

A Conceptual Model for Advancing Urban Sediment Management: Allocating Limited Finances to Deliver a Sustainable Outcome

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Two Futures For A River

***Focusing Only on Sediment
Brings Sediment Only
Solutions*** DRG - BASF

**Sustainable Remedies Make
the River Better**



Doug Reid Green (BASF Corporation)
From: USM Panel 2013 Battelle SedCon

BUSINESS SENSITIVE

[Urban] Regional Sediment Management

- **Sustainability**
- **Eco-psychology** (Urban Sed. Mgmt.)
 - Behavioral understanding of moving forward
 - Open to Change
 - Urban – City / Port Environment
 - Leadership
 - Education (K-12) / Stakeholder Outreach
 - Different brain wiring – short vs. long-term horizons
 - public – political - corporate interests
- **Integrated Sediment Management**
 - Hybrids – Holistic – Treatment Train Approaches
 - Multi Contaminants / Multi Media / Beneficial Use
 - Regional Sediment Management (watersheds/basins) – **SOURCE CONTROL**
 - Adaptive Management
- **Net Environmental Benefit**
 - Sediments replacing non-renewable resources (economic re-development)
 - Soils, aggregates, cements



How to do More with Less?

Long-term Goals

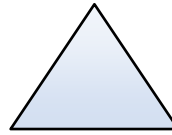
- Recovery
- Reduced liability and reserves
- Urban revitalization
- **Pollution prevention and upgrades**
- Public education
- Upland sustainable development – green infrastructure
- Reduced consumption of raw resources
- Economic and environmental recovery
- Climate adaptation and infrastructure

Short-Term Realities

- Competing non-regulatory programs
- Remedial Investigations
 - Passaic River, NJ 90M €
 - Portland Harbor, OR \$80M €
- Delay – remediate without complete source control
- Prohibitive costs
 - \$500M to 4B \$\$ or €
- Polluter pays
 - Allocation
 - Lawyers, guns and money*
- Lost revenue
- **Crisis management – political outcome**
 - **Least cost option – no long term driver – back to square one**

* Warren Zevon

Cost / Benefit Difference



- **60 – 80 Euros**
 - US Great Lakes CDF/landfill vs. innovative Regional Sediment Washing Process with manufactured soil production
- **180 – 250 Euros**
 - US Superfund* Dewatering/stabilization with Portland Cement and transport to landfill vs. Thermo Chemical rotary kiln processing with waste to energy and construction grade cement utilization
 - Contaminant destruction
 - Statutory and Contingent Long-term liability
 - *Administratively not in my lifetime*
 - Saving landfill volume
 - Marketable products
 - Transport (GHG) – Risk Management / Spills (Corporate Reputation)
 - Achieve multiple objectives
 - Habitat restoration / revitalization / source control

Sediment Management Decision Making Tools for Urban Systems

- Life-Cycle Assessment

- Evaluating total effects a product has on the environment over its entire existence (production through disposal)
 - Energy (consumption) + resource use (un-renewable resources/beneficial use)
 - Transportation (carbon footprint)
 - Final disposition (landfill, CAD, CDF, capped site)
 - Applications of beneficial use
 - Climate change adaptation
 - Habitat and ecosystem recovery/restoration
 - treatment technologies + beneficial use, CDFs/CADs, capping, landfills etc.
 - » Short vs. long-term options (in it for the long-term)

□ Multi-Criteria Decision Analysis

- (USACE ERDC): Linkov, Bates / (NGI): Sparrevik, Oen
- Supports selection of suitable sediment remediation alternatives
 - Environmental, technical, social and economics relative to the remedy
 - Probability and sensitivity analysis (stakeholders/risk perception)
 - » Critical in making decisions with imperfect information (time and €)

→ □ Sediments and Society (NGI)

- Oen, A. M. P.; Sparrevik, M.; Barton, D. N.; Nagothu, U.S.; Ellen, G. J.; Breedveld, G. D.; Skei, J.; Slob, A: Sediment and society: an approach for assessing management of contaminated sediments and stakeholder involvement in Norway. *Journal of Soils and Sediments*. 2010, 10 (2), 202-208.

NY/NJ Watershed: The [Urban] SM Perfect Storm



The Global Perfect Storm:

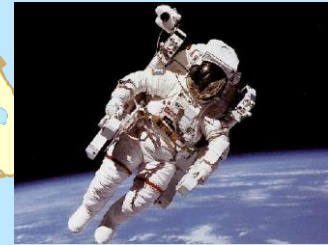
2014 - 2022

Remediation +
Restoration +

US Army Corps of
Engineers navigation al
maintenance dredging

Sediment Disposal Sites

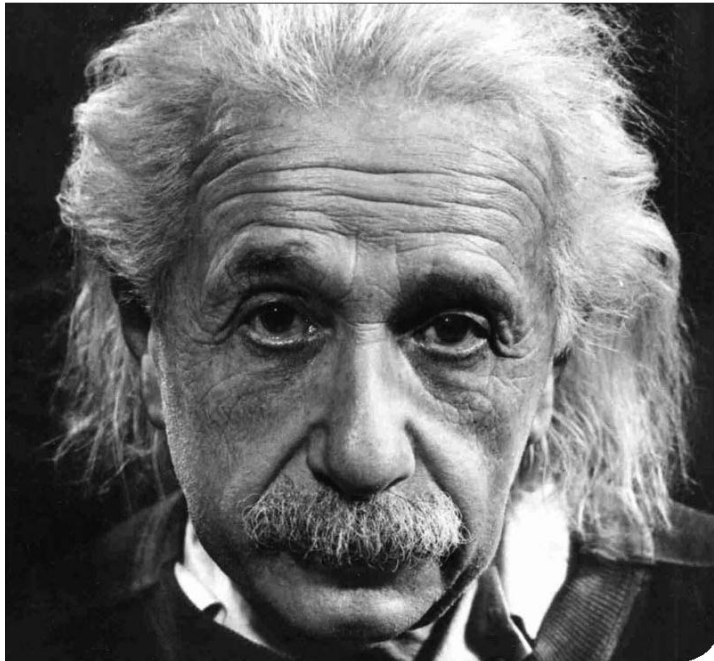
Global Multiple Waste Management
 ■ sediments - sewage sludge - MSW



10 Critical Words in Sediment Management: (try it!)

(1) How's that working for you?

(2) Are you ok with this?





You're like the rest of us.....

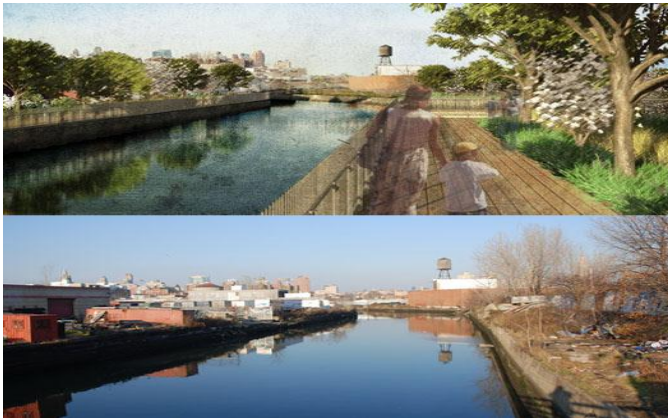
Battelle2013 Sediment Roundtable/Challenges

- Need for a technical program that incorporates a more *holistic approach* to contaminated sediments and watershed management.
- Need a cost-share between government and Potentially Responsible Parties e.g. **The USEPA Great Lakes Legacy Act**
- Need for a better understanding up front from all stakeholders what we want in the end (what is the **goal/vision** that everyone would like to see achieved).
- There are complex political, social, and technological challenges to achieving an acceptable outcome.
 - ❖ *What is the ultimate end goal of a sediment remediation project ?*



Battelle2013 Sediment Roundtable

- Need to incorporate **city planners, landscape architects, construction managers, state regulators** into the process.



- **Professional facilitation/mediation** to help avoid or resolve disputes and to help move sediment projects forward could be beneficial.

Battelle 2013 Urban Sediment Management Panel

- Does integration slow the process down?” The consensus was that the current thinking is often “yes,” but that an **integrated decision is often far better, more conserving of resources than a more localized decision, and can bring more benefits more quickly than the traditional “siloed” approach.**
- There is a disconnect between sediment-related **human health goals** and the more pervasive and difficult **human and social issues** common in urban residential environments.

Battelle 2013 Urban Sediment Management Panel

- Todd Bridges (USACE-ERDC): The key to progress is to develop resilient solutions that can be **managed adaptively to address the uncertainties.**

□ The Overarching Need: Resilient Remedies

- Includes components which enable the remedies to recover from insults
- Incorporates a combination of approaches and **technologies** that compliment and reinforce each other
 - Designed to be **optimized** and **adapted** over the long-term

❖ USACE – Engineering with Nature (EWN)

- ❖ <http://el.erdc.usace.army.mil/ewn/> or www.engineeringwithnature.org.

Battelle 2013 Urban Sediment Management Panel

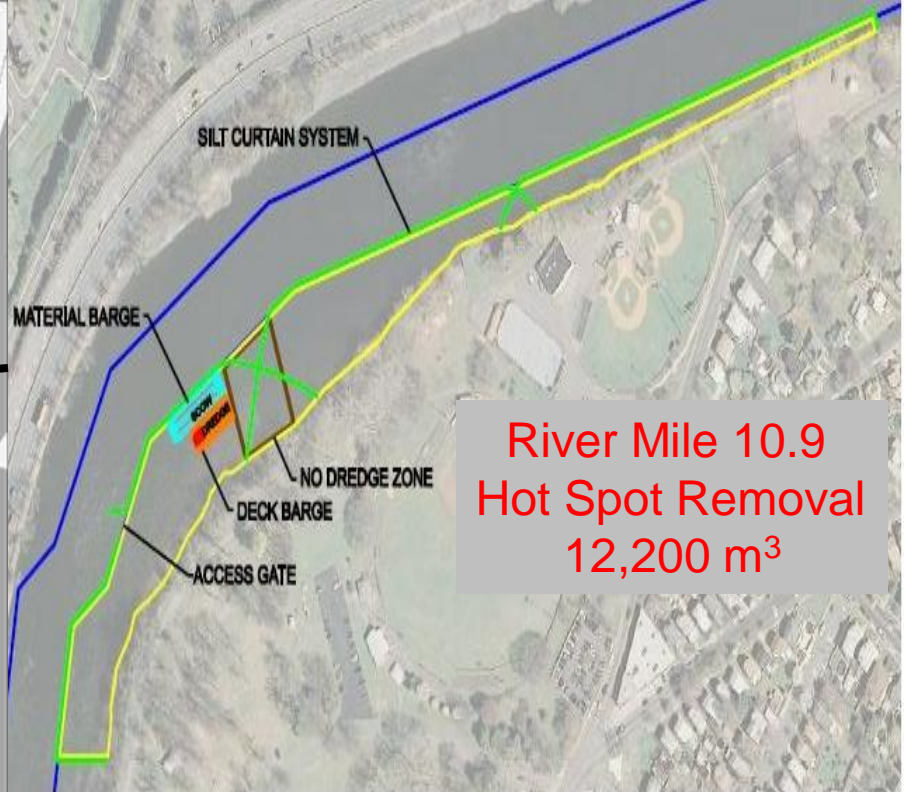
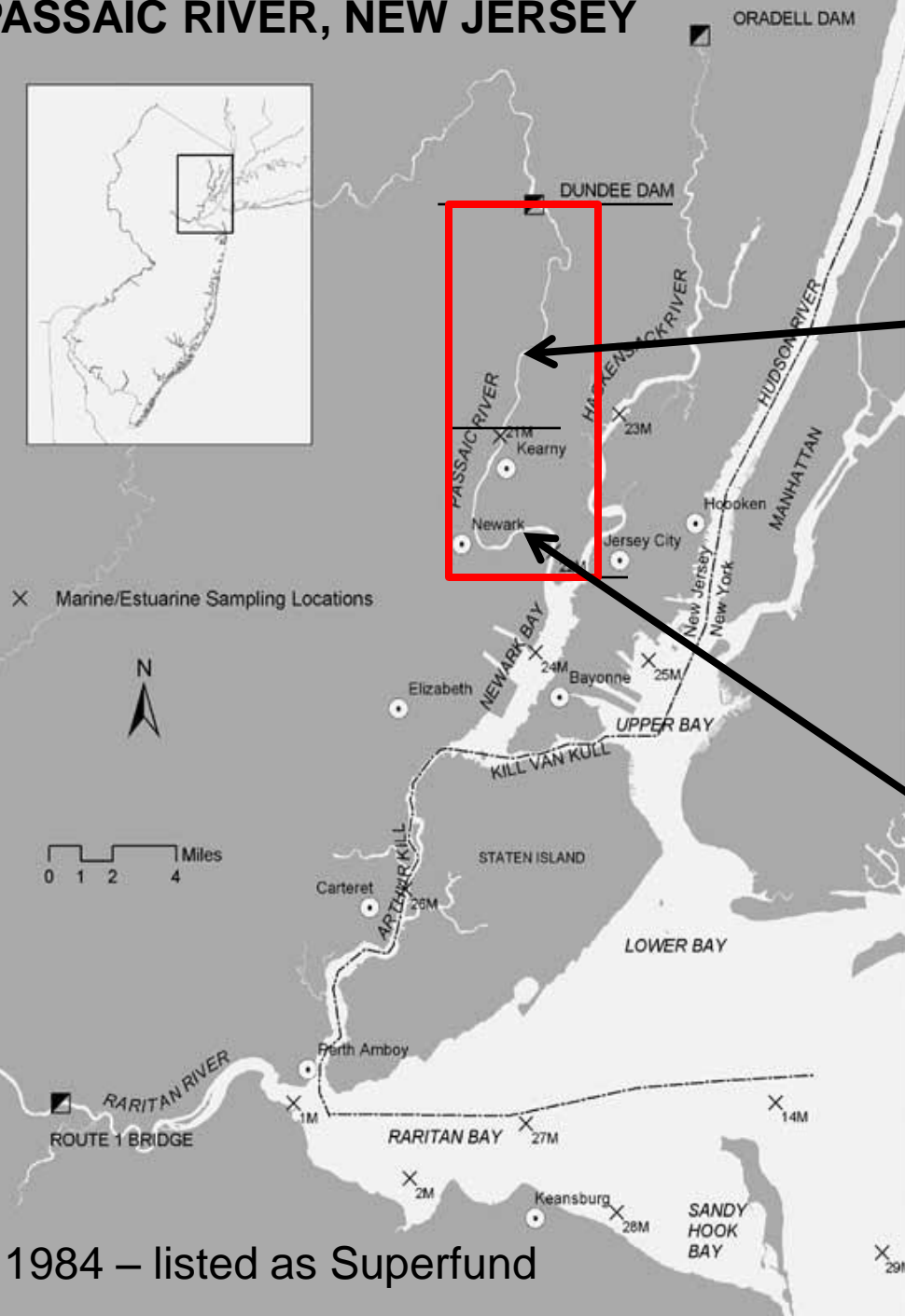
- Espen Eek (Norwegian Geotechnical Institute): Oslo Harbor
- Holistic approach that integrates urban structures, soil, storm water and sediment remediation
- The Oslo Opera House was a key anchor in the redevelopment of the Oslo waterfront.
- The pursuit of a **holistic** remedy does not mean that everything has to come under the remedy.
- **Important to consider the optimal sequence of remedies**, while recognizing that some remedial actions may have to be started before this sequence is completely defined



Battelle 2013 Urban Sediment Management Panel

- Doug Reid-Green (BASF Corporation): Corporate Industrial river stakeholder focusing on initiatives to promote projects that meet sustainability goals that include social, economic, and ecological benefit.
- **Remediation and restoration projects involves a careful allocation of effort and tracking of benefit within the context of many competing objectives in urban systems** such as the New York / New Jersey Superfund sites.
- When these social/economic/ecological **objectives are recognized to be complementary, rather than competing, sustainable solutions can be identified.**

PASSAIC RIVER, NEW JERSEY



Passaic River, NJ – Key to the U.S. Industrial Revolution

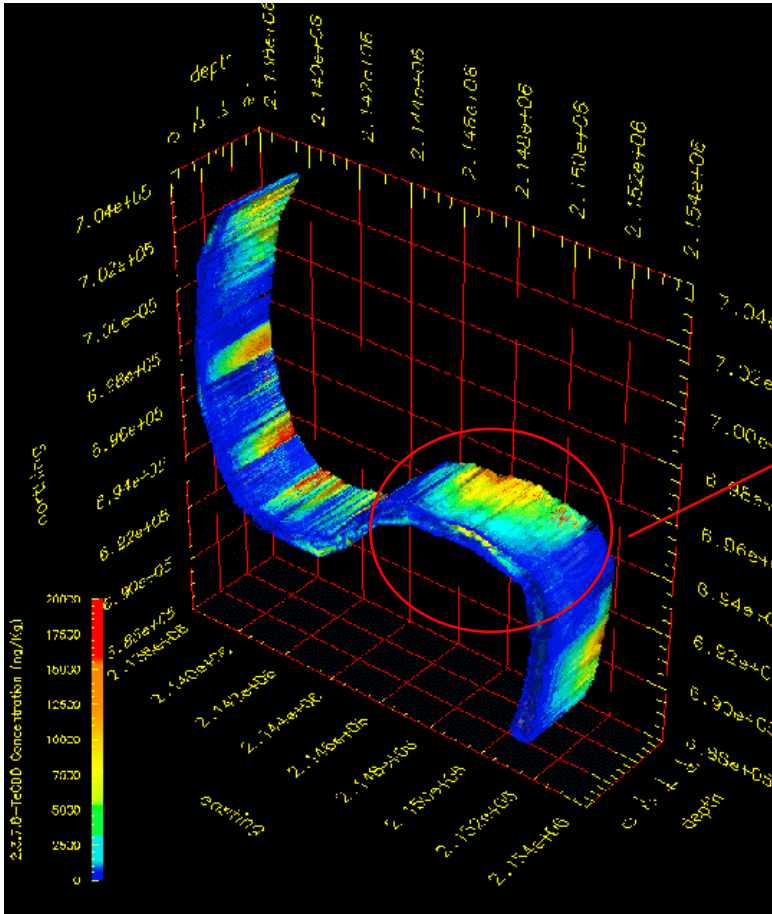
Since the early/mid 1800's – economic boom included the following industries:

- Chemicals
- Leather
- Paints & Dyes
- Petroleum Refining
- Shipping
- Creosote Wood Preservers
- Manufactured Gas
- Paper Products
- Pharmaceuticals
- Tanneries
- Electric Power Generation
- Metal Recyclers
- Pesticides
- Rubber Manufacturers
- Textiles

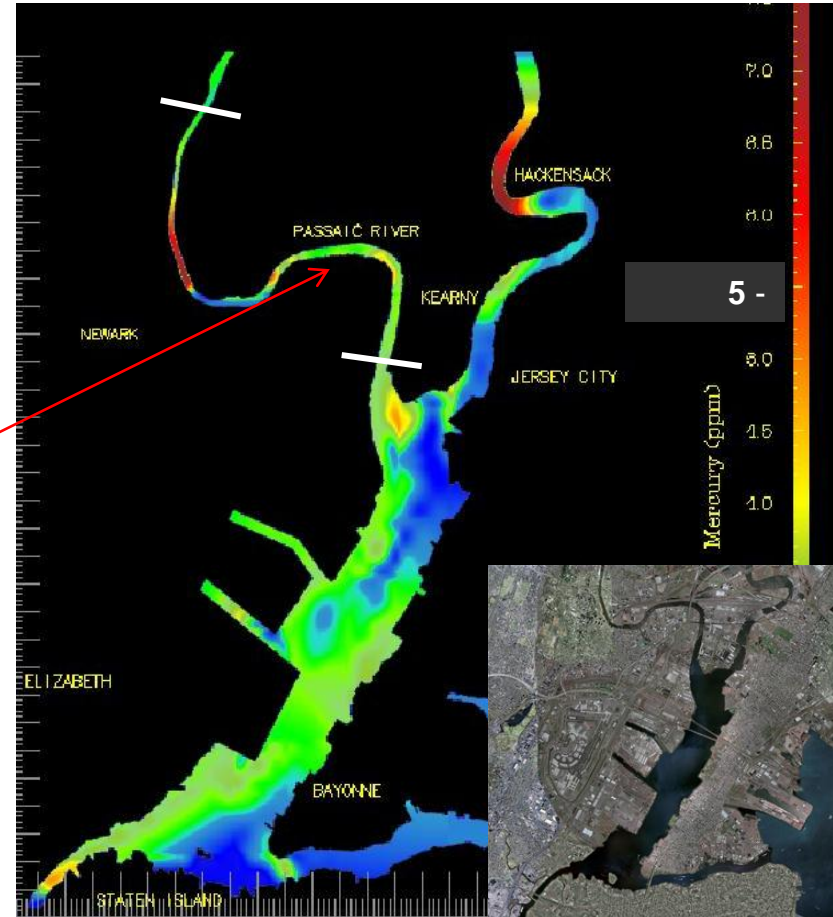




Passaic River, New Jersey



Passaic River, NJ – 3D TCDD



Passaic River – Port of NY/NJ Newark Bay Complex / Hg

Passaic River, New Jersey USEPA Focused Feasibility Study

- Two alternatives under consideration:
 - ❑ Deep Dredge – remove all sediments from RM 0-13 km
 - ❑ Bank to bank
 - ❑ Top 0.6m
 - ❑ Up to 8.4M m³
 - ✓ \$3-4B USD
 - ✓ 6-11 years construction
 - ✓ Does not address RM 0-27km
 - ❑ Dredge and Cap – remove surface sediments and cap in RM 0-13 km
 - ❑ 3.3M m³

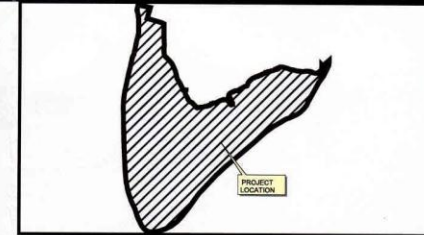


CPG Adaptive Management / Sustainable Remedy Approach

- Addresses the entire 27 km ecosystem
- Consists of: Targeted remediation of highest surface sediment contamination followed by review of actual, measured results
- Projects such as wetlands restoration, storm water reduction initiatives and efforts to improve access and usability
 - Fish exchange program
- Based on EPA's Adaptive Management techniques utilizing an iterative approach in remediation and monitoring



Sediment Ecosystem Restoration with Innovative Sediment Washing Technology (2001)



LEGEND:

- * Trees
 - ★ Navigational Lights
 - Osprey Platforms
 - Wildlife Habitat Snags
- Habitat Communities
- Dune Communities
 - High Marsh
 - Low Marsh
 - Maritime Upland Forest
 - Mud Flats
 - Intertidal Pools
 - Riprap
 - Tidal Channels
 - Proposed Nature Center
 - Sediment Treatment Facility



0 600 Feet

DRG, BASF

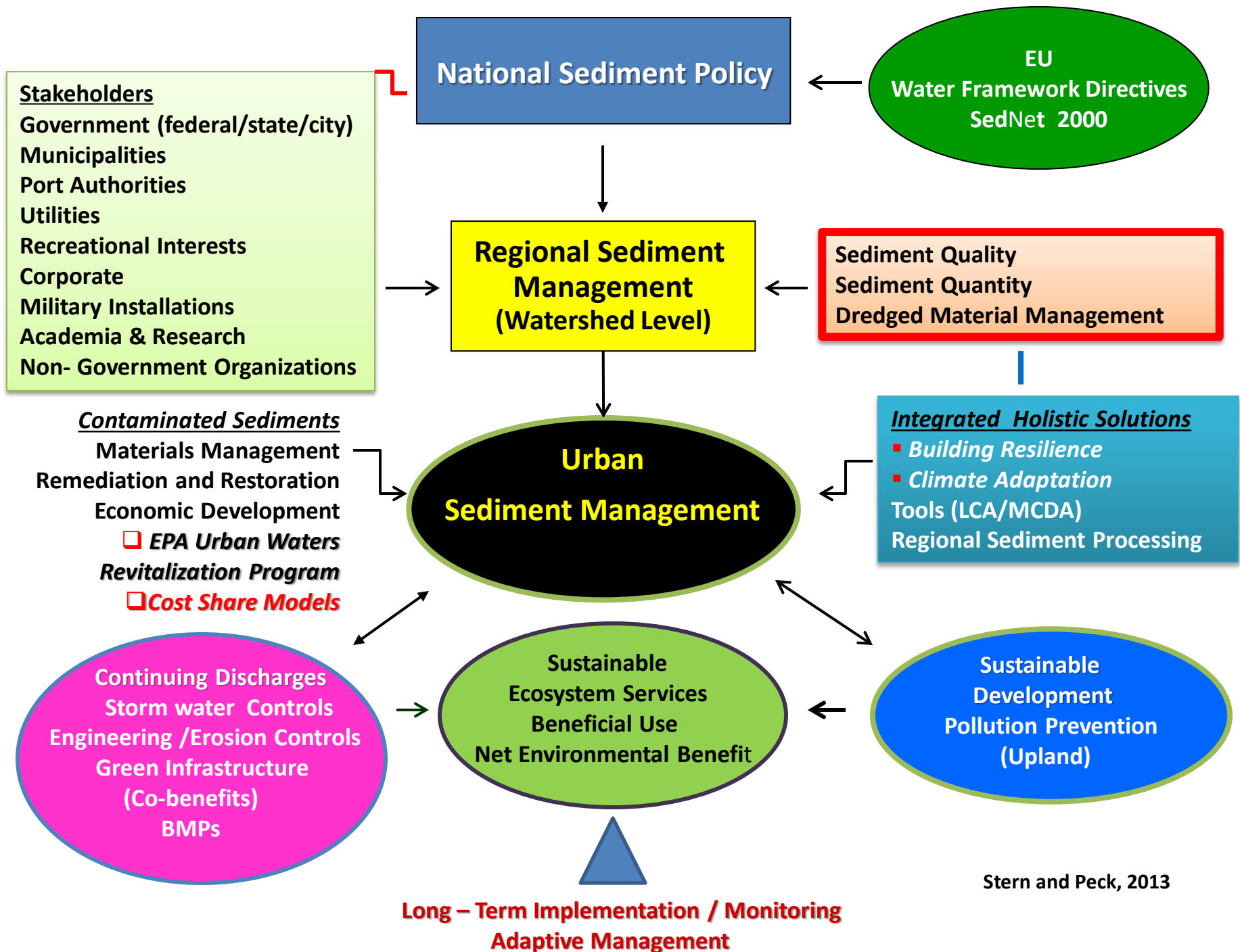
Figure 6

Kearny Point Wildlife Refuge
Conceptual Plan



Amy S. Greene Environmental Consultants, Inc.
18 Commerce Street Plaza
Flemington, NJ 08822-1743

**Conceptual Cross Program
Integration for Urban Sediment
Management [USM] that utilizes
existing Environmental Programs
to manage complimentary (not
competing) visions, goals and
objectives to drive sustainable and
cost effective outcomes for the
long-term**



Stern and Peck, 2013

Accelerating Progress at Contaminated Sediment Sites: Moving from Guidance to Practice

Bridges, T.S., Nadeau, S.C and M. McCulloch (2011). SETAC on-line. *Integrated Environmental Assessment and Management*

- **Development of detailed and explicit project vision & accompanying objectives**
 - Achievable short-long term goals
 - Metrics of remedy success at beginning of project
 - Dynamic – adjust
 - Adaptive Management
- **Strategic engagement of stakeholders**
- **Optimization of risk reduction / risk management & remedy selection**
 - Deliberate use of early action remedies (IRMs) to accelerate risk reduction**
 - Systematic/sequential development of suite of actions applicable to ultimate remedy
 - Starting with Monitored Natural Recovery and adding engineering actions to meet objectives
- **Incentive process that encourages and rewards risk reductions to industry**
 - Don't sue...
- **Pursuit of sediment remediation projects as public-private collaborative enterprises (cost share)**

– USEPA Legacy Act

Having the Heretical Debate Global Solutions

- **Rethinking Risk Assessment / Policy**

- **Sustainable Approaches**

- Design (early decision making)
 - Socio-economic-political-structural (defining risk)

- Beneficial use

- **Life Cycle - MCDA Analysis**

- **(1) Technology (driver)**
 - **(2) Innovation**
- **(3) Cost-Share Models**

*Policy-makers will have to face up to making some hard choices and perhaps accepting slightly lower levels of perceived protection to the public -
John Waters - ERM*

Contaminated Land Bulletin - July 2010

Doing more with less:

- Siloed/localized vs. Holistic/integrated: adaptive
- Net benefit you can do more with less over the long- term
 - Economic recovery/revitalization of blighted urban environments are dependent on functional healthy systems.
 - Siloed approaches bring only partial solutions.
 - Integrated investing costly in the short-term will get to the long-term remediation and restoration goal/visions with multiple net benefits.
- **Use existing (cross) programs with more efficient integration that cuts across multiple visions/goals and objectives**
- Requires a National Public - Private Policy with a broader and more inclusive approach to environmental management / innovations

