obtain all the permits needed to develop and operate a thermal-chemical treatment facility for DMM and other contaminated sediments at the site. There are sites in the region that meet these criteria. The use of such a site for the decontamination of materials dredged from the Lower Passaic River and Newark Bay should be considered "Local Decontamination". Without such a facility within the NY/NJ Harbor area these contaminated dredged materials would have to be shipped elsewhere. The site should become an "active upland dredged material placement site" that is permitted by the Corps to receive contaminated sediment from the bay and harbor.

Evaluation of Thermal-Chemical Treatment for DMM:
As in the development of most new technologies, there were problems encountered in the demonstration-scale testing of the Cement-Lock® technology in Bayonne in 2006 and 2007. Since then Volcano Partners and their associates have addressed these issues by incorporating ways to design and operate facilities for each of the four processes involved in cleaning contaminated dredged materials to produce a product for beneficial use (Ecomelt®). 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 thermal-chemical treatment option being proposed by the Volcano Partners is the best alternative for DMM. Concurrently, NACEPT reports:

> While this recommendation has been made frequently, the opportunity to pursue such a facility as a priority disposal project requires EPA's attention now. The demonstration of the efficacy of the Cement-Lock® process in New Jersey would encourage clean-ups in several parts of the United States where toxic pollutants are challenging the nation.[87]

Cement-Lock® also meets the CERCLA preference for permanent treatment. "By dredging contaminated sediment from the river and harbor, and treating it on land so it can be used beneficially, both the ecologic and economic vitality of the region can be reinvigorated."[88] Attached as Appendix 1 is a PowerPoint presentation by Robert Fabricant, Esq. that expands on the benefits of using this process.

Effects of Hurricane Sandy

Hurricane Sandy imposed record storm surges across the greater NY/NJ area. The distribution of contaminated sediments has likely changed due to these forces. New technology exists which can effectively scan sediments without taking core samples. Prior to any dredging, this new technology should be employed to reassess the dispersal of contaminants for precise removal.

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[87] National Advisory Council for Environmental Policy and Technology. February 2012. Letter to USEPA Administrator Lisa P. Jackson, Re Technologies for Environmental Justice Communities and Other Valuable Populations.
[88] *Ibid.*

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Cost Evaluation

Implementation of a LPRRP would be the responsibility of the USEPA under the Superfund Program, the USACE and New Jersey Department of Transportation (NJDOT) under the Water Resources Development Act, and by the U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA), and NJDEP as Natural Resource Trustees.[89] Funding should also be available from federal and state governments in order to restore the navigational capacity of the New York-New Jersey Harbor, which includes the Lower Passaic River. The issue of how the costs of an Early Action project might be apportioned needs to be addressed as soon as possible. The following table was presented in our report of 2008 and received considerable interest by a wide variety of stakeholders.

Potential Sources of Funding to Implement Preferred Early Action Project: Table 2 lists suggestions for potential sources of funding for the preferred Early Action project. The suggestions for potential sources of funding and the percentages that each might pay are intended to start stimulating a discussion among involved parties so that we can find mutually acceptable ways to fund and implement this project as soon as practicable. The National Remedy Review Board could be extremely helpful by establishing a process whereby the recommendations in this chart may be enacted.

Table 2 – Potential Sources of Funding for Preferred Early Action Project Alternative, Dredging with Full Decontamination of Dredged Material

Cost	*Source of Funding*	*% of Funding*
Capital Costs for Dredging Navigational Channel	USACE, Federal Government	100%
Capital Costs for Dredging beyond Navigational Channel	WRDA, USACE	65%
	Superfund, PRPs	35%
Development of Dredged Material Processing Facility	Private investors	100%
Decontamination of Dredged Material	Superfund, PRPs	100%
Operations & Maintenance Costs	NJDEP, PRPs	100%

Funding under the Superfund Program: The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, was enacted in 1980.[90] This law created a tax on the chemical and petroleum industries, which went to a trust fund for cleaning up abandoned or uncontrolled hazardous waste sites when no responsible party could be identified. Over five years $1.6 billion was collected, but the tax was discontinued. The Lower Passaic River is part of the Superfund Site which was listed on the National Priorities List in 1984. As of today there are 71 corporations that are listed as "Potentially Responsible Parties"

[89] Malcolm Pirnie, Inc. 2007. FFS, Executive Summary, page i.
[90] USEPA. 2007. CERCLA Overview. Website: <http://www.epa.gov/superfund/policy/cercla,htm>

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(PRPs) in this Superfund case.[91] Furthermore, there are many unidentified responsible parties, most of whom are no longer in business. The Lower Passaic River watershed was "one of the major centers of the American industrial revolution."[92] For more than two centuries industrial and municipal waste streams have discharged many contaminants, including ***dioxins***, petroleum hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, and metals to the Lower Passaic River. Furthermore, industries along the Lower Passaic River were major contributors to war efforts, including the Spanish-American War, World War I, World War II, the Korean War, and the Vietnam Conflict, when the US Defense Department used Agent Orange. The role of the Federal government in degrading the environment at this Superfund site is well documented in a paper entitled "Wartime Mobilization and the Newark Bay Home Front Environment: A Case Study Revealing Opportunity for Federal Leadership in Resolving Mega Site Problems."[93] In two judicial cases that have been heard by the United States Court of Appeals, the courts have ruled that under CERCLA the Federal government is liable for some portion of response costs based on government's role in operation of facilities during war.[94] The responsible parties in this Superfund case should include the Federal government, which instituted these wars and commanded that war supplies be produced by companies along the Lower Passaic River and others. The National Remedy Review Board shall do all in its power to include the Department of Defense and its responsibilities in the cleanup of the Lower Passaic River.

Funding under the Water Resources Development Act: The U.S. Army Corps of Engineers (Corps) lists the mission priorities of their civil works program as follows:[95]

- Navigation (Deep draft)
- Ecosystem Restoration
- Flood Damage Reduction (Coastal and Riverine)
- Bank Stabilization
- Debris Removal

A project that dredges and restores navigational capacity to the Lower Passaic River, that develops a dredged materials processing facility that would treat and use the dredged materials beneficially, and that would reduce flooding would meet all these mission priorities. In the Water Resources Development Act of 1999, the Passaic River is listed as one of eight priority sites. Funding up to $50 million per year may be used to "remove and remediate contaminated sediments from the navigable waters of the United States for the purpose of environmental enhancement and water quality improvement if such removal and remediation is requested by a non-Federal sponsor and the sponsor agrees to pay 35 percent of the cost of such removal and remediation."[96] This may be a source of funding that can be used to remove and remediate the

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[91] Kluesner, David, US EPA, Region 2. 2007. Proposed Amendment to Administrative Settlement for the Lower Passaic River Study Area. Website: www.ourpassaic.org.

[92] Malcolm Pirnie, Inc. 2007. FFS, Executive Summary, Description of the River, page ii.

[93] Reis, Michael. 2006. Wartime Mobilization and the Newark Bay Home Front Environment: A Case Study Revealing Opportunity for Federal Leadership in Resolving Mega Site Problems. Environmental Claims Journal, 18(4/Fall):293-320 (2006), pages 293-320.

[94] United States Court of Appeals, Third Circuit. 1994. FMC Corporation vs. United States Department of Commerce. & United States Court of Appeals, Ninth Circuit. 2002. Cadillac Fairview/California, Inc., vs. Dow Chemical Company vs. United States of America.

[95] U.S. Army Corps of Engineers. 2007. Passaic River Basin, New Jersey, Congressional Staff and Stakeholders Briefing, April 5, 2007.

[96] Water Resources Development Act of 1999, Section 224.

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contaminated sediments that are outside of the navigational channel. The State of New Jersey should be the non-Federal sponsor, and should request that the Corps bear at least 65% of the costs of removing the contaminated sediments from outside of the navigational channel.

In 1986 the New York District of the USACE completed a Bank Stabilization Project and also included the Lower Passaic River in the Debris Removal Program for the Greater New York – New Jersey Area. These two studies should become part of the multifaceted integrated management plan for the Lower Passaic.

Funding to Restore Navigational Channels: "The Federal interest in navigation derives from the Commerce Clause of the Constitution."[97] The Corps is the Federal agency responsible for maintaining the navigational channels of the New York-New Jersey Harbor, including the channels in the Lower Passaic River. Most of the Lower Passaic River has not been dredged since the 1940s.[98] The authorized navigational channels have been filled in with contaminated sediments. Therefore, in our judgment, Congress should demand that the Corps fulfill its responsibilities to dredge and restore the navigational channels of the Lower Passaic River to the authorized depth that was dredged to in the 1940s. The Federal government should fully fund this aspect of the Dredging alternative.

Funding to Develop a Dredged Materials Processing Facility: **The development of a dredged materials processing facility, which would treat the dredged materials so that they could be used beneficially, and which would eliminate the need for ocean disposal or in-water confined disposal facilities (CAD or CDF), would facilitate future dredging to improve the navigational capacities of the harbor, to restore ecosystems, and to reduce flood damage.** Such a facility could also be designed to treat contaminated materials from Brownfield sites and industrial wastewater plants. Such a facility could provide far reaching environmental benefits. It also could provide many economic benefits for the region. Since this facility would be selling Ecomelt® and generating electricity it would have an income. Now is the time to design, build, and use a facility that will turn contaminated sediments and materials into useful products. Agencies involved in implementing this part of the project, which is of paramount importance, should include the USEPA, the USACE, the NJDOT, the Port Authority of New York and New Jersey, the NJDEP, the New Jersey Environmental Infrastructure Trust, and private investment concerns.

Decontamination of Dredged Materials: Currently the cost is $350 per in-situ ton, which will substantially, if not completely, eliminate future liability of the contaminants entering the environment as they will be destroyed or immobilized.

Operations and Maintenance Costs: Under CERCLA, the costs of operation and maintenance can be delegated to the NJDEP to carry out the responsibilities assigned to the PRPs forever. Therefore, all cost effective measures must be considered in the development of the operations and maintenance component of this project.

Clearly in order for a complicated project, such as the cleanup of the Lower Passaic River, to be implemented, calls for an integrated, comprehensive management program. All such elements have been developed by their respective agencies and reviewed. A need exists to bring all parties

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[97] U.S. Army Corps of Engineers. 2000. ER1105-2-100, 22 April 2000. Appendix E, Civil Works Missions and Evaluation Procedures, Section II-Navigation, page E-18.

[98] Malcolm Pirnie, Inc. 2007. FFS, Executive Summary, pages ii-iii.

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together in a cooperative manor so that a parallel course may be taken on the elements listed in the chart above. Integrated, comprehensive management programs, such as the one we have outlined here, have the proven ability to save costs in the present and long-term. NACEPT reports:

> … elsewhere in the United States and in Europe significant cost savings and other benefits have resulted from (Regional Sediment Management) efforts. The implementation of projects to restore the ecologic vitality of the Lower Passaic River and Newark Bay is critical for restoring economic prosperity to this region![99]

Now is the time for all stakeholders to work together in a cooperative manor to maximize the cleanup of the Passaic River in the next seven years.

Conclusions

The Passaic River Coalition agrees with the recommendations of New York – New Jersey Harbor Estuary Program, which states:

> The Regional Sediment Management Plan is a long-term Plan with anticipated near-term economic returns. The Dredged Material Management Plan for the Port of New York and New Jersey estimates that achieving the goal of clean sediments throughout the harbor can save at least $25,000,000 per year in costs of maintaining our water transportation infrastructure. Other economic drivers for implementing the Regional Sediment Management Plan also include increased and improved opportunities for recreation, tourism, and fisheries – industries valued at over $20 billion per year that depend on a clean Harbor Estuary.[100]

Leading academics also endorse this type of management.[101] Considering the high economic and ecological values of a clean Passaic River in the New York – New Jersey Harbor Region, the NRRB should recommend that immediate actions be taken to demonstrate the effectiveness of an integrated management program as outlined by the New York – New Jersey Harbor Estuary Program and detailed by the Passaic River Coalition within this report.

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[99] National Advisory Council for Environmental Policy and Technology. February 2012. Letter to USEPA Administrator Lisa P. Jackson, Re Technologies for Environmental Justice Communities and Other Valuable Populations

[100] New York – New Jersey Harbor Estuary Program. October 2008. Regional Sediment Management Plan. Executive Summary, Page iv.

[101] Stern, E.A. and E. Peck. 2012. Integrated Approaches to Sustainable Sediment Management – The Paradox of Having it All. Keynote Presentation at NORDROCS 2012, Olso, Norway.

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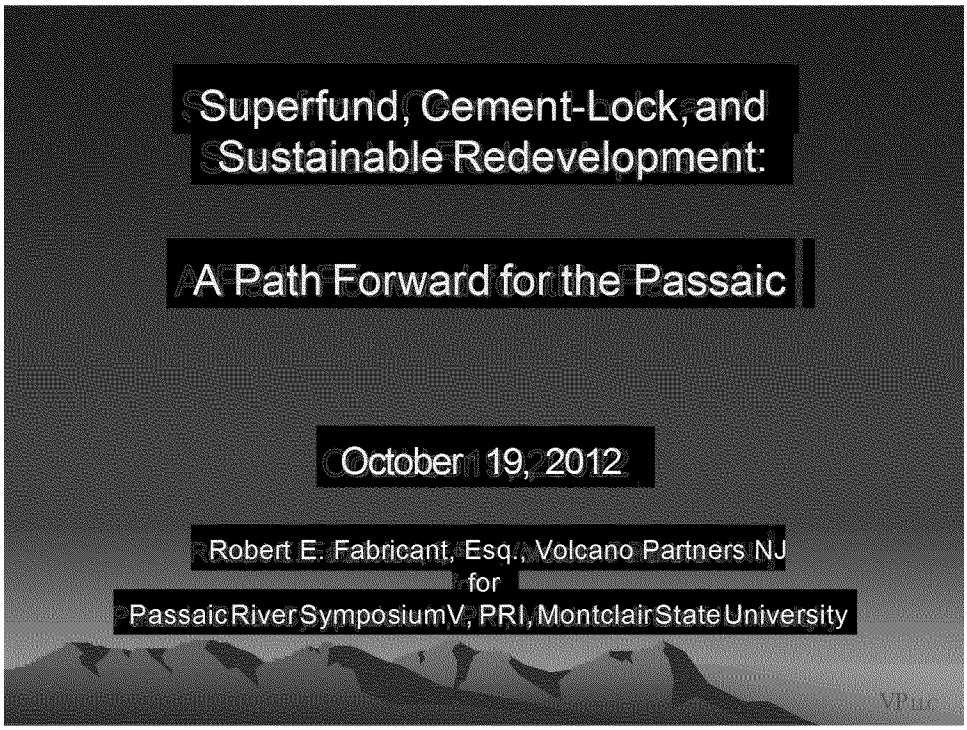
Appendix 1 - PowerPoint Presentation Provided by Robert E. Fabricant, Esq., Volcano Partners LLC



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Adaptive Management

- 2007 NAS Report Recommendation:

  "An adaptive-management approach is essential to the selection and implementation of remedies at contaminated sediment megasites where there is a high degree of uncertainty about the effectiveness of dredging."

Interim Remedial Measure

- "Substantial" Removal
- Full 17 Miles (Not Just Lower 8 Miles)
- Faster Risk Reduction

- Examples:
- Tierra Solutions: 200,000 cy IRM
- CPG: 20,000 cy Removal RM 10.9

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Integrated, Sustainable Sediment Management

Precision Hydraulic Dredging/Minimize Resuspension

Dewatering/Sediment Washing/Sand Removal/Reuse/Volume Reduction

Cement Lock Processing/Ecomelt Manufacturing/Beneficial Use

Ecomelt/Portland Cement Blend for Regional Infrastruction Projects or to Stabilize and Dry Sediments for Upland Placement

Overview of Cement Lock Technology

- Thermo-chemical manufacturing process
- Slagging Rotary Kiln
- Designed to produce Ecomelt, a cement admixture, and Electricity
- Dredged sediment as a feedstock
- Clean natural gas for fuel
- Patented, Proven technology
- Design enhancements by Foster Wheeler Corp. for commercial facility

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Proven Design and Process

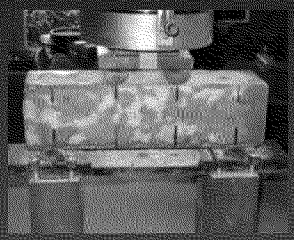
2008 WRDA Pilot

Bayonne, New Jersey

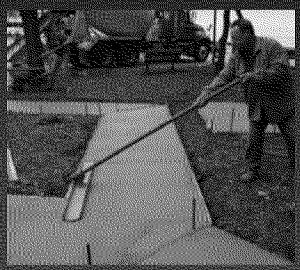
Ecomelt Replaces 40% of Portland Cement in Concrete

Milled Ecomelt

ASTM Tested



Montclair State Pour



- Letter of Intent with Concrete Manufacturer
- Initiated NJDOT approval process
- Potential stabilizer for sediment placement at upland disposal sites

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Electricity is a Beneficial Use Product

- Capture excess heat
- Heats Boiler
- Steam runs turbine
- Electrical power for export.

Proposed 4.4M Rotary Kiln Plant Design:

1.1MW Plant (about 10,000MWh produced per year)

Proposed "Minimum" Program

- Minimum commercial-scale plant dedicated to processing river and harbor sediments
- 4.4 meter Slagging Rotary Kiln
- Minimum 50,000 tpy processing capacity
- 300,000 "in-situ" cy sediment needed to support a commercial-scale plant
- 18-months to design, build and permit
- 4 years needed to process 300,000 cys
- $350 Fee per "in situ" ton, including onshore material handling, dewatering, processing

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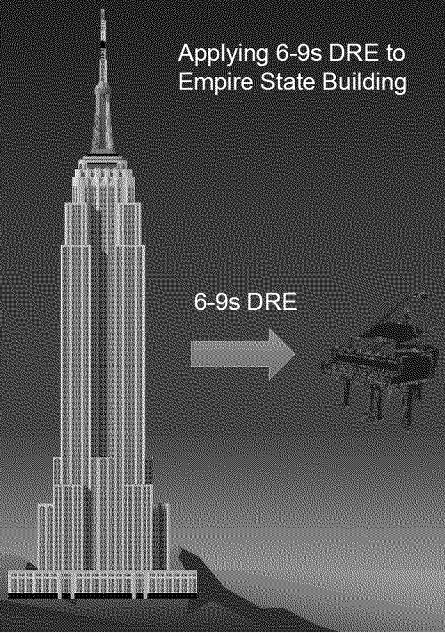
CERCLA Section 121 Prefers Treatment

- CERCLA Section 121 "prefers" treatment that "reduces volume, toxicity or mobility … of contaminants"
- 6-9s dioxin destruction (99.9999% DRE)
- Dramatically reduces contaminants in environment
- Dramatically reduces liability



Beneficial Use and Treatment Offsets Deliver Significant Net Emissions Benefits

- 99.9999% DRE
- Cement Offset
- Electricity Offset
- Transportation Offset

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Cement-Lock Creates Local/Regional Jobs and Sustainable Redevelopment

2012	2013	2014	2015	2016	2017
Construction Phase		Operation Phase			
100 FTEs per year		400 Direct FTEs per year 2500 Indirect FTEs per year			

Example of Riverfront Project:

Anacostia River in Washington D.C

2012 CRID Report projects (20 years):

- $2.28 billion in tax revenue
- 21,000 permanent jobs
- 585 construction jobs each year

Conclusion

A Path Forward for the Passaic:

- A Substantial IRM
- Sustainable "Cement Lock" Sediments Management Program
- Sustainable Redevelopment Program

The Program Delivers:

- Process a substantial IRM starting in 2014
- Reduce contaminants and liability, don't just move it
- More cost effective than other out-of-state remedial options
- Technology available for future projects
- AND …
- Local/Regional Jobs
- Clean Passaic River

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