Hudson River Marina Dredging

A Guide for

Marina Operators

Sea Grant
New York

Hudson River Marina Dredging

A guide for marina operators

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Table of Contents

Preface

In partnership with New York State Department of Environmental Conservation's (NYSDEC) Hudson River Estuary Program, New York Sea Grant sponsored a study of the agency's existing Hudson River Marina Sediment Contaminant Data conducted by Rensselaer Polytechnic Institute (RPI). The research yielded useful information for NYSDEC and the boating community, clarifying the types of sediment contaminants likely found in Hudson River sub-basins based on projects that have been permitted through the agency, and contrasting that information with known ambient levels of the contaminants.

The Information in this Guide will help Hudson River marinas, boat clubs and non-governmental organizations understand background levels of sediment contamination and clarify NYSDEC's maintenance dredging regulations. Ultimately this information should help reduce costs of compliance, improve environmental protection and help maintain the recreational and commercial viability of Hudson Estuary marinas and boat clubs.

Hudson River Marina Dredging

A Guide for Marina Operators

The Hudson River estuary supports a vital commercial and recreational boating industry. This guide is designed for marina operators planning marina dredging. It contains basic information about sediment contaminants, testing, costs, and dredge disposal and is arranged as a series of questions and answers.

PART I The dredging permit process

When is it time to dredge?

A marina's location, the number and size of vessels using the facility, and the configuration of fixed or floating docks all factor in how frequently maintenance dredging will be required. Dredging can impact water quality at the site and surrounding areas, so you must obtain a permit before dredging.

How do I obtain a permit?

The NYS DEC and the US Army Corps of Engineers, the state and federal agencies responsible for protecting the water bodies, have established permits for dredging as well as for other activities which may impact protected and navigable waters. Through the "Joint Application Process" your application should be submitted to both agencies. Detailed information on the application process may be found by contacting:

NYSDEC's Environmental Permit section at the appropriate regional offices:

Region 3:
21 South Putt Corners Rd
New Paltz, NY 12561-1696
(845) 256-3054
Includes these counties: Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster, and Westchester

Region 4:
1150 North Westcott Rd
Schenectady, NY 12306-2104
(518)357-2069
Includes these counties: Albany, Columbia, Greene, Rensselaer, Schenectady

Application information can also be found at the following websites:

- www.dec.state.ny.us/website/dcs/upa/index.html
- www.nan.usace.army.mil/business/buslinks/regulat/index.html

What are the steps in the permit application process?

1: File an application

Obtain the Joint application materials from a regional NYSDEC or USACE office. Request a pre-application conference with DEC staff to clarify project objectives, clarify DEC requirements, get a preliminary reaction to your proposal, and discuss alternative approaches. Although not mandatory, this step is highly recommended.

2: Respond to DEC comments

A complete application will generally include the appropriate application form, location map, plans, report, and an environmental assessment prescribed by NYS DEC. The NYS DEC must notify you if your application is incomplete within 15 days. If the application is incomplete, you will be told what else is needed. When you respond, the above time frame for DEC review will again apply.

3: Respond to public comments

A dredging project may require publication of an application notice in a local newspaper (at the applicant's expense). The notice gives the public the opportunity to review and comment on the application. In instances where applications require public notice, the Department must make a permit decision within 90 days of the notice, or, if needed, conduct a public hearing on the application. Few marina dredging applications go to hearing.

4: Final decision

NYS DEC must make a permit decision on minor projects within 45 days of determining the application complete. The Regional Permit Administrator normally issues permits for projects not requiring a public hearing.

The US Army Corps of Engineers (USACE) reviews the application for a dredging permit independently of DEC. During this process, you may be required to submit additional information to the Corps. You must receive permits from both the USACE and DEC before you begin dredging.

It is necessary to sample the dredged sediments, perform chemical analysis and submit the results of analysis to the Department for review.

The Dredging Permit Process

STATE
Dredging & Placement Permit Process

1. **Call the NYSDEC/NYSDOS**
   Contact your regional NYSDEC and NYSDOS to discuss your dredging/placement process
2. **Assemble Project Design/Plan**
   (Consultant recommended but not required)
3. **Review Options for Upland Disposal or Beneficial Reuse**
   (Consider sampling/analysis of sediments prior to Pre-Application Meeting for a more productive discussion)
4. **Pre-Application Meeting**
   (Joint with Army Corps and other Federal agencies if possible)
5. **Sampling/Data Collection/Analysis**
   (As required by State and Federal processes)
6. **Joint Application Submission**
   (To the NYSDEC and NYSDOS)
7. **Public Notice in Area Newspapers**
   (At your expense)
8. **Review and Comment**
   (General public, DEC, DOS and Interagency – State/Federal)
9. **Permit Decisions (DEC/DOS)**
   (Sect. 401 Certification, Protection of Waters permit, Federal Consistency Determination or generic or case specific Beneficial Use Determination)

FEDERAL
Dredging Permit Process

1. **Call the NY District of Army Corps**
   (And other federal agencies to discuss project)
2. **Assemble Project Design/Plan**
   (Consultant recommended but not required)
3. **Review Options for Disposal/Reuse**
   Not applicable - since in-water placement of dredged material (a federal matter) is not a viable option while placement on non-wetland uplands or beneficial reuse is a state matter.
4. **Pre-Application Meeting**
   (Joint with State, as well as other Federal natural resource agencies if possible)
5. **Sampling/Data Collection/Analysis**
   (As required by State and Federal processes)
6. **Joint Application Submission**
   (To the Corps)
7. **Public Notice From Corps**
   (Via e-mail/website)
8. **Review and Comment**
   (General public, Corps and Interagency – State agencies, EPA/NMFS and FWS)
9. **Permit Decisions**
   (May include conservation measures as special conditions)

10. **Final Approval — NYS Office of General Services**
    (Authorization granted to "take and use" underwater lands)
11. **Dredging Operation**
12. **Placement of Dredged Material**
    (Beneficial Reuse or upland placement)

Adapted from information presented by the AHRI program at a November 2004 meeting in Poughkeepsie N.Y.

AMERICAN HERITAGE RIVERS

PART II: Hudson River contaminants

What groups of contaminants are commonly found in the lower Hudson River sediments?

Groups of contaminants commonly found in Hudson River sediments include: metals, organochlorine pesticides, petroleum-derived compounds including polycyclic aromatic hydrocarbons (PAHs), and chlorinated organics.

Which metal contaminants are commonly found in the lower Hudson?

Copper
Copper is used in a wide variety of industries. It is the principle material in copper pipe for plumbing. Copper is also used as a conductor in electrical wire and in circuit board manufacturing. Copper is used heavily as a pesticide in anti-fouling marine paints to prevent unwanted build-ups of scale and barnacles. It is applied to the hulls and out drives of marine vessels. The dominant component of some of these paints is copper. (Scorecard, 2002).

Cadmium
Cadmium is used heavily in the metal plating industry and for coating machinery, including transportation equipment. Cadmium is used in silver solder, nickel-cadmium batteries and is found in paint pigments (USEPA, 2002b; NJDOH, 2002).

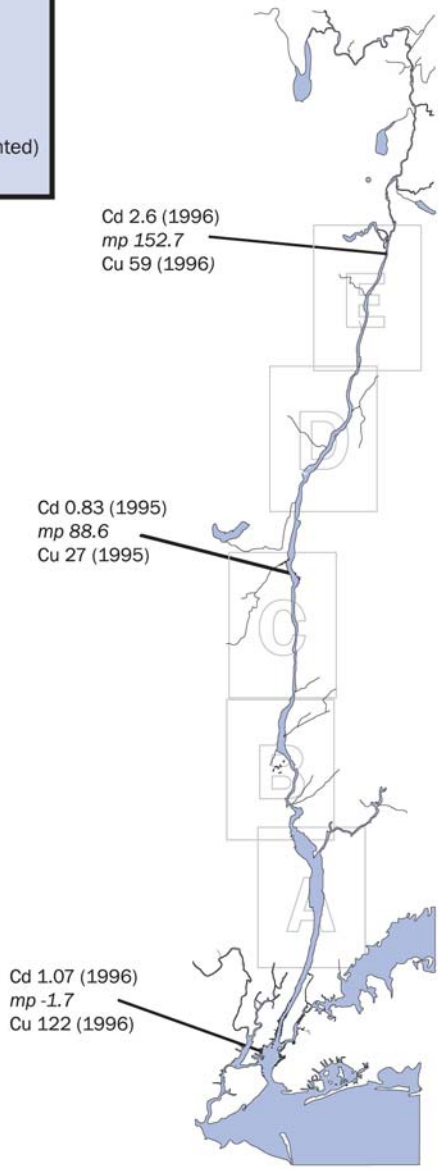
Lead
Lead was commonly used in pipes and pipe solder and was banned from those uses in August 1998. Lead was also commonly used as a gasoline additive and drying agent in paints. Lead was used in printed circuit board manufacturing, solid lubricants and as heat transfer media. Lead is also found in automotive and marine batteries as an electrode (USEPA, 2002b; NJDOH, 2002).

Mercury
Mercury was used in dry-cell batteries, switches, and fluorescent light bulbs. Mercury can be released from the combustion of fossil fuels (especially coal), garbage, and medical waste and from metal smelting and refining. Mercury can be converted from inorganic to organic forms by microorganisms in nature. The organic form can be readily taken up by aquatic wildlife (USEPA, 2002b; NJDOH, 2002).

Cadmium (Cd) Levels
(background - 0.5 ppm)

Copper (Cu) Levels
(background - 25 ppm)

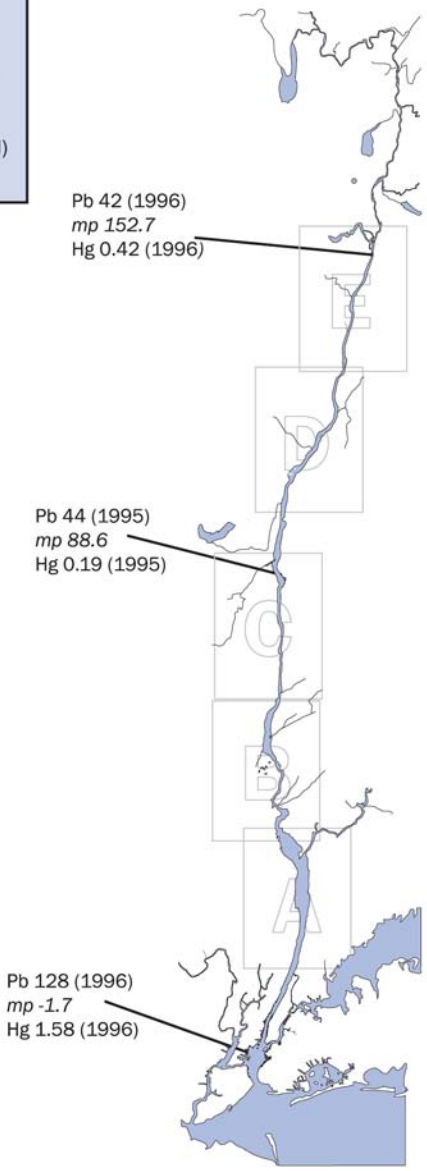
concentrations in ppm (date represented)
milepoint (mp)



Lead (Pb) Levels
(background - 20 ppm)

Mercury (Hg) Concentrations
(background - 0.18 ppm)

concentrations in ppm (date represented)
milepoint (mp)



Which organochlorine pesticides are commonly found in the lower Hudson?

DDD, DDE, and DDT

Dichlorodiphenyltrichloroethane (DDT) is an organochlorine pesticide that was used in this country until 1973 when it was banned. DDD and DDE are breakdown products of DDT in soil, sediment, and groundwater systems (EXTOXNET, 1996).

What petroleum-derived compounds and PAHs are commonly found in the lower Hudson?

PAHs

Polycyclic Aromatic Hydrocarbons (PAHs) are a group of about 100 compounds associated with the incomplete combustion of coal, gas, oil, garbage, and even charbroiled meat. PAHs are also components of crude oil and found in gasoline, fuel oil, crankcase oil, asphalt, coal tar, and roofing tar. PAHs are thought to be carcinogenic or have carcinogenic effects (ATSDR, 1996).

Anthracene

Anthracene is a specific PAH compound that is a recognized carcinogen (NJDOH, 2002).

Chrysene

Chrysene is a specific PAH compound that is a recognized carcinogen (NJDOH, 2002).

Benzo (a) Anthracene

Benzo (a) Anthracene is a specific PAH compound that is a recognized carcinogen (NJDOH, 2002).

Benzene

Benzene is a volatile organic that is a recognized carcinogen and also thought to cause reproductive damage. It is used in many industries. Benzene can be found as a component in gasoline. Benzene is used in pulp and paper manufacturing as a de-inking solvent. It is also used as a solvent for wood varnishes (Scorecard, 2002).

Which chlorinated organics are commonly found in the lower Hudson?

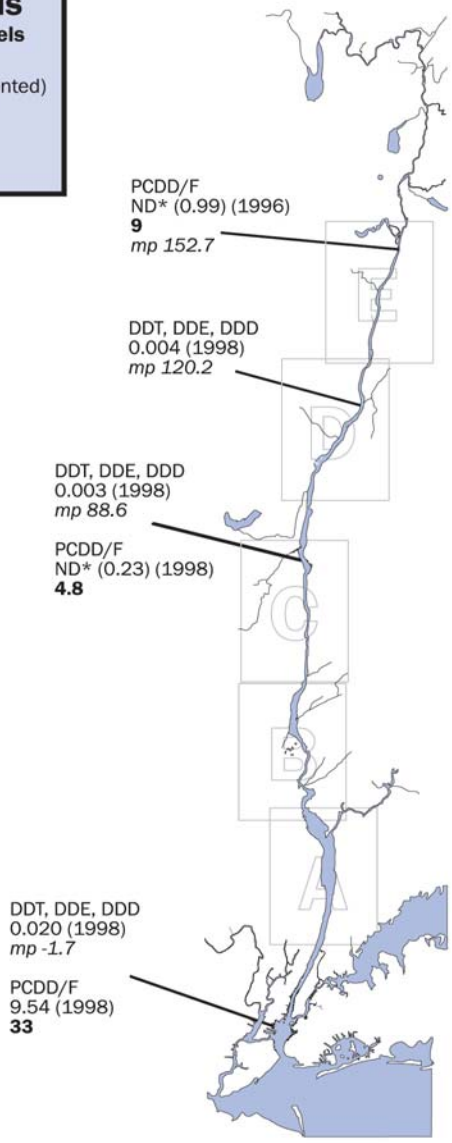
PCBs

Polychlorinated biphenyls (PCBs) were used in capacitors and transformers, hydraulic fluids, lubricants, and heat transfer fluids. PCBs can cause a rash known as chloracne, liver problems and are a possible carcinogen (USEPA, 2002b). Hudson River sediments have been contaminated with PCBs as a result of discharges from two General Electric capacitor plants in the upper basin.

DDT, DDE, DDD Levels

Dioxin (PCDD/FTEQs) Levels

concentrations in ppm (date represented)
Total Dioxin and Furan TEQs
(toxic equivalents)
milepoint (mp)



Are there certain contaminants I can expect to find present at my site?

Depending on the location of your site, you can expect the presence of certain contaminants based on an earlier evaluation of sediment data. In 2002, researchers at Renssalaer Polytechnic Institute (RPI) collected and analyzed sediment data from dredging projects on the Hudson River and its tributaries in NYS DEC Regions 3 and 4 (the tidal Hudson River). The purpose of their research project was to examine and analyze historic dredge project data. The information reported here may give you an idea of what can be expected at your marina site.

The RPI project examined sediment data for eleven marina dredging projects. Three marina projects were on file at the NYSDEC headquarters in Albany, N.Y. The New York State Department of Environmental Conservation regional permit offices supplied data for five additional marinas and a private firm contributed sediment analysis from one project. To supplement the limited marina data, dredging projects at the Chelsea Pump Station and the National Gypsum Facility were included in the analysis.

The following list includes the eleven projects where sediment data were collected and their locations by river mile point (mp), the number of statute miles upstream of the Battery (mp 0) at the southern tip of Manhattan.

Marina	Mile Point
Nyack Municipal Marina	28
Shattemuc Yacht Club	32
Cortlandt Yacht Club	40
Cornwall Yacht Club	57
Chelsea Pump Station	65
Hyde Park Marina	78
Norrie Point Marina	78
Anchorage Marina	91
Athens Ferry Slip	118
Ravena-Coeymans Yacht Club	133
National Gypsum	143

The table on the next page shows some examples of the contaminant concentrations at each location. The numbers assigned each contaminant indicates the greatest measured concentrations in parts per million. However, PCBs are measured in parts per billion.

What is meant by ambient levels of contamination?

Ambient levels of contaminants refer to background levels of a contaminant, amounts that were deposited sometime in the past.

How does ambient (background) data compare to Dredge Project Sediment Data?

The RPI researchers also provided ambient data (Bopp et al.,1998; Bopp et al., 2002). Data on background contaminants was determined by examining fine-grained sediment samples from the top layer of the river bottom, all of which represented deposition in the 1990s.

Sample Contaminant Levels in PPM
Along Locations in the Lower Hudson Valley

Mile Point	28	32	40	57	65	78	91	118	133	143
Copper	87.5	7.8	15.6	89.5	21.7	86	6.2	120	46.8	
Cadmium	2.8	1.0	.4	.011	1.2	.4	.62	2.52	1.11	
Lead	96	6.9	2.48	.11	16.4	.78	2.5	212	45.6	
Mercury	.51	nd	.52	.005	.071	nd	nd	1.74		
PCBs	12*							1.25		1.8
Benzo (a) anthracene						.017		2		
Anthracene				0.39						
Chrysene								2.39		
PAH				1.67						
Benzene								2		

nd not detected
*measured in parts per billion
Blanks indicate that data are not available

A typical marina dredging project will involve at least some removal of recently deposited fine-grained sediments from slips and docking areas. The regional ambient data indicates the contaminant levels that can be expected from sources unrelated to marina operations. The findings for sediments from each of the eleven projects and the ambient data suggest that sediment to be dredged from a marina will likely be moderately contaminated. Dredging and disposal of moderately contaminated sediments is subject to several restrictions, some of which will be discussed below.

How are ambient levels of contaminants determined?

Examining sediment cores, scientists can determine when contaminants were deposited. They do so by detecting the distribution of radioactive elements such as Cesium-137 (Cs-137). Found in natural systems as a result of global fallout from nuclear weapons testing, significant amounts of Cs-137 were distributed globally as early as the 1950s. The levels of Cs-137 reach a peak in sediments dated from 1963-1964 caused by tests carried out just prior to the ban on atmospheric testing. The ambient levels of contaminants Dr. Bopp used in his 2002 study are from surface sediments collected in the 1990s that contain Be-7. Like Cs-137, Berylium-7 (Be-7) is another radioactive

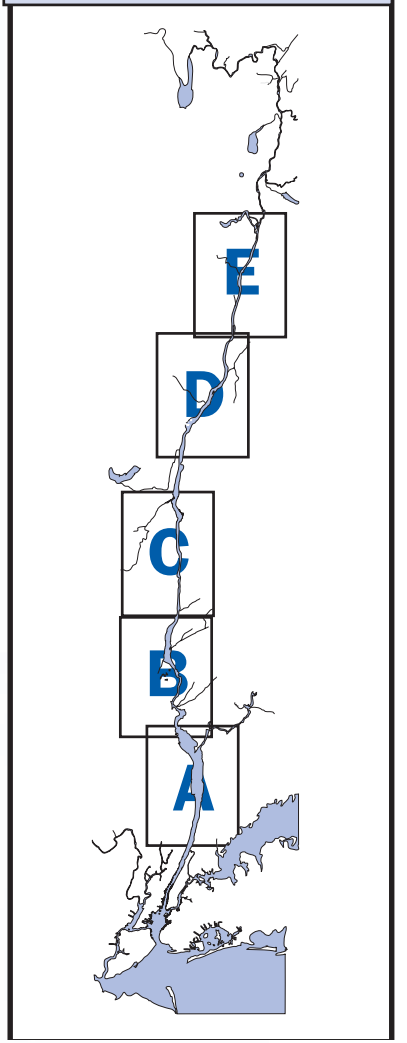
material. Be-7, produced by cosmic rays in the atmosphere, has a very short half-life of just 53 days. Thus Be-7 is mainly found in the most recently deposited particles, usually in sediments deposited within a year of core collection.

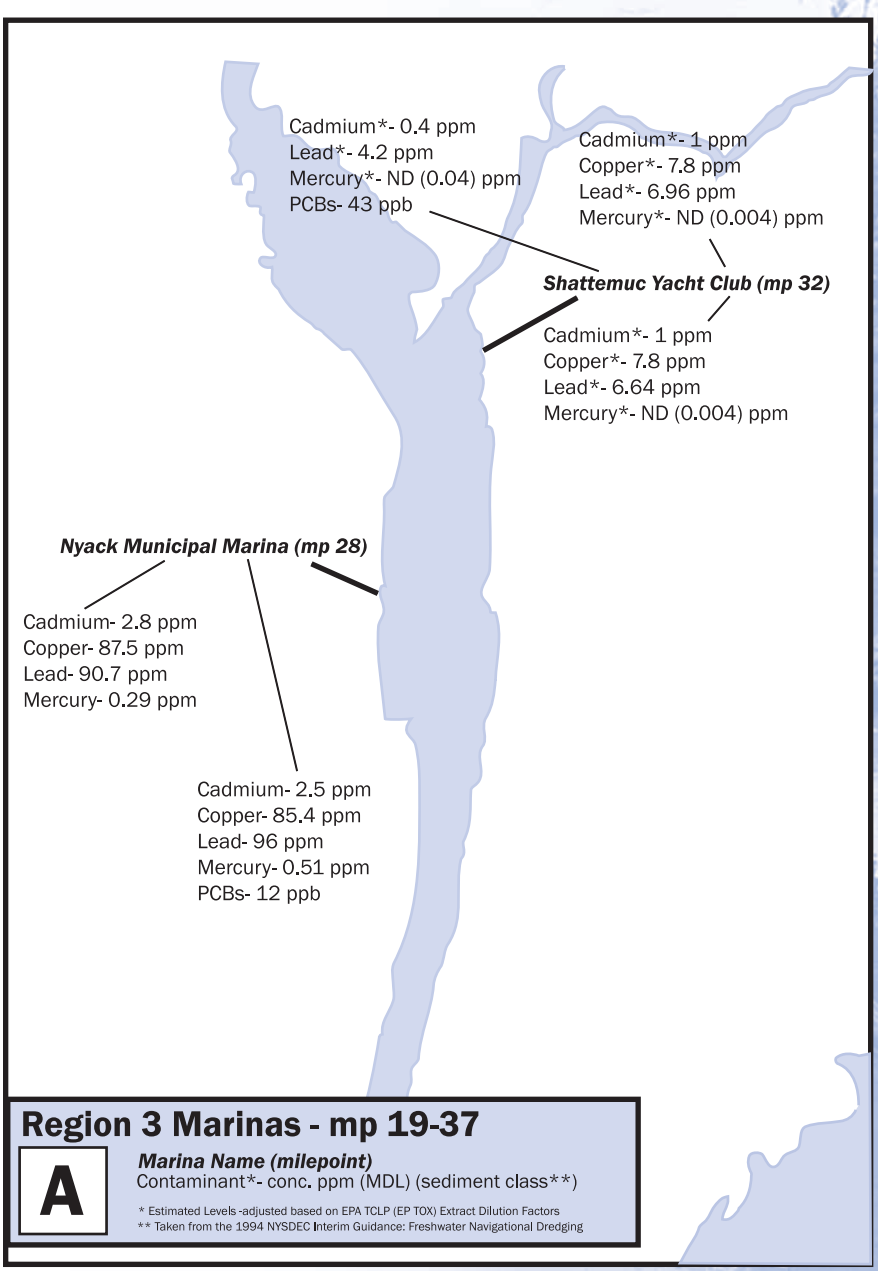
Consequently, the levels can be considered to be representative of "recent" (i.e. post 1990) deposition. These samples are dominated by fine-grained sediment particles such as silts and clays and thus would be similar to recent deposition in the areas between slips at marinas. Contaminants that are likely to adhere to particles have a much greater affinity for fine-grained particles than coarser-grained sands.

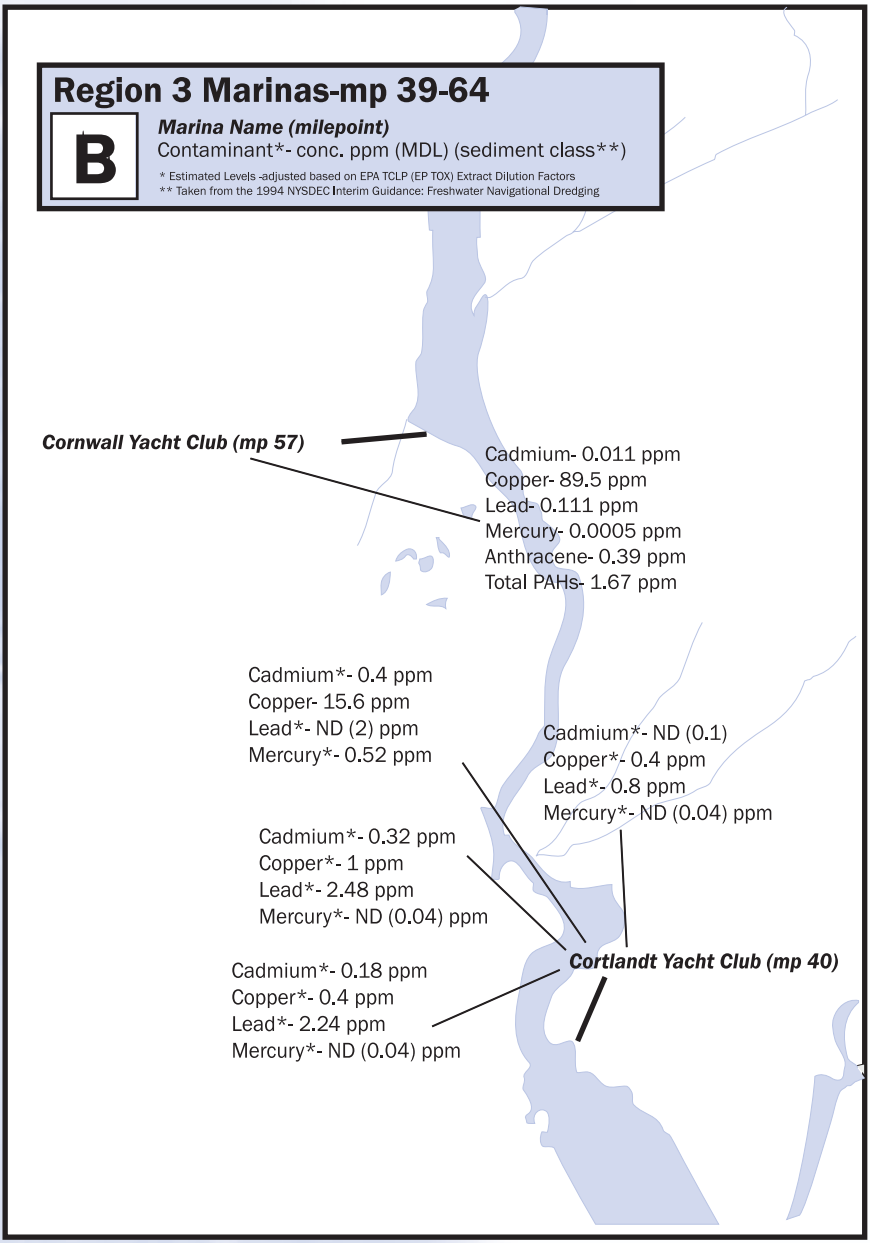
The samples presented in the RPI research project were collected on the Hudson River near Troy (below the Federal Dam), Kingston, and near Liberty Island in NY Harbor. Other sampling sites include Athens, Foundry Cove and Hastings-on-Hudson. All of the contaminant level data are from Be-7 found in the fine-grained surface sediments, indicating that the contaminants were probably deposited since 1990.

The following maps show the regional distribution of ambient levels of cadmium (Cd), copper (Cu), lead (Pb), mercury (Hg), PCBs and DDT. Find your area on the Basemap at right, and then study the close-up maps of that specific location.

Basemap:
Hudson River
Marina Locations
Regions 3 & 4




Cadmium*- 0.4 ppm
Lead*- 4.2 ppm
Mercury*- ND (0.04) ppm
PCBs- 43 ppb
Cadmium*- 1 ppm
Copper*- 7.8 ppm
Lead*- 6.96 ppm
Mercury*- ND (0.004) ppm
Shattemuc Yacht Club (mp 32)
Cadmium*- 1 ppm
Copper*- 7.8 ppm
Lead*- 6.64 ppm
Mercury*- ND (0.004) ppm
Nyack Municipal Marina (mp 28)
Cadmium- 2.8 ppm
Copper- 87.5 ppm
Lead- 90.7 ppm
Mercury- 0.29 ppm
Cadmium- 2.5 ppm
Copper- 85.4 ppm
Lead- 96 ppm
Mercury- 0.51 ppm
PCBs- 12 ppb
Region 3 Marinas - mp 19-37
A
Marina Name (milepoint)
Contaminant*- conc. ppm (MDL) (sediment class**)
* Estimated Levels -adjusted based on EPA TCLP (EP TOX) Extract Dilution Factors
** Taken from the 1994 NYSDEC Interim Guidance: Freshwater Navigational Dredging

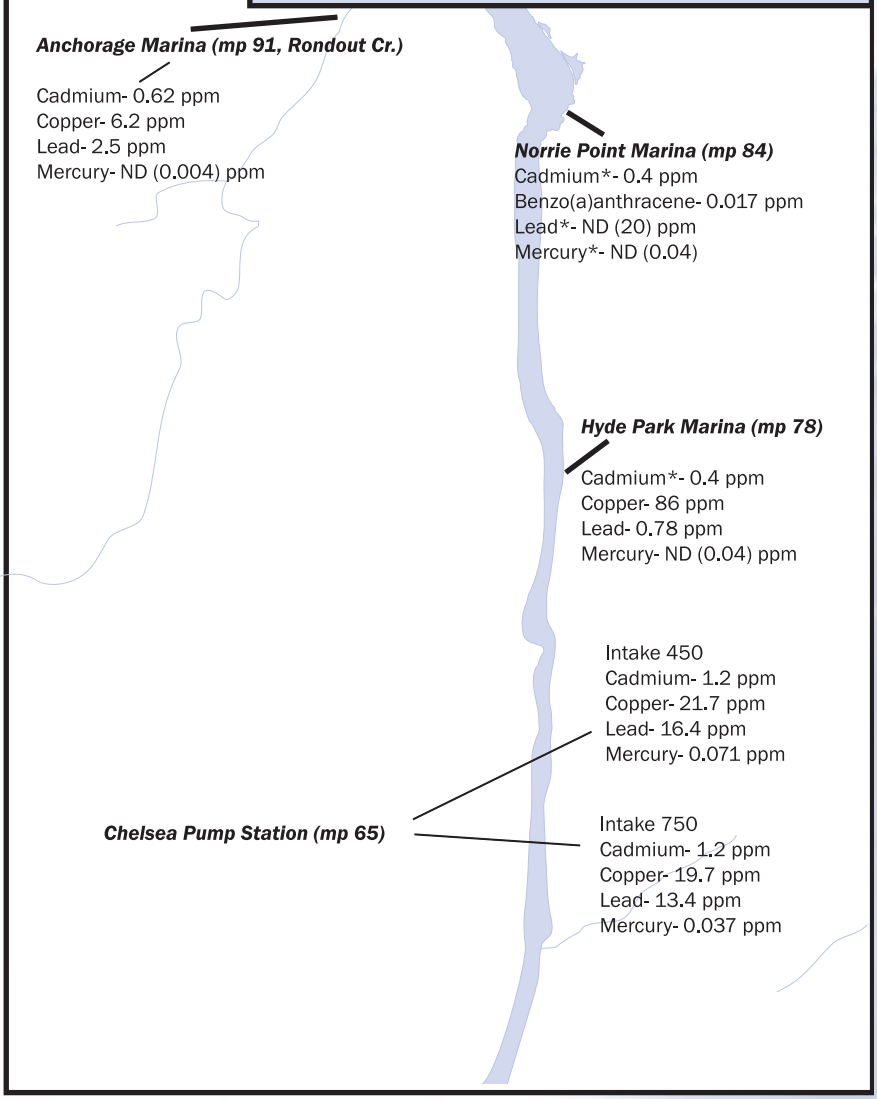

Region 3 Marinas-mp 39-64
B
Marina Name (milepoint)
Contaminant*- conc. ppm (MDL) (sediment class**)
* Estimated Levels -adjusted based on EPA TCLP (EP TOX) Extract Dilution Factors
** Taken from the 1994 NYSDEC Interim Guidance: Freshwater Navigational Dredging
Cornwall Yacht Club (mp 57)
Cadmium- 0.011 ppm
Copper- 89.5 ppm
Lead- 0.111 ppm
Mercury- 0.0005 ppm
Anthracene- 0.39 ppm
Total PAHs- 1.67 ppm
Cadmium*- 0.4 ppm
Copper- 15.6 ppm
Lead*- ND (2) ppm
Mercury*- 0.52 ppm
Cadmium*- ND (0.1)
Copper*- 0.4 ppm
Lead*- 0.8 ppm
Mercury*- ND (0.04) ppm
Cadmium*- 0.32 ppm
Copper*- 1 ppm
Lead*- 2.48 ppm
Mercury*- ND (0.04) ppm
Cortlandt Yacht Club (mp 40)
Cadmium*- 0.18 ppm
Copper*- 0.4 ppm
Lead*- 2.24 ppm
Mercury*- ND (0.04) ppm

Region 3 Marinas-mp 65-91

C

Marina Name (milepoint)
Contaminant*- conc. ppm (MDL) (sediment class**)

* Estimated Levels -adjusted based on EPA TCLP(EP TOX) Extract Dilution Factors
** Taken from the 1994 NYSDEC Interim Guidance: Freshwater Navigational Dredging



Anchorage Marina (mp 91, Rondout Cr.)

Cadmium- 0.62 ppm
Copper- 6.2 ppm
Lead- 2.5 ppm
Mercury- ND (0.004) ppm

Norrie Point Marina (mp 84)
Cadmium*- 0.4 ppm
Benzo(a)anthracene- 0.017 ppm
Lead*- ND (20) ppm
Mercury*- ND (0.04)

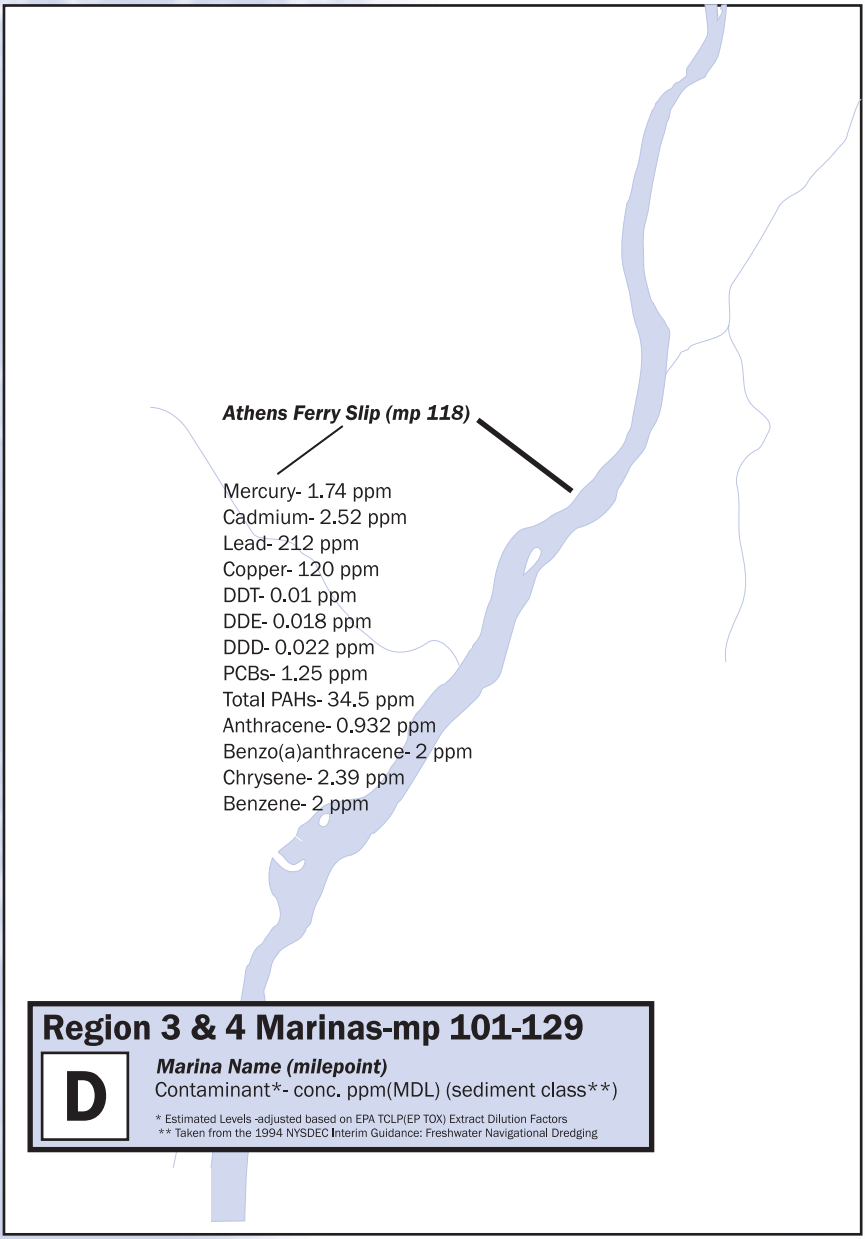
Hyde Park Marina (mp 78)

Cadmium*- 0.4 ppm
Copper- 86 ppm
Lead- 0.78 ppm
Mercury- ND (0.04) ppm

Intake 450
Cadmium- 1.2 ppm
Copper- 21.7 ppm
Lead- 16.4 ppm
Mercury- 0.071 ppm

Chelsea Pump Station (mp 65)

Intake 750
Cadmium- 1.2 ppm
Copper- 19.7 ppm
Lead- 13.4 ppm
Mercury- 0.037 ppm



Region 3 & 4 Marinas-mp 101-129

D

Marina Name (milepoint)

Contaminant*- conc. ppm(MDL) (sediment class**)

* Estimated Levels -adjusted based on EPA TCLP(EP TOX) Extract Dilution Factors

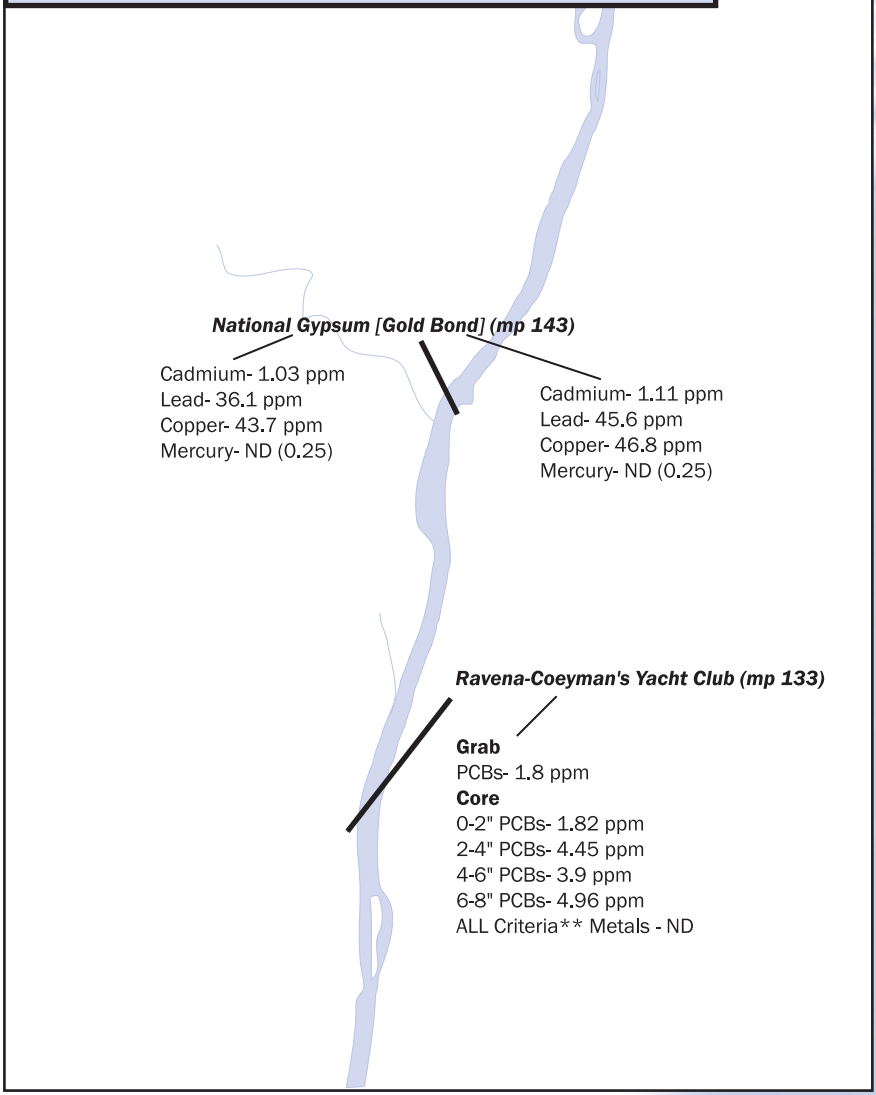
** Taken from the 1994 NYSDEC Interim Guidance: Freshwater Navigational Dredging

Region 4 Marinas- mp 130-154

E

Marina Name (milepoint)
Contaminant*- conc. ppm (MDL) (sediment class**)

* Estimated Levels -adjusted based on EPA TCLP(EP TOX) Extract Dilution Factors
** Taken from the 1994 NYSDEC Interim Guidance: Freshwater Navigational Dredging



PART III: Decisions About Disposal and Testing

After dredging is complete, what is the likely condition of the dredged materials?

The dredged materials may be uncontaminated, but also may be moderately contaminated with the likely contaminants from your region as noted on the maps.

Can uncontaminated or moderately contaminated dredged materials be disposed of in the river?

Disposing of any dredged materials in the Hudson can cause loss of valuable aquatic habitat and will not be approved.

What are some management options for dealing with uncontaminated sediments?

As an alternative to disposal in a landfill, uncontaminated dredged sediments can be managed in accordance with a generic or case-specific *beneficial use determination* which DEC issues known as BUD. Dredged materials may be suitable for **Upland Beneficial Re-use**.

For more information on this, read about the generic BUD at 6 NYCRR Part 360-1.15(b)(7).

In other cases, you might consider on site placement. This option may be pursued if you have a suitable location on land directly adjacent to the dredge site and receive approval from the NYSDEC and USACE. Potential beneficial uses include use as alternate grading and fill material at landfills and brownfield sites. Sediment processes may be necessary for use as clean fill.

What are the management options for re-use or disposal of moderately contaminated sediments?

Dredged materials which exhibit moderate levels of contamination may still be eligible for beneficial use, but require a case-specific BUD issued by the Department in accordance with 6 NYCRR Part 360-1.15(d).

Disposal of moderately contaminated dredged materials is also an option. Dredged material may be placed in a permitted landfill that is authorized by DEC. In order to pursue this option you must make arrangements with the entity controlling the site you select.

In either case, whether seeking a BUD or disposal, it is necessary to sample the dredged sediments, perform chemical analysis and submit the results of analysis to the Department for review.

How do I decide the best method of sampling dredged sediments?

To assist you in collecting appropriate sediment quality data to support reliance on the generic BUD or to be issued a case-specific BUD, follow the general sampling and analysis guidelines below. However, alternative sampling and analysis plans may be approved on a case-by-case basis. For this reason, applicants are strongly encouraged to discuss sampling requirements at a pre-application conference Prior to conducting any sediment sampling, the best course of action is to meet with NYSDEC engineers to determine the appropriate sampling plan and required analysis for your project. During the pre-application meeting, be sure to ask for specific written instructions for collection and testing to be sure the results you submit will be accepted by both agencies.

What are the most common methods of sampling dredged sediments?

Sampling Method: Collect undisturbed cores which are representative of the entire depth interval which will be dredged and are uniformly distributed within the dredging area.

Number of Samples: Determine the number of samples based on the number of cubic yards to be dredged (see chart below).

What contaminants need to be analyzed in each sample?

At a minimum, each sample should be analyzed for volatile organic compounds (EPA 8260B), semi-volatile organic compounds (EPA 8270C), pesticides (EPA 8081A), PCBs (EPA 8082), and the following toxic metals (EPA6010B): arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc.

Number of Samples Needed

# Cubic Yards:	Under 5,000	5,000-10,000	10,000-20,000	20,000-30,000	Over 30,000
Minimum # Samples:	1 for each 1,000 CY	6	7	8	Contact DEC

In what cases can testing and analysis of contaminants be waived?

In cases where sediments to be dredged consist primarily of sand and gravel, requirements for chemical testing may be waived. In such cases, applicants should submit results of testing for particle size analysis and total organic carbon. In general, chemical analysis will not be required for samples which contain less than 10% of particles passing the number 200 sieve and less than 0.5% total organic carbon.

In what cases does the Department of Environmental Conservation require additional sampling?

The DEC may require additional sampling in areas of known contamination. In cases where sampling costs appear excessive in relation to total project costs (i.e., greater than 15%), contact the Regional Office to discuss ways of reducing sampling costs while maintaining adequate characterization of sediment characteristics.

How do I select a laboratory to test my samples?

For projects that require sediment sampling and analysis, it is important for you to select a laboratory that is certified by the New York State Department of Health and that follows the analytical methods recommended by NYS DEC.

What are some typical fees to test dredge samples?

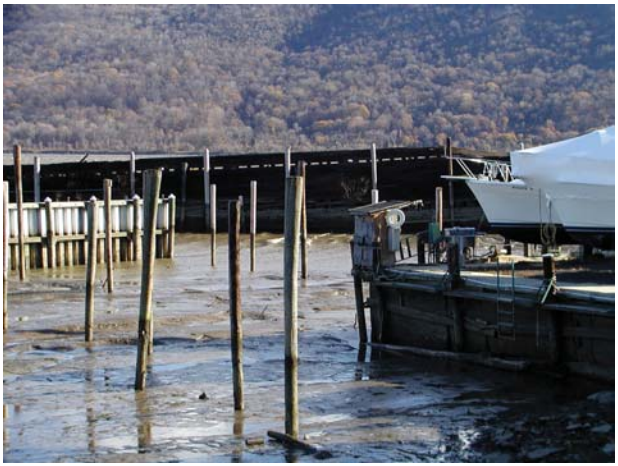
Fees can vary widely depending on the scope of the work needed and the companies hired to do the dredging. By way of example, a large marina hired an environmental engineer from an approved firm to put together a sampling plan that included the number, depth and location of samples needed. The engineer also suggested that some samples be composited for testing. The sampling plan was submitted to the DEC and approved. The marina management called on three companies to get estimated fees for sampling and testing for contaminants. The plan called for three samples to be taken and composited into one for testing. The three companies quoted estimates of $3,990; $5,000 and $10,530. Thus getting estimates from several firms and working closely with an engineer who designs an efficient sampling plan may be the best strategy for getting the best possible job done economically.

Conclusion

We hope this guide has been helpful. Comments on the content are welcome. Please contact Nordica Holochuck, Hudson Estuary Specialist, New York Sea Grant, at (845) 340-3983 or reach her via e-mail: <nch8@cornell.edu>.

Hudson River Marina Dredging

A Guide for Marina Operators



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